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Published by
About the author
Nwm .

DEDICATION

This report is dedicated to the memory
of my wife and to ail the people of
South Africa, in the hope that we
can find a peaceful and positive soiu-
tion to the country's problems. Any
future edition should be retitled
Industry AFTER the Siege.

Tony Beaumont

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pleased to be involved in publishing

INDUSTRY UNDER SIEGEI

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Special thanks are due to Abe Berry and Lowry Publishers of Johan-
nesburg for the iliustrations from "Act by Act - A Cartoon History

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Africa's political history as it was illustrated at the time by

The Star and other opposition newspapers. It is recomended to

a with a special interest in South Africa. Other cartoons came

frotn Engineering New . The author's son contributed the opening

lllUstration. Others came from companies mentioned in the text.

Numerous tables and graphs have been borrowed from Financial Mail,

theiauthor's former publication Engineering Now, the Financial Times

(of London), and other, mainly more specla ised, meaia. A iist

of sources is given in the Appendix.

Any report of this nature is essentially a working document, whose

usefulness rises according to the speed with which it is produced.

The,result has inevitable shortcomings, most of which could be

rectified with more time, but it is hoped the report as it stands

is of use to its target market.

In pohciuding this general acknowledgment, the author wishes to

apoiogise to any he has offended, and thank aii who have helped

in the preparation of what has become his biggest research project

to date. And possibiy the most significant.

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Fig 1.1.- Extract from a letter received from a South

African company interviewed before the recent

election, when covert business

initiatives were

the norm.

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. SCOPE AND TREATMENT

Industry under Siege provides an up-to-date, sector-by-sector assessment of the technical and financial strengths and trends of South African industry, at this time when the country is poised for political change. It is written from the businessman's point of view. After a summary of conclusions and brief introduction, the first chapter outlines the South African situation, concentrating on the political system. In Chapter 2 the economic view is given. Thereafter individual industries are dealt with, chapter by chapter, with the emphasis particularly on the heavy sector where South

Africa's capability is most questionable. Finance, commerce and consumer sectors are dealt with briefly. Major influences on industrial performance such as R&D, education and training and relations with the region are also dealt with briefly. The final chapter investigates prospects, while the appendix gives supplementary information on various topics.

The whole has been produced as soon as possible after the South African general election, at some expense of completeness. Accuracy, editorial polish and no doubt absolute accuracy: Readers and companies mentioned are asked to submit updated information, but the editor's decision is final as to what amendments are included in any future edition. Reasonable efforts will be made to respect corporate wishes to keep a low profile, but it is the editor's clear perception that the time when

is past, merely helping yesterday's men to power in the belief that they can preserve an already outdated status quo.

South African industry is, of course, a moving target, whose circumstances and attitudes change quite rapidly. It is very largely the failure of industry to respond positively to previous circumstances which is precipitating political change. Its role will be crucial in the implementation of any new political dispensation.

CURRENCY

South Africa's currency, the Rand (R) is given in its original units, which are divided into 100 cents (c). It is officially measured against the US dollar because of its dependence on the gold price, but is often quoted against the Pound Sterling. The Average closing prices. 20th October 1989:
Commercial Rand: R2.66 : S1 R4.21 : 51
Financial Rand: R3.92 : \$1 R6.23 : 11
Gold bullion: 3366/02

The country operates a unique two-tier exchange rate mechanism, details of which are outlined on page 30.

P N Botha was prevented from crossing

the Rubicon by the fall of the currency
following his 'Rubicon' /
speech in 1995: JZi/

SUMMARY OF FINDINGS.

W. South Africa is in transition from a minin econom to one mo broadly industrial, for which the primary progcessing)infrastructu: is largely in place. There are still bounteous minerals, whose explaitation will increasingly be supplemented by export- and consumer-led industrial development. The transition is severely retardeq by the economic siege imposed in outrage at the (dying) apartheid system. The siege is escalating for emotional reasonsfl . With a few notable exceptions such as machine tools l

. and com uters,

South .Africa has the theoretical ability to survive a prglong'ed economc Siege. It probably lacks the manpower, the political will, and even the economic competence to do so.

. The huge political misjudgment of the 'Rubicon' speech in 1985 triggered world financial sanctions and disinvestment which are far more serious than the limited trade sanctions. Since the country has been denied formal overseas finance its financial growth has been Tess than the inflation or birth rate. As a result South Afri- cans (of all races) are getting poorer.

. Because of the financial erosion, which commenced with collapse of the currency, many _of the previous top financial and technical People have .left the country. The exodus is on hold for the moment, waiting for-clearer indications of political reform or reaction, but if it is not to resume it is considered essential that the ecorioniy turns up. This can no longer be achieved without sufficient political settlement for reinvestment, and abolition of sanctions.

. The recently unionised black labour force has denonst economic and political muscle (2-3 million stayed awayrihtepdrottkeytl during the.r.ecent general election). Because of the absence of formal'pohtical representation, both trade unions and churches are used as.means of political self-expression. To a degree this may change With the release of the ANC leaders except Nelson Mandela .(who_ appears to be dictating terms for his own release). Sticking to indosty, .both labour and management are still learning th ir roles in the industrial bargaining process. They are learning fasi!

. South Africa has abundance of coal but no natural oil reserves. Its strategic oil stocks are believed sufficient for some months or at most a very few years. Because of its natural oil deficiency the country has pioneered oiT-from-coal (Sasol) and is aboutito add ml-from-gas (Mossel Bay). These significantly lessen the country's oil import dependency. but do not make it self-sufficient, even strategically.

.The country is self-sufficient in electric power, but equipment for its generation is imported. Shortage of water has led to pioneering developments in dry cooling, and South Africa also leads_ in the use of very-low-grade coal for power generation. The Single nuclear station at Koeberg is uncompetitive.

, South Africa is self-sufficient in electric power transmission and distribution equipment, and has pioneered the use of extra-high-voltage (765W) at high altitude. The transmission network 15 not yet a true grid, major routes being unduplicated in places,

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' Such as the timing of the SA debt rescheduling announcement H a sdtisfying gesture for white South Africans. but anti-productive. if it increases the external pressure. '

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9. The countrgs strategically self-sufficient in electric motors.

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lighting, ting and most categories of electrically-operated equipment, though local manufacture is broadiy supplemented with imports.

Water is the most intractable shortage facing the country in the longer term. Its immediate shortage in the interior has abated

somewhat with the ending of the drought, and is being offset more permanently by the Lesotho Highlands water scheme. coming on stream in stages over the next 30 years. This is perhaps the most important engineering project under construction in the region.

South Africa is best known abroad for gold and diamonds. In diamonds it is still dominant through the activities of one company (De Beers - an affiliate of Anglo American, which is by far the largest mining house. Other major mining groups are Gencor. Goldfields, JCI and Rand Mines - Barlow Rand group. Anglo comfortably exceeds the other groups in size together.)

The country is still the world's largest gold producer but its output is declining and costs are escalating. Massive capital investment is required for a third major phase of gold mine development in the nineties, including the development of technology for extra-deep-level mining. It is thought that the finance will be forthcoming owing to the mind set of Johannesburg stock exchange investors. In strict financial terms the merits of this investment are debatable.

Coal is second to gold as a national export revenue earner, but the world market prices of both are depressed today. More important strategically are iron, chrome, nickel, vanadium, copper, manganese, zinc, lead, tin and the precious metal platinum. Those underlined represent South African monopoly or near-monopoly positions.

In a continuing siege economy the South African government can withhold strategic minerals from the world market, thereby disrupting production of stainless steel, many other alloy steels. and catalytic converters for engine exhaust systems. A legitimate pretext for doing this is increased processing in South Africa itself, which is already happening in stainless steel.

Primary and secondary production of iron and steel are well established, for South Africa's needs and exports. The state undertaking Iscor is easily the largest but there are major private producers including Highveld and Middelburg (stainless). Primary and secondary production of non-ferrous metals are well established, including aluminium (Alusaf - whose raw material is imported). The country is strategically self-sufficient in most plastics. some ceramics, most building materials and most timber. Since 1985 it has been a net exporter of pulp and paper on a considerable and growing scale (Sappi, Mondi and Nampak).

South Africa has made major progress in electronics but is predominantly dependent on imported components. It makes most of its communications and military electronic equipment and all television receivers.

The country is almost wholly dependent on imported computer hardware. There is, or has been significant local software development. Some very sophisticated computer systems, such as networks are installed, but dependent on a diminishing pool of skilled manpower.

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South Africa is strategically self-sufficient in many sectors of heavy engineering, including most boilers and heat exchangers, mechanical power transmission equipment, materials handling, plant engineering and project management. It is predominantly an importer of hydraulics and pneumatics, and almost totally an importer of machine tools.

In general, manufacture the country is strategically self-sufficient, and capable of making most of what is not made locally today.

It is far from self-sufficient in precision mechanical engineering and is predominantly an importer of measurement and control equipment. South Africa's armaments industry is now one of the top half dozen in the world - not far behind those of UK, France or West Germany, and manufacturing equipment better designed for fighting in the region. Production embraces small arms and other individual weapons and equipment, field guns, tanks, personnel carriers, aircraft including helicopters, missiles, small vessels, communications, radar etc, mostly field-proven in the Angola/Namibia war. It now has the capability for submarines and larger surface vessels, and possibly nuclear weapons. As well as manufacturing for its own needs, South African arms are exported widely.

With the end of hostilities in Angola, South Africa's now under-employed armaments industry is likely to be redeployed to rectify strategic deficiencies, of which the most serious are considered to be machine tools, components and more electronic components. South Africa is well-served by internal and external transport; but dependent on imports for large vessels, aircraft and many high-tech components and assemblies for motor vehicles (bodies and engines have been made locally for years). The measurement of motor vehicle content by weight for those wishing to qualify as locally manufactured for duty purposes has recently been changed to a value-added basis. This will reduce import-dependence further. The country has largely First World communications. It is trying for self-sufficiency in communications equipment manufacture, which is undermined in practice by its high-tech nature. Thus digital electronic telephone exchanges and microwave equipment are assembled locally but their components are mainly imported. Broadcasting equipment is wholly imported.

South Africa is strategically self-sufficient in financial services, commerce, building construction, food, drink and clothing manufacture. The financial sector (banks, building societies, insurance companies) is technically sophisticated, but considered too short-term profit oriented for the long-term good of the country. Fruit and wine are traditional exports which are particularly hard-hit by overseas boycotts owing to their visibility. They are produced by particularly labour-intensive industries.

The country is theoretically well set up to maintain its industries on an ongoing basis, as much because of its geographical distance from First World sources of supply as on the siege economy which is a recent phenomenon. Thus Eskom has the most comprehensively equipped facilities of any electricity supply authority, including dynamic balancing equipment able to handle its largest turbine rotors. For the country as a whole, excellent facilities are often undermined by poor local workmanship and import of parts.

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Owing to large Third World element, South Africa has a large informal sector. Major informal initiatives are black taxis, home trading, street trading and traditional medicine, mostly supported by trade associations. In time more informal initiatives will

emerge and maybe transfer wholly or partly to the formal sector. 'I South Africa has a poor environmental record and some major air pollution black spots (Nitbank, Secunda, the Vaal Triangle). They are accepted nationally now for economic reasons, but represent probably major long-term problems. Water pollution is already serious, so legislation against it was recently tightened. The Republic of South Africa overshadows the rest of the region industrially. Beyond its borders, Botswana has a thriving economy. Lesotho may have in time, as a result of the Highlands water scheme. These and the other neighbours, including the TBVC 'countries', Namibia and the 'Front Line' states are more or less dependent on the Republic for external trade.

The above countries, Mauritius and the Seychelles are used by the Republic for the import and export of strategic goods banned from direct trade. The Republic's largest visible trading partners are Japan, West Germany, USA (still) and UK, but South Africa has significant trade with Switzerland, Israel, Taiwan, Hong Kong and even Chile.

The present level of sanctions is distorting the South African economy but is not as damaging, or as unwelcome to the South African authorities, as outsiders suppose. On the positive side it forces structural industrial changes which may be to the country's long-term benefit, causing industry to be rationalised into fewer, larger, more competitive production units which serve the country's own needs now and are potentially capable of competing in more export markets. This does not happen when export markets are denied, and an unwanted side effect is the price-fixing which results from local monopolies and small cartels, which tend to fix prices locally in line with competitive imported products, or world market prices if the industry is export-oriented (whichever is greater). The weakness of the currency is also welcome to many export industries, resulting in sometimes massive Rand profits.

The restructuring of industry is seriously hampered by the present brain drain, but the departure of skilled white artisans and low-level technicians is compensated by the opening up of opportunities for advancement of the non-white population. If non-whites are to play an effective industrial role, however, a massive increase in education is needed. If it is not provided (at present it is not budgeted, rather education was recently cut back), then South Africa's present First World industry and economy will slide towards Third World norms. It is now far too expensive to rectify skilled personnel deficiencies by importing 'experts' from overseas on the scale that it was done in the past.

32. The present restructuring of industry presents opportunities for foreign investors willing to take the political risk, on attractive financial terms. Thus Taiwanese participation is under discussion for the new stainless steel project of Highveld and Samancor, in return for exclusive or preferential customer treatment. Further foreign finance is needed for future public sector investment, and will certainly be sought for major mining investment in the nineties. It will not be made available until South Africa has reformed sufficiently, while maintaining sufficient stability, to reactivate its economy.

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33. An increasing amount of South African money is looking for investment

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ment overseas - not always successfully (as in Minorco's bid for ConsGold). As other observers have commented, the South African economy is now in a box - from which an increasing amount of smart money is somehow finding its way overseas. The rest is buying up foreign-owned assets in South Africa, being invested in property or the Johannesburg stockmarket, pushing share prices up despite (worldwide) stock market uncertainty.' There is insufficient industrial investment for the long-term future of the country, nor will there be sufficient investment in the correct direction,

which industry leaders must be towards the future. Now!

The mass withdrawal of foreign-owned companies, including almost all those of US origin, has resulted in some streamlining but little mass redundancy despite some tragic cases. ; More important, much of First World South African industry is now automating as far as it can in order to reduce its dependence on a now strike-prone, low-skilled labour force, inevitably increasing social pressures beyond the factory gate. The largest employer (the mining industry) talks of its social responsibility, but trackless mining (now being introduced) uses far fewer, more highly skilled people and similar trends are evident across the board. i

Making the most objective possible assessment, the question is not longer whether, but exactly when South Africa will change, and how disruptive the process will be. There are so many random factors, and so many interested parties, that any forecast is likely to be quite wrong, but applying economic and technical criteria it is felt that the South African authorities have 'at most five years to implement major reforms before irreparable damage is done to the existing industry and economy.

If the siege lasts until the end of the century, there is not likely to be much industry or economy worth saving. That, however, seems unlikely. What seems much more likely is that the country will reach a politically acceptable settlement, or that the siege economy will escalate into war.

If the siege economy is allowed to persist or escalate indefinitely, there is a danger that white South Africa, dominated by the Afrikaners, will declare open war on the world and inevitably lose, as they are losing the present economic war. :

That scenario may seem far-fetched. It could happen quite easily and accidentally through the country's need to protect offshore installations. This is likely to lead to an early extension of territorial waters, inconveniencing shipping on one of the world's most strategic sea routes, off a coast notorious for bad weather and the size of its freak waves. Suppose South Africa is obliged to sink some out-of-control vessel liable to damage the Mosses gas offshore rig... The result makes exciting fiction (and should remain there).

Assuming a sensible resolution (which presently seems the most likely scenario) the First World industry and economy are set to boom through the coming decade, sufficiently to lift the Third World sector to First World levels within a generation. Shorter term, export-led First World industries will be supplemented by the already burgeoning Third World internal distribution sector.

A sensible solution to the South African problem has a great deal to offer the world, as South Africa has to learn from it. The population of ethnic minorities who must somehow learn to live together is seen as a microcosm of the emergent global village.

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. is real reform plus stability.

ruinous, st whatever sector of industry is considered. SA industry has gely washed its hands of present political circumstances and is making contacts with the dispensation to come. So has the 'friendly' overseas financial centre of London if the absence of response to advance promotion of this report is indicative. SA industry would bankroll the revolution tomorrow provided there is not too much economic disruption, and that industry can be part of the new scenario in which the free enterprise system is retained. With so many interested parties, the author's voice will perhaps not be heard, but his recommendations are:

RECOMMENDATIONS

Overseas pressure groups should keep up the pressure for more sanctions (they will anyway), which however are materially damaging. The author agrees with Walter Sisulu that the SA government should not be given time to regroup. Neither, preferably, should the country be faced with more material sanctions, which will hit the black community hardest. Something symbolic, which adds to whites' sense of isolation without being materially damaging seems right, with the carrot of promised removal for real reform. This report's message in a nutshell is that apartheid has become SA's First World industrialists hoping to stay in the country in the longer term are advised to build up their corporate responsibility programmes, employee share ownership schemes etc, and make contact with the ANC if they have not already done so. If the opportunity arises to provide non-military support, then do so. Those not planning for the longer term should leave now, or in the very near future as the get-rich-quick mining camp days are over. Overseas businessmen cannot be advised collectively whether they should stay, go or come; it depends on individual circumstances. Those wishing to stay, or come for the longer term should make their mark with the ANC if they have not already done so. Those able to provide assistance in the areas of education or low-cost housing should do so now. Any major industrial investment should be dependent on political progress, and politicians should not delude themselves. Whatever is signed, the substance of major investments will not transpire, or will be withdrawn, unless there is that implies transfer of power.

provided it occurs in an orderly fashion, so be it, at least so far as the author is concerned. No incoming administration is likely to handle the economy worse than the custodians of white privilege have done in this decade.

South Africa's black leaders about to inherit the political kingdom are asked: think very carefully what you promise your followers. Assuming a major component is prosperity, this can be achieved for all South Africans by the now white-led First-World economy, which is largely managed by foreign asset holders. It cannot be achieved by simplistic socialism, communism or major unrest. Lacking full military backing, you cannot win a military confrontation

tion. Neither can the whites win the present economic war. On that basis, compromise. Industry is on your side. Or wants to be. Reactionary whites who voted Conservative in the recent election have two alternatives: come to terms with multi-racial South Africa, or secede to form some sort of Blankestan. Be quite clear if you do that you are choosing the road to poverty, which you cannot continue to choose for the country as a whole. If you choose to secede, please do it peacefully. The rest of us would be sorry to lose you, but your outdated and discredited policies have no place in South Africa in the nineties or next millenium.

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INTRODUCTION

WITH THE APPARENT ending of the Cold War. and the cessation of hostilities in Angola and Namibia, South Africa has moved up significantly on the lists of the world's major trouble spots and embarrassments. It is also now perhaps in first place on the First world media's HIT list.

This is not because it has the world's worst regime, nor is it the most oppressive. It is, however, the most openly racist, and still relatively open as regards information. For the world's media, South Africa makes a convenient Aunt Sally. The press is frequently encouraged in this by foreign governments anxious to divert attention from their own problems, and by the now established prejudices of readers and viewers. The South African regime has simply lost its propaganda war, whether or not the rest of us are right to feel morally superior. It is also in the process of losing the economic war which has been (ieclared by much of the international community to the extent of imposmg mild trade sanctions and severe financial sanctions. This is denied by the South African authorities. They are right to the extent that the country has the theoretical ability to withstand the present level of sanctions etc, despite some notable weak spots. South Africa's obvious weak spots are oil. machine tools, computers, electronic components and high technology in general. Less obvious weaknesses are thought to be more important. These are lack of skilled manpower, moral right (which undermines political will), economic competence and even financial resources sufficient for a long economic Siege.

In practice it is expected that South Africans (of all race groups) will reach an accomodation quite quickly, thus relieving the financial pressures for change.

Alternatively the siege will escalate, and the opportunity for a relatively non-violent resolution will be lost, to the considerable long-tenn detriment of all race grougs.

. CHAPITr 1: HIL bUUIM AHULAN SHUI'xliU'ii

THE REPUBLIC of South Africa, to quote a 1989 tourist brochure, covers 4% of the Afri'can continent and accounts for 6.5% of the total population yet generates 25% of the continent's gross national product (GNP). It accounts for 40% of the industrial output, 45% of' mining production, consumes 66% of the steel produced and electricity generated. It uses 46% of all motor vehicles and 36% of telephones installed. It is the largest producer of agricultural products in Africa. It is inherently a wealthy country and potentially the powerhouse of Africa south of the Sahara - which role it has been precluded from fulfilling in recent years by the political (and consequently economic) distortion -resulting from the domination of the minority white race group. Their erst-while apartheid policy has attracted the adverse attention of the entire outside world.

The country lies at the southern tip of Africa, between latitudes 22D and 35" south. It is flanked by the Indian ocean on the east and the Atlantic on the west. It is bordered by South Nest Africa (Namibia), Botswana and Zimbabwe to the north, and by Mozambique and SwaziTand to the north-east. It entirely surrounds the independent kingdom of Lesotho.

It also contains within its borders the TBVC 'countries' of Transkei, Bophuthatswana, Venda and Ciskei - whose 'independence' is recognised

nowhere beyond South Africa's borders, and six nominally self-governing territories; Lebowa, KaNgwane, Gazankulu. QwaQwa, KwaZuTu and KwaNdebele, which refused to accept independence as conferred on the TBVC.

According to that brochure the Republic is 1123 226 km²: in extent - more than five times the size of Great Britain, one eighth the size of the USA and almost as large as the combined areas of West Germany, France, Italy, The Netherlands and Belgium. Debatably it is larger, since the figure given excludes the nominally independent TBVC - which is certainly part of the country's unitary economy. South African statistics are usually accurate as stated. but the terms of reference are too rarely made clear.

The country is divided into four provinces: the Cape Province in the south, Natal in the east, the Orange Free State in the centre and the Transvaal in the north. The coastline is 3000 km long.

Pretoria is the administrative capital, Cape Town the legislative capital and Bloemfontein the judicial capital. Durban is today the principal port of entry and Johannesburg the largest city and leading business centre. It is situated on the Witwatersrand, where gold was discovered in 1886. The Pretoria-Witwatersrand-Vereeniging (PNV) area forms a single economic region in which almost two-thirds of the country's business and industry are concentrated.

CLIMATE

South Africa has a temperate and near-ideal climate for most people. Temperatures are moderate. Summers are warm to hot with temperatures varying from 21 to 28°C. Humidity is low except along the Natal coast. Seasons are reversed for visitors from the northern hemisphere: winter compares favourably with the northern hemisphere's summer.

Climatically there are two regions. The Cape coastal belt has a Mediterranean-type climate (winter rainfall). Summers are dry and sunny. Further east the rainfall is distributed evenly throughout the year. Frost is rare and snow, when it falls, is generally limited to high mountain ranges.

by beached sailors and retired company officials, were augmented by French Huguenots and Tater Scottish and German elements, who coalesced to form the Boers, and eventually the Afrikaners, with their own language, Afrikaans, which is closest to Dutch and Flemish today. They were a hardy folk (or Volk) who were forced by their isolation to be self-sufficient, though they adopted modern ideas when it suited them. Thus the American War of Independence inspired the formation of two short-lived republics in the then-remote interior settlements of Swartkopsdam and Graaff Reinet. In practice many of them preferred to herd cattle as far as possible from the company's administrative reach, entirely missing the liberalising influence of the French Revolution, bringing an 18th Century fundamental Calvinist religious outlook into the 20th Century.

They were a God-fearing people who found justification in the Bible for their self-evident superiority to the Tswana population - who were not "present-day Bantu Africans but now-extinct Bushmen and Hottentots. These were exterminated when they caused trouble. attacked by European liquor and diseases when they did not. Eventually their remnants were absorbed by the growing Coloured (mixed descent) population. who were treated as inferior by the white settlers, though as a servant/slave class they adopted the white man's languages and much of his culture.

RuTe Bri tann i a

The Cape Dutch were isolated from their European origins by their remoteness, exacerbated first by dislike of the autocratic company administration in Cape Town, then by the arrival of the British, who occupied the Cape during the Napoleonic wars and retained it for strategic reasons after the ending of hostilities.

The main British presence was military, but organised British settlement occurred in the eastern Cape from 1820 (The 1820 Settlers). The British also made strenuous efforts to anglicise their new Dutch-speaking subjects, foisting on them schooling in English then Scots Presbyterian ministers - many of whom were assimilated by the Cape Dutch instead.

The British made themselves unpopular in other ways, for example by the abolition of slavery, failure to pacify the eastern frontier, and above all failure to share the language. attitudes and outlook of the Cape Dutch population whom they tried to convert to their own ways instead. For many Cape Dutch colonists, the liberation of the slaves was the last straw, losing on the colony a large number of shiftless vagrants whose numbers were swelled

by migrant Bantu workers (initially
such workers were- migrant). It
was to control migrants that the
first pass laws were introduced, by the
British, not the Boers, but by then
many of the latter had had enough.
Those who felt most strongly anti-
British trekked by ox wagon into the
interior (The Great Trek, 1836-38),
as occurred at the same period in
the American West. They established
16 separate republics, of which two
survived historically beyond the reach
of the British for a time.

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The movement of the Boers into the interior and of the British into Natal combined with pressure on the eastern Cape border to produce a series of confrontations with the Bantu (black Africans) who comprise the bulk of the population today.

Earlier versions of history emphasised that the Bantu were semi-nomadic.

So at that time were the Boers, living out of covered wagons. Both moved slowly, in response to socio-economic pressures, such as the rise of the Zulus or the advent of the British.

In the nineteenth century, of course, European technology was paramount, allowing the Boers and British to subdue their ethnic rivals, not by leadership or discipline in which the Basuto and Zulus could match them, but by superior fire power. For whatever reason the Boers and British triumphed in a series of so-called Kaffir wars on the eastern Cape border, Zulu wars in Natal, Basuto wars in the Orange Free State and other major and minor clashes, which resulted at the end of the day in military defeat of the blacks and their containment in 'traditional homelands' - which were too small to support them economically by the primitive farming methods they employed.

Both the Boers and Bantu were cattle farmers, and the Bantu, confined, over-grazed, over-planted and chopped down the trees for firewood, moving on when the land could no longer support them. When this happened in the homelands the population sought work with the white man, first on the farms and subsequently in the cities, forming satellite townships which are mostly shanty towns or urban slums.

For more than 200 years, white South Africa was a poor farming community, existing originally only to service passing vessels. The first important economic development was the discovery of diamonds in 1869 then, even more important, the discovery of gold in the Transvaal in 1886. Masses of fortune hunters and mining technicians, mainly from Britain, poured into the country. President Paul

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Kruger of the Transvaal, fearing British domination, imposed strict franchise requirements. Britain retaliated, and the situation escalated into the Anglo-Boer War (1899-1902).

The Boers did well initially, but dissipated their strength in futile sieges, and never had the strength to survive a long war. Failing to secure international support they inevitably lost the war of attrition to the by-then-much-larger British forces, but the Boer forces were not defeated in the field. The British won by the use of barbed wire, garrison-

ed blockhouses and concentration camps for the Boer women and children, where thousands of them died. The defeat, and the death of the women and children, left a legacy of bitterness between English and Afrikaans-speaking white South Africans, which colours political thinking to this day.

Having won the war and thus annexed the two republics, Britain was generous to the defeated, granting self-governing Dominion status to the Union of South Africa formed by the merger of the four formerly separate colonies and republics in 1910. The move divided the Afrikaners into those willing to co-operate and those who wanted nothing to do with the British. The Union of South Africa supported Britain in both world wars, despite a minority of Afrikaners who wished to support Germany (and a few who openly rebelled in 1914).

It also resulted in the rapid industrialisation of the country, which established a strong First World economy. Unlike other First World countries, however, the menial tasks were performed from the outset by defeated Third World tribesmen and women, or their descendants, forced to work in the white-run economy and industry by the extreme poverty of their 'traditional homelands'. They still have no political rights in the central government of the white-dominated society which their labour has helped to create. Their situation is steadily improving and is materially better than elsewhere in Africa, but the

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and poor is vast. Poor black

has exacerbated it.

All the economic and social structures were organised for the benefit of the whites, including forced appropriation of land owned by non-whites whenever it was convenient to the dominant race group; In the economic sphere, wherever blacks represented real competition. they were deliberately held back, by restrictive legislation such as the Job Reservation Act where social custom was insufficient. Eventually the gulf between the major race groups was not only in wealth and custom, but enshrined for more than 40 years by the doctrine of apartheid.

APARTHEID

Considering that Afrikaners outnumber white English-speaking SA citizens two to one, it was, perhaps, mostly the military might of Britain which prevented the Afrikaners from uniting before World War II to pursue an independent course. It was Dr Malan's National Party which achieved that in 1948, coming to power on the vote-

catching policy of apartheid. Seen from the point of view of Afrikaner white South Africans out of touch with Europe for about 150 years, blacks are obviously inferior, and in any terms they are less developed. Other non-white elements such as the Coloureds and Indians were considered inferior by association.

(The Indians are another complicating, important immigrant-element, brought by the British to work the sugar cane fields of Natal because the Zulus, being proud warriors, would not. Today many of them are traders.)

As conceived by its architect, the late Dr H F Verwoerd, who became prime minister in his turn, the central tenet of apartheid is that each group should achieve autonomy in its own area, which is, perhaps, not so much evil in its philosophy as out-of-step with economic forces. In pursuit of this Grand Apartheid vision, South Africa has gone some way towards deliberately balkanising itself, in the face of economic logic and world opposition. At the end of the day, economic logic has won.

South Africa - which is itself part of a larger southern African region and indeed the world - is a single economic entity, and group aspirations towards autonomy must be contained within the economic whole. Anything more is either a fore-doomed attempt to reverse the tide of history, or a pretext for something else - in this case permanent white baasskap (domination) supported by a battery of legislation which is morally indefensible and deeply offensive to human dignity. The whole is enforced (if your skin is any colour but white) by all the trappings of a police state. In support of Grand Apartheid were a whole battery of petty apartheid restrictions, of which the pass laws have already been mentioned. There were separate transport facilities, separate toilets, separate entrances to public buildings, the Mixed Marriages Act which prohibited marriage between racial groups and broke up many existing marriages, the Immorality Act which prohibited sexual intercourse between different race groups, and a host of more trivial regulations, limiting the use of public benches, parks, swimming pools, schools, hospitals and the better residential areas to whites only. Most have now fallen away or are, in liberal areas, ignored. Separate (inferior) facilities might be provided for blacks in their own areas, including satellite townships sited for the convenience of white industry, and 'traditional tribal homelands' in which the major tribes were encouraged to accept independence. first sought work with

the white man, all they were offered were menial positions which their lack of language and skills allowed them to fill. Many are intelligent, and as a race they are adaptable, and their numbers keep growing. It is impossible to keep them in subservient roles such as those to which white society wished to confine them. This

When blacks

gave rise to the swart gevaar (black danger) political platform of successive National Party and Conservative Party politicians. The danger perceived was less 'military than social. i.e. the danger of being swamped by the blacks' superior numbers, with which one can perhaps sympathise. but apartheid is dead (the Nats say).

Apartheid was a mistake of the past. It is recognised as such by the National Party leaders and all parties the left of centre. if not yet fully by the white electorate who are understandably reluctant to give up the good life they have made for themselves. Nevertheless the system is softening.

_Towards reform

In 1984 a new constitution was implemented, representing a break with the all-white Westminster system inherited from the British - ignoring the disenfranchisement of the Cape's Coloured voters following the National Party's accession to power in 1948, which the present NP wishes to be forgotten. The 1984 constitution provides for a State President incorporating the office of Prime Minister, a three-chamber parliament separately representing white, Coloured and Indian voters, a cabinet chaired by the State President, a Minister's Council for each house of parliament and a multi-racial President's Council.

It is some credit to South Africa's administration that it has been able to reverse past, mistaken policies to the extent that it has, or at least accepts their impracticability. Getting rid of the consequences is another matter. Whether they would have tried to cross the Rubicon if the economy had been in better shape is a question the politicians should ask themselves. It is widely agreed that the omission of blacks is a major blunder, and not tenable in the longer term. A special cabinet committee was appointed to enquire into and make recommendations on the political and constitutional future of urban blacks, but

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no meaningful progress was made, because no credible black leaders were prepared to negotiate with the white government prior to the release from imprisonment of Nelson Mandela, the ending of the State of Emergency and the unbanning of the ANC itself.

AHC

The African National Congress is a black political organisation which has been in exile for many years. It has been banned in South Africa as a terrorist organisation since the early sixties - which it was not until white South African police opened fire on an African mob in Sharpeville, killing 62 people in 1966.

As a result of total government intran-

sigence at that time, Nelson Mandela and other highly articulate and educated blacks resorted to abortive armed struggle, were arrested, tried and found guilty, and have spent more than quarter of a century behind bars. The South African government has for years been seeking ways to let them out without conceding the justice of their cause. In this it has been morally defeated by the recent action of former State President P H Botha in inviting the jailed Mandela for tea! It has also gained some moral kudos. demonstrating to the world that it is not entirely unreasonable and that Mandela is in fact, keeping himself in prison to the extent that he is (refusing to bow to government preconditions for his release and his participation in negotiations, such as the renouncement of violence. Rather he appears from this distance to be setting his own preconditions for release, which certainly include the unbanning of the ANC and the ending of the state of emergency.

The opposition to apartheid will surely coalesce around the ANC, but reformist politics are far from united. They range from the white liberal Democratic Party (with three leaders because they could not agree to nominate one, to the largely Xhosa-based 11151111:

ANC, to the Zulu-based Inkatha movement (presently the widest in any political assessment) to the moderate black consciousness movement and the far-from-moderate Pan African Congress, one of whose more colourful slogans was "one settler, one bullet". Despite the release of one leader from detention, that organisation remains banned. as does the ANC at least nominally. In practice the release of most of its leaders coupled with the government allowing peaceful protest has created a situation where the non-militant ANC has all but unbanned itself. Garment factories are reported to be working overtime on clothing in the ANC colours.

In fact the situation seems remarkably similar to the early days of the French Revolution, including the near-bankruptcy of the administration, with the notable difference that it controls enough fire power to decimate the whole southern African region, and probably the resolution to use it.

Since 1985 South Africa has been living almost continuously under a State of Emergency, which allows the government to suspend the constitution whenever it becomes a nuisance - which seems to be whenever they run into serious opposition or even inconvenience. The country is also recover-

ing from more than a decade of 'rule' by the strong (: autocratic) P N Botha, and 41 years of government by the increasingly corrupt and incompetent NP.

CENSORSHIP

The South African government has a battery of legislation allowing it to gag the press, which is one major reason why the present report is being published from London. Some fringe publications were closed down, but the main opposition media continue to be vociferously critical. Apart from 'specific areas such as security legislation there is no press blackout in practice.

Recently the SA government appears to have embarked on a new "and probably more serious" strategy to Silence the press according to the Stag. IL is prosecuting newspapers for contravening the Police Act or Internal Security Act in the hope of drawing less condemnation than direct censorship or closure resorted to earlier.

RELIGION

South Africa is a Christian country, and there are statistics to prove it, which did not come to hand in time. Most of the authorities belong to one of the Dutch Reformed Churches. Most other major religions are represented, as well as the local black Church of Morija, whose Easter assemblies in Pietersburg are the largest.

What part religion will play in the resolution of racial problems remains to be seen. However it is noticeable that blacks - today's most oppressed people in the region - identify very literally with the oppressed people of the biblical era. Clerics such as Archbishop Tutu are extremely prominent in the movement for reform. The united voices of the (regrettably separate) Christian churches MAY play a significant part in cooling everybody's tempers and creating sufficient trust to reach a peaceful agreement.

The signs for this are quite hopeful, because unlike such areas as the Middle East, most people seem to WANT a peaceful solution. In fact there is enormous goodwill on all sides.

That is the situation inherited by the new State President F. W. de Klerk and which he has a new electoral mandate to change. He is already starting to do so. With relatively little fanfare he has released the imprisoned ANC leadership, except Mandela so far. It was Marius de Haas, chairman of the government's own Industrial Development Corporation (IDC) who said after interviewing a cross-section of community leaders that South Africa's greatest problem is not the constitutional logjam but the simple moral issue that South Africans (of all races) need to meet at grassroots level across the First World/Third World divide.

SOUTH AFRICA, it is frequently stated, has a unique First World/Third World economy, on the following assessment of which an explanation is needed. The author's expertise is engineering and industrial reporting. What follows is not a professional economic assessment but a reflection of the views of industry. plus sufficient of the author's personal view to provide a frame of reference for the specialised industry sector assessments following. Some key facts and figures are given in Tables 2.1-2.3. These and supplementary data are illustrated graphically in Figs 2.1-2.11. with Gross Domestic Product (GDP) of R170 billion for the formal First World sector, it is easily the largest in Africa. Long-term the First World sector is static or declining from the peak year of 1980. From 1980-84 disposable income per head fell by 0.5% p.a., then by 2.5% from 1984-88. HP and retail sales are still too buoyant today, as is the M3 money supply, and above all government spending. There is constant talk of reducing this, by cutting government's role in the economy, but so far this year there has been nothing but talk, though labour is due for privatisation. Contrary to many expectations, the South African economy continued to grow during 1988 and into 1989, with the restraints of high interest rates and credit restrictions not noticeably effective at the fiscal 89 year end. Inflation. however, continued to soar. Estimates early in September said that GDP growth of 3.2% last year was falling to around 2% this year, with 2-2.5% predicted by Chris Stals, Governor of the Reserve Bank for 1990. Private economists suggest that 0.5-1.0% may be more realistic. The Producer Price Index rose by a low year-on-year 13.6% in June last year compared with 13.3% in May. but has risen sharply since.

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South Africa has become a net exporter of capital to the tune of R25 billion over the last few years, and the pressure on the Rand remains severe. According to Tilman Ludin of Siltek, the priority for government at the moment is to reduce the outflow of capital. for which he recommended incentive schemes aimed at reducing demand for foreign exchange and promoting exports. Exports last year accounted for 28% of GDP and imports for 23% of gross domestic expenditure - both high figures as a result of which the exchange rate and domestic rate of inflation are vital. According to the South African Reserve Bank's recent annual report, measures aimed at cooling the economy and provid-

ing it with a soft landing are working, but it adds that there are a number of problem areas and worrying factors which militate against any premature relaxation of the the current restrictive policy stance. It hints that further restrictive measures may be necessary .

The annual rate of increase in the consumer price index was stated as 15.5% by Chris Stals, the new governor of the South African Reserve Bank at the end of August and was expected to peak later in the year at 16.5 to 17%. Private estimates put the real rate of inflation much higher. The rate of interest on new mortgages is nearly 20%.

Speaking shortly before the election, Stal5 said the time was opportune to launch a serious attack on inflation, spearheaded by restrictive monetary and fiscal policies. Interest rates would have to remain relatively high, because the maintenance of positive real interest rates is essential. The quarter to quarter increase in M3, the broadly-defined money supply, seasonally adjusted and annualised, peaked at 29.5% in the third quarter of 1988, and declined to 17% in the second quarter of 1989. Still high!

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SELECTED DATA 1 . table 2-1

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In the March budget more than R9 billion was voted for the ten 'national states' (formerly the homelands), four of which are nominally independent and six self-governing. The amount is not consolidated with the normal SA budget and details on how the cash is spent are generally lacking. No one department or person is responsible for the way in which the money is spent. Worse, SA has guaranteed certain debts of these territories - again amounts and details are unavailable but the figures are huge.

According to the South African Reserve Bank's 5 recent annual report, measures aimed at cooling the economy and providing it with a soft landing are working, but it adds that there are a number of problem areas and worrying factors which militate against any premature relaxation of the current restrictive policy stance. It hints that further restrictive measures may be necessary.

Areas are the still rising trend in inflation, unacceptably high levels of bank lending, low levels of foreign exchange reserves and the relatively high level of government spending.

Problem

It mentions are outflow, the

The worrying factors

continuing high capital strengthening of the dollar and the drop in the gold price.

Perhaps the most telling indicator is South Africa's foreign debt, which mounted to 41% of GDP in 1985 - the year when Chase Manhattan pulled the plug. In 1960, as Trust Bank pointed out in August, South Africans were twice as rich as the Portuguese and nearly four times as rich, per person, as the Koreans. Today South Africans are poorer than either. Then the country liked to compare itself financially with Australia or Canada. Today's comparison is with Yugoslavia or Argentina. The country ran down its gold reserves from 35.5 million ounces in 1968 to 4.8 million ounces in 1985, to pay for expensive projects designed to make the country self-sufficient and pay for the direct excesses of grand apartheid. When the country ran out of gold reserves it piled up foreign debt. To regain control of the then runaway economy the country was thrown into a severe recession, as a result of which, some months before Rubicon, a European financial magazine carried a prophetic article entitled "Is SA about to join the world's delinquent borrowers?" To quote Ken Owen of Business Day "We were drowning in short-term debt, and inflation was wreaking havoc with social relationships, wealth distribution,

tax equity, productivity, iiving standards and the legitimacy of government itself. Our weakness invited attack and today we contemplate the one shiii-ing Rand."

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According to official figures put out by the Central Statistical Service the R1 note of 1970 is now worth less than 12 cents.¹

According to Reserve Bank figures, black

unemployment in January last year amounted to 924 000 or about 15%, but the real problem is of much greater magnitude though it cannot be quantified properly, so we have not sought to alter official data. Private estimates in excess of 4 million are mentioned in economic and academic circles. These include the number of unemployed in the independent homelands, but nobody really knows whether those people are totally without an income or employed in some capacity by the informal sector.

Per capita disposable income is marginally up since 1970, down 13% since 1975, down 15% since 1980 (the peak year) and 6% since 1985. Officially.

THE INFORMAL SECTOR

Official statisticians almost by definition relate to the First World, formal sector of the economy. Alongside this is a more-or-less healthy, informal Third World sector in which no records are kept, and on which few authoritative estimates are available.

Some typical activities are the cleaning of cars, the making and selling of African souvenirs, and a wide variety of mostly small-scale trading and odd-jobbing.

A considerable amount of moonlighting by over-committed whites also takes place, and is not declared for tax purposes, so debatably belongs to the informal sector, which by definition is poorly defined. Most references to the informal sector imply the black Third World sector. Black unemployment is high, with estimates ranging up to 40% of the would-be active adult population, which encourages a great deal of informal initiative.

Two prominent informal initiatives which have emerged from obscurity to semi-formality are black taxi operations

and street vending. The total informal sector is probably 30% of the economy, an growing uncontrollable. Recent estimates by the Small Business Development Corporation suggest that 3.5-4 million jobs are now provided by the informal sector, which soaks up 40% of all job hunters and accounts for 30% of GNP, making a mockery of official statistics.

In a detailed study by Simpson McKie a year ago, chief economist John Banos outlines three major growth areas of the informal sector, which he defines as economic activity not captured by official statistics. It includes legal activities and illegal ones

such as drug dealing and prostitution.
t The 120 000 black taxis accounted
for a turnover of about R3.6 billion
or 21 of GDP assuming a monthly average
income of R2500 per taxi. Only 45%
of these are inciuded in the SA BTack
Taxi Association (SABTA). According
to SABTA figures, taxi owners annuaTTy
buy 800 miTTion Titres of petroi or
diesel oil, 3.5 million Titres of
engine oil and spend about R800 million
on spare parts.

He estimates that there are now iover
a million hawkers in SA, with a combined
buying power of over R2 billion. Another
report says home spazas sell R3 bn p.a.
in cash and carry lines (Chapter 18).
t The South African Traditionai Healers'
Association (SATHA) has about 180 000
members but estimates that there are
a further 1.3 million full or part-
time heaTers active south of the border.
Banos unconditionally welcomes the
growth of the informai sector, because
most of the activities do not require
much starting capital, of which there
is a desperate shortage, and they
are usually Tabour intensive. "The
authorities should consider rerouting
some of their expenditure to funding
of informai sector initiatives", he
says. Instead, "The biggest problems
remain the regulations and red tape,
as well as harassment by local authori-
ties."

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It was Dr Verwoerd .said many years
ago that the electorate would have
to choose between being poor and pure
or mixed and rich, but the eiectorate
never accepted that. In practice they
wanted the good life as well as racial
exclusiveness; without accepting that
the two arei in fundamental conflict.
For a while, things worked, but the
massive gold price hikes of the mid
seventies tempted the government to
overspend in the expectation of more
of the ,same, which simply has not
happeneds Gold bullion, today, is
listed with other commodities in the
London Finan ial Times, with no special
prominence, ana the price bareiy moved
this month despite major stock market
uncertainty. As a result the government
got into debt over its head. It is
still living in cioud cuckoo land
if it believes it can escape from
its present economic impasse without
major politicai concessions sufficient
to all1ow the woer financial community
to relax the external pressures for
change.

CORRUPTION 1

With probably any government which
has been in power for 41 years, corrup-
tion would be a fairly major problem.
Certainly it is a probiem in South
Africa under the present regime -
mostTy pushed out of sight, but suffic-
ientiy prominent to attract eTection

posters with the message "The Nats are soft on corruption, better vote CP" - or was it DP? It wasn't, but it could as well have been. In many constituencies with three-way contests there was strong discouragement of tactical voting, at least partly because the 'Fat Cats' have been in power too long. The country has highly paid legislators and senior civil servants with spectacular pension rights - way beyond what SA can safely afford, sane of whom nevertheless adopt a Latin American approach to maximisation. When the subject was last 'aired in a big way by Financial Mail, three parliamentary seats were vacant as a result of their incumbents' behaviour, two judicial inquiries (which have since become three) were wealths investigating public sector corruption, and prominent private citizens are involved, almost as routine. In fact corruption has become endemic in public life.

After 41 years in power, SA's National Party government has become a machine for the collection of vast sums of money which are distributed between members of the ruling elite. The country is rotten with legalised graft. To restore economic discipline must begin in Pretoria, not Zurich or London, with firm control of the money supply, ruthless elimination of over-government and abandonment of a wide variety of schemes involving planning, decentralisation, liaison, promotion etc, and letting the private sector tune the economy to supply and demand.

Any business that ran its finances the way the SA government runs the economy would long since be bankrupt.

SUPER-SENSITIVE .

South Africa's weakened economy has become extremely sensitive to political decisions - there is no longer any fat to act as a buffer against extraneous factors such as more international sanctions. particularly financial, which may arise from domestic political decisions. In addition business is increasingly being caught in the cross-fire between politics and the community, because the disenfranchised masses lack legitimate outlets for political expression. This accounts, at least in part for the very high incidence of recent strike action.

For the Reserve Bank, Industry, the economy and the community, the political framework has become paramount - in preventing continued sliding into Third World economic chaos.

Growth is the key issue, not just for economic reasons but as an urgent social priority. Recently Jan Steyn of the Urban Foundation has said that sustained growth of 4% during the 1990s is needed to end poverty

and ensure stability in South Africa.

During the 1980s, economic growth

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has been well below the 2.51 annual Population growth. Stellenbosch University's 'Bureau for Economic Research Estimates that growth for the first half of the 1980s averaged out at 1.1% - well below the 3.4% of the 1970s and 5.7% of the 1960s.

The Reserve Bank has estimated that sustained growth of only 3% is possible without foreign investment. That, of course depends on sufficient political progress to allow the world to relax the external pressures for change. Significant economic recovery in the major First World portion of the economy depends on a continuation of that process.

INDUSTRY'S ATTITUDE

This is true, but the author questions the assumption that major growth is not occurring. It is not occurring in the First World. white controlled sector where it can be measured and taxed by Pretoria, but the extent of informal activity makes a mockery of official statistics. So far as it can be quantified, it is a highly significant measure of the extent to which the government has lost control of the economy. It is the First World sector of the economy which is in a state where the government tax net which is not growing sufficiently. It is profitable enough, but the well-run companies are in defensive mode, or they have been up to last month's general election, growing only sufficiently to match or exceed inflation, unless it is by acquisition or export-led growth resulting not from improved efficiency but the weakening currency. South African industry, since the Rubicon speech of 1985, has simply lost all confidence in the status quo. It was industry which led the trek to Lusaka to open discussions with the banned ANC, followed by academics, clergy. partly government sponsored bodies, even major semi-government bodies such as Iscor and Eskom, then most recently an Afrikaner Broederbond delegation including the new State President's brother. Though both sides deny it they ARE moving closer together.

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In the opinion of Bill Venter, founder and chief executive of Altron, who speaks in that regard for many business leaders, "it is essential for government to take a bold step in establishing monetary, fiscal and political policies which once again set the country on a path of sound economic growth. It would be naive to imagine that the dilemmas facing South Africa could be solved to everyone's satisfaction in the short term, but given the necessary support from the business sector, as well as from the international community, it is

possible that change can take place in a swift and orderly manner. The role of business as an agent in such change is critical, given the debate surrounding black attitudes to free enterprise, the impact of sanctions and the concern of many South Africans to promote peaceful co-existence. and improving standards of living for South Africans after the change. It is the author's perception of industry as the critical agent in the change which provides the justification for the present report. Considering the circumstances under which South African industry operates. its power as an agent of change is less than it should be. Unlike the majority of the First World, South Africa has no tradition of structured business input to state policy, and very few senior politicians or government officials have any exposure to industry (or any other business). It is only with the imposition of external sanctions and disinvestment that the government has, belatedly. begun to invite commerce and industry to express an opinion on national policy matters, and the invitation is largely restricted to the economic sphere. Industrial leaders' opinions are, almost without exception, reformist not because they are notably liberal but because no other course promises sufficient stability for them to make decisions with confidence for the longer term. As a result industry is taking at least covert political initiatives way beyond its designated role. It is the firm opinion of the author that the time for covert initiatives is past. 50.5 the time for sanctions-busting strategies which involve the withholding of information as to national identity from the export market. Rather, the South African government must be told unequivocally by industry that the time for prevarication is past. A lot can be done to improve the economy internally, but the biggest contribution which the government can make to the economy is to provide a political climate which allows the country to trade freely with the outside world. Without that, in the long run all bets are off. The cost of clinging to power can only be economic catastrophe. The problem of promoting economic growth in SA is becoming increasingly urgent. The President's Council recently accepted a major report calling for co-ordinated strategies to encourage productivity, which was hailed by Assocom as a major contribution. At least the government and the private sector agree that the raising of living standards deserves to be a national objective which overrides sectional

interests.

Anglo's position

Another indicator, from Gavin Relly of Anglo American Corporation (South Africa's largest company) who addresses himself to the wider economic and political issues in the group's annual report. As he says, the total abolition of apartheid will not in itself prove a cure-all. The dangerous rate of population growth, entrenched racial elites, cost of redressing historical imbalances of privilege are problems common to developing countries and will endure beyond the period of political reform.

The route to success (described by Anglo Director Clem Sunter as the High Road in a published video presentation last year) must include "a multi-party constitutional system and acceptance of the rule of law... regard for private property and staunch adherence to free enterprise, deregulation and privatisation, and to the principle that factors of production must be priced according to relative scarcity". Over the past three decades. the record of failure has accumulated not always because policy was inherently at fault but because "the cutting edge has consistently been blunted or eroded by the perceived need of politicians to conciliate this group or that, in the staggeringly innocent belief that the economy can always be made to yield a little more. or suffer a little more. without permanent damage to its wealth-creating ability". The March budget reflected an awareness of these limits. "Yet there is no guarantee that spending in politically sensitive areas. Such as the civil service. development aid and defence, will not again be pushed beyond budget limits in the continued endeavour to placate the discontented through official patronage."

There is also the problem of SA's international debt. by which the country "remains bound to repay capital on a scale that makes a mockery of the international community's claim to have the welfare of Africa at heart, and its aim to bring about a material and sustained improvement in living standards." True, but the country was not obliged to get itself into short-term debt in the way that it did, in pursuit of so many peripheral apartheid goals. Not that getting rid of apartheid is considered peripheral. "Without rapid constitutional change to accommodate the legitimate aspirations of all South Africans we cannot hope to have an economy strong enough to ensure optimal development...Progress on the political front is the prerequisite to realising our economic potential. and indeed to our survival as a player in the modern world."

Relly finds hope in developments within the National Party. the proposed summit between Inkatha, the ANC, Cosatu and UDF, greater strategic thinking among extra-parliamentary opposition groups and the potential for regeneration within opposition politics. Perhaps more relevantly to our purpose, he outlines what he sees as the role of business - or at least of SA's largest business, whose primary duty

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some will see as to its shareholders. Its various duties are reconciled without significant conflict in non-racial employment policies, the recruitment and training of blacks for management, academic support programmes and a pioneering employee shareholder scheme in which 133 000 Anglo employees now participate. The scheme "is not intended in any way to undermine our commitment to trade union rights and collective bargaining. and indeed it should be seen as an arrangement between shareholders and employees - not one between management and workers." The premise is that capitalism offers more chance for human fulfilment than socialism, which Anglo would, of course promote. So it should, because the author perceives real danger in the resistance of many blacks to the principle of free enterprise, which is seen as having enriched the white man at the blacks' expense.

The contrary message conveyed in Retty's statement has generally been valid for the First World, and is perceived as being valid by the Second World. It is probably valid for the Third world - and can certainly be made valid for Anglo employees, though the company is moving in that direction only late in the day. The fact that it is doing so, backing Clem Sunter's scenario planning, bankrolling the Democratic Party to the extent that it is reported to be doing and engaging in direct discussions with the banned ANC etc is highly significant.

Savage says

According to Cedric Savage, in an interview with Mike Peirson of The Star, "businessmen must get more involved in the negotiating and consultative process with leaders of the emerging democratic movements which may not be represented in parliament.

"It does appear that out of a sense of frustration these emerging movements, the so-called MDM being one, are trying to achieve their political objectives through business".

Savage said that the economy can no longer afford the waste brought about

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by apartheid. The nation will only improve when greater resources are channeled into education. Instead, 119 white schools are standing virtually empty while there is a desperate need to educate blacks.

Similarly the economy cannot afford a dozen parliaments, 140 departments of state, more public servants per capita than any other developed country, and a disproportionately high slice of the GDP being attributable to government. "Therefore the emphasis in the years ahead must be to improve the quality of our political decisions by participation of all, including

businessmen, to ensure that we as a nation become more productive and world competitive."

Barlow Rand

In the opinion of Derek Cooper, director of the SA Housing Trust and (not by coincidence) deputy chairman of BarTow Rand, South Africa has the basic ingredients to provide a good standard of living for all its people and to become the economic powerhouse of Africa south of the Sahara. What is envisaged is the setting up of manufacturing industries to beneficiate raw materials, thus generating billions of Rands of forex and creating new jobs. According to figures from Paul Hatty of Barlows the same ton of raw materials currently exported at R178 can be transformed into goods worth R25 000, which is a view that Ron Haywood, executive director of the Federated Chamber of Industries (FCI) has been putting across to government, which is - belatedly - starting to recognise the importance of bread-and-butter issues. At least the Board of Trade and Industry and the Departments of Manpower and Industrial Relations are - the latest package from the Ministry of Finance includes a loan Levy (described by Financial Mail as retrospective taxation, which publication castigated the measure and the package as economically deleterious). Narren Ciewlow, chief executive of Barlow Rand, speaks the message out for the politicians: We do not regard South Africa's economic and socio-

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1 5' I I I I I I I i I I I 'Ii-ITI: political problems as insoluble. We do believe that to a great extent solutions will flow from our ability to generate higher economic growth." From sector after sector the message for to the authorities is the same: South Africa can no longer AFFORD apartheid, whether it is grand apartheid or petty apartheid. South Africa is now a relatively poor country (though inherently wealthy) which is getting poorer as a direct result of economic mismanagement compounded by continuing pursuit of the economically impossible. While most businessmen - in South Africa as elsewhere, adhere by choice to Peter Drucker's maxim that "The purpose of business is business". a far different, and broader, approach characterises South Africa today. With the collapse of the Cold War, the establishment of the EC etc, it may be the forerunner of more business involvement in politics worldwide. Frankly it is no longer safe to leave even politics to politicians who understand neither economic or technical constraints. and especially big

business, wants to be part of the new dispensation in South Africa - so much so that it is probably prepared to bankroll the change and finance the new society to an extent that blacks would be well-advised to listen to. If the well-being of black South Africans is more important than posturing, they will certainly do better to accept the participation rather than insist on the nationalisation of such enterprises as Anglo.

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As a carrot to the SA government, Rehy announced R8 billion of Anglo forward investment plans. More recently Harry Oppenheimer, retired chairman and former SA MP, visited John Major, the new British Foreign Secretary, two weeks before the Commonwealth Conference to ask for British support for free enterprise.

to the Urban Foundation (Chapter 17). What else was on their agenda? And who is running SA? The country's white politicians are no longer in control, neither economically nor politically.

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So far they have not formally relinquished control. but the present parliament is probably the last chance for them to do so in an orderly manner.

' RUBICON' AND AFTER

BOTH PH BOTHA AND HIS PREDECESSOR JOHN VORSTER CAME TO POWER TALKING REFORM. It never happened in the case of Vorster, and P.N.'s reforms (which were more than cosmetic) all took place in the first five years of the ten years he was in power. His last reforming gesture was the Rubicon speech of 1985 in which he wagged his finger at the world on international television at a time when the country was heavily in debt to foreign banks, as a result of which the US banks took alarm, or offence, and recalled their loans, causing other foreign banks to follow. As a result, two weeks after Rubicon. South Africa was forced to suspend debt repayments unilaterally and stop trading on the Johannesburg Stock Exchange, causing the collapse of the South African currency and inflicting damage on the South African economy from which it has never fully recovered.

The immediate panic was short-lived. South Africa is not a banana republic, but an inherently wealthy country well-capable of meeting its obligations before the debt standstill, and still capable of doing so, although with greater difficulty as a result of the lower exchange rate. An accommodation with foreign bankers was reached fairly quickly, but the country has been faced subsequently by a refusal of foreign banks to grant further loans, which rapidly escalated to semi-formal financial sanctions. On

strictly financial grounds it is probable that foreign loans to South Africa would have been resumed long since, except that the propaganda barrage of the anti-apartheid lobby makes it politically unacceptable for foreign loans to be renewed. It is also too expensive for South Africa to borrow abroad significantly at this stage, as a result of its newfound poverty resulting from the collapse of the currency.

The following year's US trade sanctions stemmed at least in part from the financial sanctions and the disinvestment campaign was a result of both. .At its post-Rubicon level of poverty. South Africa is insufficiently important financially for foreign bankers to support it except at the price of the total abolition of apartheid, which view is broadly shared by foreign businessmen.

There are some signs
be changing.
that this may

The currency is badly undervalued in terms of its buying capacity, and the exchange rate has been firm for many months, DESPITE CONTINUING HIGH INFLATION AND EROSION OF THE PRICE OF GOLD. The word has got around the international community that South Africa is a cheap country, which is largely containing its unrest, as a result of which the financial rand mechanism has been used by foreigners to buy private property in unfair competition with local residents.

FINANCIAL RAND

South Africa operates a two-tier exchange rate, with a Commercial Rand and a Financial Rand: the difference being based on the difference in price of South African gold shares on the Johannesburg and London stock exchanges. The most recent exchange rates and bullion price are given on page 3. The commercial exchange rate applies to normal, day-to-day commercial transactions and the financial rate to capital movements, including immigrants bringing in personal funds from abroad. Until the loophole was closed, it was used by a number of foreign residents to purchase second properties in South Africa, which caused adverse local publicity during the recent election campaign, though the extent of such activity was always low.

More important, the Financial Rand makes South Africa a very cheap country for business to invest in UNTIL THE TWO-TIER EXCHANGE RATE IS ABANDONED.

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This may not be so delayed. When it happens it will be a clear signal that the South African economy is turning up, or that the authorities are trying for an upturn, or at least a resurgence of business confidence WHICH CAN ONLY BE DONE BY MOVING TOWARDS REFORM.

ALIBI

US companies have mostly pulled out, for internal (US) political reasons, as have the Scandinavians and SOME British and European companies. Others are staying put, while keeping as low a profile as possible, and in several cases quietly INCREASING their

investment, while about 150 new Taiwan companies have arrived. Some large new investment is planned, but the biggest projects remain in the planning phase and seem likely to do so until there are clear indications of reform. The present level of sanctions is certainly distorting the South African economy, but is not as damaging, or as unwelcome to the authorities as the government pretends or outsiders suppose. Internally it provides a useful alibi for the government's own economic mismanagement and encourages structural industrial changes which may be to the country's long-term benefit. Thus industry is being rationalised into fewer, larger, more competitive production units which serve the country's own needs now and are, at least potentially, capable of competing more in export markets. This does not happen when export markets are denied, which is a strong motivation towards political change.

Another trend welcome to the government is transfer of SA industry to South African ownership, which has often occurred at fire-sale prices. In the great majority of cases the production of previous goods has continued, supported by continued access to the former parent company's technology - with or without that company's agreement. In practice we know of few cases where technical piracy is admitted, but the process is quite legal in South Africa today. I

UN FINDINGS .

1984 to April

study sponsored by the United Nations

From January 1989, a

disin-

which

reported that 277 foreign firms vested from South Africa, of 155 were US-based.

"Quite frequently, disinvestment has been accompanied by an agreement whereby the transnational corporation ensures continued production of its product, or continued supply of its inputs, to South Africa. These agreements are often in the form of licences, franchises, the establishment of a distributorship, or contracts for the transfer of technology.

"Trade sanctions have been weakened by South Africa's mislabelling of products, the use of intermediate countries in the shipping of exports, and the commingling of bulk commodities, such as coal, with commodities from other countries."

Restrictions on high-technology products have frequently proved difficult to enforce, for example computers sold for civilian use can readily be used for military purposes. South Africa has also encouraged greater self-sufficiency, particularly in weapons, energy,

cars and electronics, but at high cost, as the present report also shows in some detail.

"The world economy is too fluid and flexible for any set of measures to be fully effective, but sanctions and disinvestment have imposed costs on the South African economy and increased its vulnerability to international pressures", with which finding we generally agree. Finance Minister Barend du Plessis, trying to explain his record in office, pointed out reasonably enough that the country has squandered capital, money and skills on heating the oil embargo, the arms embargo, the nuclear embargo, and there is barely enough to beat the capital embargo, with the trade embargo still to come. All of which is so, BUT better financial self discipline would go a long way towards alleviating the problem directly. Lacking direct leverage, international anti-apartheid activists are probably right to focus on financial weaknesses, which represent easy targets for them today. In the author's view South Africa is NOT a financially well-run country as the deputy finance minister recently admitted. Rather it has been treading water financially for 20 years at a time when many countries have been roaring ahead.

ON HOLD

Almost everything is on hold, waiting to see if there is going to be real progress, which will not in itself restore economic confidence or competence. Whether or not the country reformers it should tighten up its economic management, and in the end it must do so. Whether the present government has any intention of doing so in present circumstances remains to be seen.

The South African municipalities are massive markets for a wide range of products and services which are served by specific publications. Munisipale & 0 enbare Dienste (Municipal and Public Services - despite the title it carries some stories in English), and Local Government in Southern Africa as well as Municipal Engineering should be mentioned, as well as SFIN (State Products Information and News)

The country is theoretically well set up to maintain its industries on an ongoing basis, as much because of its geographical isolation from First World sources of supply as the siege economy which is a recent phenomenon. Excellent facilities are, however, often undermined in practice by poor local workmanship and import of parts.

CARTELS

An unwanted side effect of the rationalisation of South African industry is internal price-fixing by monopolies and cartels, which tend to fix prices in line with competitive imported

products which are restrained from
'unfair competition' by duties as
necessary. Alternatively local prices
are fixed in Time with world market

prices if the industry is export-oriented (whichever gives greater profits). The weakness of the currency is, of course, welcome to the country's export industries, which report frequently massive Rand profits.

The restructuring of industry is materially hampered by the brain drain, but the departure of skilled white artisans and low-level technicians is offset by the extent to which it necessarily opens up opportunities for advancement of the non-white population. If they are to play an effective industrial role, however, a massive increase in education is needed.

If it is not provided (at present it is not budgeted - rather education was recently cut back), then South Africa's present First World industry and economy will slide towards Third World norms. It is now too expensive to rectify skilled personnel deficiencies by importing experts from overseas on the scale that this was done in the past, nor does it provide a long-term solution for the country's own people.

The present restructuring of industry presents opportunities for foreign investors willing to take political risk, on attractive financial terms, owing to South Africa's unique financial Rand mechanism. Further foreign finance is needed for future public sector investment, and will certainly be sought for major mining investment in the nineties. Whether it will be made available, however, will depend on political progress combined with maintenance of law and order, and the re-establishment of financial self-discipline.

While some foreign money is coming in, South African money is looking for investment overseas - or should that read escape routes? Not always successfully, as in Minorco's bid for ConsGold. As other observers have commented, the South African economy is now in a box, from which an increasing amount of smart money is somehow leaking, to find its way overseas. The rest is buying up foreign-owned assets, being invested in property

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or the JSE, pushing share prices to new record levels despite the 1987 crash. There is insufficient industrial investment for the on-term
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000 of the country, nor will there be sufficient until there is clear political direction towards reform. In the very short term, it may be sufficient to talk reform, which must precede action in many cases, but the government's track record of talking reform while not actually doing it is such that it will have to do something, and quickly, to satisfy

the international community, and even the South African electorate (and non-electorate). The whole world has simply lost patience with National Party double-talk, and double-think. A Financial Times survey of 12th June 1988 commentea that the gold price which is the dominant factor is moving in the wrong direction for economists trying to engineer a 'soft landing' at the bottom of the ggwnswing, and the gold price has no more than firmed on recent stock market jitters. A more recent FT report - on the annual report of the South African Reserve Bank, held the view that a soft landing is likely. First quarter figures agree. Most of the financial indicators seem contra, but what has happened in the interim is the replacement of the man at the top in South Africa, and renewal of his party's electoral mandate. As a result, in the writer's view, the economy is sitting on a ledge, waiting to see what he does with his new mandate. If he moves positively on reform - and more reform moves are expected quickly, the ledge could be the button of the trough or very close to it. The provisos are that the the government keeps control of the country without too many enormities of the police state, that real reform is simultaneously perceived to be taking place, and fiscal discipline is re-established. No country with a large Third World element can be quite as monetarist as conservative First World businessmen prefer. The Third World has to be allowed to live, but at what price? Hyperinflation? Revolution? Civil war?

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FINANCE

While South Africa's politicians appeared to believe they had limitless time, and top businessmen were upstaging them in the political arena, the second string of businessmen and managers were and are making corporate profits and sometimes personal fortunes. South Africa's main business centre of Johannesburg recently celebrated its centenary, despite which, in the writer's view, it still exhibits a mining camp mentality, being strongly influenced by the price of shares on the Johannesburg Stock Exchange (JSE). These are back to, or a little above their average levels before the 1987 crash, despite recent world market hiccups.

South African industry is largely controlled by interlocking pyramids of public companies, mostly heading up to the financial services sector, comprising banks, insurance companies, building societies, specialised mining and industrial finance houses. of which by far the largest is Anglo American Corporation.

South Africa's gold mining industry required the provision of large amounts of capital, as a result of which financial services are large-scale, professionally managed and First World in their sophistication with two important reservations: short-term profit orientation and relatively frequent downright dishonesty. 1 Exchange control abuses in which bank people are knowing parties necmmmpm.

Another frequent backer for a different reason is the government-controlled Industrial Development Corporation, which is the government's vehicle for financially backing many desired industrial activities, including iron and steel (Isacor), aluminium (Alusaf), oil-from-coal (Sasol) and electronics (several companies).

Via the IDC, government participation in the economy is substantially greater than its direct role. In several cases I

decision to back the activity has been amply justified by the long-term profitability of the activity. - In other case the results have been less happy. It is generally felt by the private sector that government's role in the economy is too large, and that feeling in many instances includes its indirect role. The positive results of its past involvement are recognised, but when the chips are down - as they are with sanctions at present, the private sector far prefers to rely on market forces than place any reliance on government's siege economic plans. The major public companies, whether backed by private institutional or government finance (in most cases some combination of the three) are mostly well run financially to comply with stock exchange rules and safeguard the reputations of the parent concerns. These are the 'blue chip' companies of the mining and major industrial sectors.

Outside the major blue chips, which tend to dominate their stockmarket sectors, is a second tier of generally smaller, often well-run independents, which are considered a bigger risk, though they include some notably high fliers.

Beyond them are a mass of private companies, many of which are excellently run. but their performance is probably as good as the people in charge. South Africa, particularly under the siege economy, lacks the management expertise in depth of the major First World economies. The top people are often top echelon, but lower and middle management is often second or third rate, as is even the top management of many smaller companies in such sectors as computers which are at the leading edge.

SMALL BUSINESS

Small business is the essence of the free market system and in South Africa is a dynamic factor in creating job opportunities, stimulating the economy and improving the quality of life. Almost 90% of the country's business

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Fig 2.12: How the JSE sectors have performed

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enterprises and 65% of the turnover falls in this category. There is a Small Business Development Corporation and a Small Business Advisory Bureau at Potchefstroom University, but one suspects

have insufficient time to them. _ '

An increase in loan applications to the Small Business Development Corp reported in August, coupled with a half point increase in Assocom's July Business Confidence Index after two successive declines are two of the grounds for suggesting that what is now being experienced is a dip in the business cycle rather than a blown recession. SBDC often experiences an increase in loan applications when interest rates rise (as they have just done) because it can offer loans with interest rates as low as 12.5% against a prime rate of 20%. The level that many small businessmen consult

of application for 'crisis loans' is presently infinitesimal. However, "Confidence in the large business sector will remain fragile until the serious problems of inflation and the balance of payments are solved", according to Assocom economist Bill Lacey.

THE JSE

The sector performances vary widely, and change too rapidly to be worth

commenting on in detail. except for
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I Source: JSE

the general observation that the indices
essentially reflect prices of the
large groups with big market capitalis-
ations. The equity market is nowadays
generally dominated by cash-rich insti-
tutions, who tend to buy land hold,
and select on the basis of the perfor-

mance of the individual share rather than the sector. For months they have tended to prefer the relatively large companies with established track records which are often the same ones which influence the indices. Many smaller and newer listings remain neglected, despite good financial performance.

Corporate profits, Financial Mail noted in June, are generally past their peak, while corporate debt is lower than it used to be. In fact the financial performance of most JSE-listed companies is healthy, but profits are increasingly threatened by rising interest rates.

Under present circumstances in South Africa, individuals are not saving much. and the structure of their savings has been channeled more towards inflation-hedge instruments such as insurance policies and unit trusts. As a result the question is being asked whether institutional investors will become the only players on the JSE? 1

In the author's view it is too early to judge categorically, but cash-rich institutions are pushing share prices to levels which may be out of reach

of most private investors in the long run. Meanwhile the marketers of retirement annuities, profit-linked endowment policies and unit trusts are aggressively marketing these instruments by stressing their inflation hedge value. The growth in the cash flows of long-term insurers and pension funds has averaged more than 20% p.a. in the eighties. In 1989 the cash flows of short and long-term insurers, private pension funds and unit trusts could approach R30 billion. Their growth is expected to be sustained or increased in the future as the privatisation of state enterprises means that their pension funds start to invest more in the market.

The huge growth in institutional funds means that more and more private individuals are acquiring an indirect stake in the market through the various financial instruments mentioned. The direct role of private investors could therefore continue to decline, until the market is almost exclusively dominated by institutional investors, who concentrate their buying on a small range of easily-marketable blue-chip shares where dividend yields are low while many excellent second-line shares are ignored. The scarcity of blue-chip shares will be exacerbated,

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and the market may become almost two-tier in nature.

These financial trends are, of course, in large measure reflected worldwide,

but are described at some length to emphasise the fact that the South African financial sector is First World nature and sophistication - with the important difference that many individuals still have the mining camp mentality. Johannesburg, and indeed the country are still extremely entrepreneurial. to a degree that the government generally fails to appreciate. for which the present economy allows little legitimate scope. The bigger chancers engage in sanctions busting and selling the government and its agencies schemes for relieving it of cash in a variety of questionable ways, which the government is remarkably inclined to fall for.

BRAIN DRAIN

A major problem with which the country has to contend is emigration - which in 1988 was no higher than immigration. Ostensibly the process was in balance but was this really so? It is strongly suspected that those who emigrated were more highly qualified than those who came in, or that the latter were paid higher salaries for coming than

those paid to the leavers before they went, though it is certainly comforting for the authorities to know the process was not all one way.

A 1988 graph published in The Star indicates that it is political shocks rather than economics which have stirred emigration. Two other 1988 graphs show that, if investment is to be financed, higher levels of domestic saving are essential. They will be forthcoming only if interest rates rise says a consultant for JCI - to which we would add political confidence and stability are necessary.

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Another graph published in the same article relates economic cycles to political unrest.

LABOUR

Trade unions were relatively recently legalised for South African blacks who have not been slow to take advantage of them, by instituting strike action at almost every significant manufacturing plant in the country. The legislation allowing black trade unions is possibly the most significant breakthrough made by the non-electorate so far. Lacking legitimate means of political self-expression, however, they are being used, directly and indirectly, as political tightening conductors, for example by the calling of a two-day general strike to coincide with the recent white election, in which close to three million workers stayed away.

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Economic and political cycles 3,
The government has acted predictably by arresting many union leaders during the state of emergency, and amending the Labour Relations Act to restrict the right to strike, banning sympathy and repeat strikes and making unions financially liable for the costs of illegal strike action. The tightening up has gone too far if it seriously impedes the unions in legitimate industrial disputes, but it was a natural reaction by government and management to excessive union action, particularly during the wave of strikes which hit the country two years ago.

Both labour and management are still learning their roles in the industrial bargaining process, in which South Africa is still in its infancy. Industrial action is far too often accompanied by violence and intimidation - even murder during two 1987 strikes, while management too easily resorts to lock-outs and refusal to negotiate. Powerful bombs, which were expertly placed, destroyed the offices of Cosatu, the leading trade union federation near the height of 1987 unrest. They were placed 'by the' right wing, covert security forces or radical left to throw

suspicion on the right (choose one). From 1987-88 strikes involving more than 1000 workers were down by 80% and their average duration fell from 9.9 to 5.6 days. The number of man-days lost fell from 5.82 million to 914 000, and more than 30% of strikes lasted a day or less. Union membership continued to grow, by 10% in 1988, at the end of which the workforce was 35% unionised, with 2.08 million in registered trade unions. Some 330 000 belonged to smaller, unregistered unions.

The reduction in union action reflects the toughening attitude of the authorities and the fact that the unions were licking their wounds after the massive activity of 1987, as well as the fact that the economy had turned up in 1988. Wages of South Africa's blacks are generally low, and the unions are concentrating on long-term 'living wage' campaigns, but the extent of politically-motivated strike action

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during the recent election campaign indicates they still have plenty of muscle.

A major result of their organised use of it to periodically paralyse strategically selected companies is to force South Africa's businessmen into the political arena. If only for fear they will otherwise end up with no businesses to own or manage.

EDUCATION

One of the most serious problems facing South Africa now and in the future is the critical shortage of skilled manpower: The country's population is growing at the rate of about a million people a year. By the year 2000 it will be faced with a shortage of around 350,000 technical people and 220 000 managers, assuming a growth rate of about 2% p.a. The exact figures do not matter, but the scope of the problem is clear.

Looking at it from another direction, the black population will make up around 89% of the total by the year 2000 if present demographic trends continue. Assuming a maximum contribution to skilled manpower of about 30% by the much smaller white population sector, 14 000 qualified black people need to enter the technological workplace every year to satisfy the projected need. The present entry level is less than one tenth of that.

Negative perceptions of engineering and technology are found throughout the population but are sharply seen in the black community. The effect of the Bantu Education Act of 1953 which de-emphasised maths and science as subjects for black schools is still

evident. There is a glaring lack of adequate teachers, facilities and materials which is most acutely felt in maths and science classes. There is a high degree of technophobia. High school students see maths and science as academic minefields which can be avoided by taking easier courses. The high failure rates in maths and science result in a strong cause-and-effect cycle.

Career guidance in black schools is very poor. Students are often unaware of the importance of good maths and science for future tertiary 'study' and career progress. Little work is done to assist students to choose appropriate career paths.

Black students have both a high level of social commitment and a lack of information or understanding of technological careers, which favours the more visibly 'socially relevant' careers of medicine, law and teaching. There is misunderstanding of the link between science and technology on the one hand and political power and oppression on the other.

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According to Protec it is too to talk of solving the problem.

What must be done is work to reduce it, focussing on technological career development at the high school level.

Protec works to increase student awareness of reality and stimulate interest in, and ability to successfully choose, prepare for and embark on technological careers. Established in 1982 to address the shortage of engineers in South Africa, its programme has been broadened to focus on all fields of technology. The problem is not unique to SA, but is critical. In the US, school children are turning their backs on technical subjects in such numbers that the US global supremacy in research and technology are doomed, according to an article in Fortune recently.

In South Africa major promotion is needed to attract the young into engineering, where they can at least be offered work. Meanwhile South African business is stuck with imported overseas talent, or attracting unemployed arts and social science graduates into industry to satisfy day-to-day needs so far as they are able.

Technological development (said a special report on Technikons in Financial Mail) must be a major component of any long-term scheme to promote real growth. But progress cannot come without solving the skilled manpower shortage which has plagued SA for

decades. The backlog in skills training can be blamed on apartheid to some degree, but also on the high status accorded to white collar workers with a university degree - which in the public mind does not include engineering or technology. There is a wrong identification of 'technical' with 'practical', and relegation of both as being suitable career paths only for those incapable of greater academic attainments. In these days of electronics, computers and other information technology, such perceptions seem to the writer totally incorrect. For many years the education of technicians and technologists was neglected in South Africa, but belated attempts are being made to rectify this. Since the late sixties technicians have been carving a niche for themselves in the SA educational system. How major a role they will play in promoting technological development and economic growth has still to be determined. At present they suffer from state financial restrictions as well as the stigma against vocational education. If progress and productivity are to be linked to technology, the stigma may dwindle in time, meanwhile the government expects industry to contribute more towards its specialist manpower needs.

The National Training Board (NTB) has recently announced a joint investigation into in-service training, which is carried out by 20 industries that have set up industry training boards (ITBs). The intention is to privatise procedures, training schedules, regulations and trade testing.

Almost a quarter of Johannesburg's white schools are at risk of closure now or over the next five years, owing to unfilled places, according to a recent report by the Education Policy Unit of Wits University. 42 of 175 white primary and high schools are at risk owing to 13 150 unfilled places, which in a post-apartheid society must be made available to non-white students.

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Special mention must be made of the University of South Africa, which allows study by correspondence, tele-tuition or 'distance learning', to quote the most fashionable phrase. Although non-residential, it is claimed to be the largest university in the world and was the first to offer distance learning. Situated on the southern outskirts of Pretoria, more than 80% of its staff are Afrikaans speaking, but its student body is totally multi-racial, prominent graduates including Nelson Mandela and Robert Mugabe.

UNISA

As well as having more than five times

the enrolled student body of its nearest South African rival, Unisa 1 has the largest library in the country and the largest in-house printing and publishing works in the southern hemisphere. Recent statistics show the distribution and growth in enrolment of its student body are characteristic of the country's demographics and the growth in the thirst for knowledge of the population as a whole. g
Uin a 9.30 a.m. Saturday morning visit to Johannesburg's main public library, there were long queues of mainly black students waiting to use both the reading room and reference libraries, indicating the strong drive of blacks towards self-improvement through knowledge.)

STREAMLINING

The mass withdrawal of foreign-owned companies, including a majority of those which were US-owned, has resulted in some streamlining but no mass redundancies despite much emotive talk. More important, much of First World South African industry is now automating as far as it can to reduce its dependence on a now strike-ridden low-skilled labour force, thereby pushing social pressures beyond the factory gate. The largest employer (the mining industry) talks of its social responsibility, but trackless mining (now being introduced) employs far fewer, more highly skilled people, and similar trends are evident across the board.

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Because of the tough conditions it is working under, the shape of South African industry is being distorted to rectify strategic deficiencies so far as possible.

With the ending of hostilities in Angola and the political accommodation in Namibia, South Africa's now under-employed armaments industry is likely to be redeployed to rectify strategic deficiencies, for example in machine tools and computers. The extent to which it will succeed in doing so is a major imponderable.

SOCIAL PROGRAMMES

Corporate social responsibility is a vague term imperfectly understood, which is assuming increasing importance in the industrialised South African First World. According to definition, it covers everything from on-style charity to business lobbying on political issues, but most South African companies now accept that it is a necessary aspect of doing business in South Africa. As reported in a Financial Mail supplement, for some it's contributing to a post-apartheid society. For others it's being a 'good citizen'. For yet others it is a simple question of long-term self-interest, which might better be described as insurance for the future. Whatever

the philosophy behind corporate giving, however, leading SA businessmen agree it is important in creating an environment in which the corporation can exist in the future. Businessmen are looking to the bottom line in the longer term, which they realise will be shaped in large degree by the nature of political change and the degree to which social inequalities in SA can be reduced.

Almost every company which spends anything on corporate responsibility programmes devotes most the budget to education, in an attempt to overcome the inadequacies of black education, to improve long-term productivity and provide managers for the future. Some companies include training and other benefits for their own staff, while others confine the definition to community work outside the company (which the author favours). Promoting black business and sport is defined as social responsibility or marketing, but where it is defined as social responsibility the companies are sensitive to criticism that they are doing it for the money. Many of the more worthwhile and innovative projects are the ones they are reluctant to talk about.

The area is not an easy one for business people to engage in, since it brings them into an area where the bottom line cannot be measured, though assessed in the long term it must be, according to many.

Companies are increasingly sensitive to criticism that they are giving hand-outs or imposing projects on communities without asking the people what they want. There is a definite trend towards greater community consultation, and to encouraging self-help programmes, and those that enable people to improve their own quality of life.

Because of the specific nature of South Africa's political and economic structure, its major companies are possibly ahead of those in other countries as regards such programmes which are forging ahead among those companies which are large enough, established long enough, or otherwise secure enough to be concerned about the future beyond the immediate reporting period. For the established companies, or those with established backing, the question is no longer whether, but why, and what the money should be spent on. The first thing it should be spent on in the writer's view is reinstating or at least reassessing with a view to possibly reinstating, the programmes abandoned by disinvesting companies which were signatories to the Statement of Principles (formerly the Sullivan code). While US disinvestment has resulted in few mass redundancies

except through streamlining by the
successor company, no successor company
is known to have signed the SoP signed
by its predecessor. (The successor
company may, of course, be undertaking
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other social responsibility programmes, but these are not the companies written up in the FM supplement.)

Since the programme began in 1976 the signatory companies had contributed R554 million "for the benefit of blacks, Coloureds and Asians in SA" according to the 12th report of the signatory companies, published last year. For a Category 1 listing, evaluated by Arthur O Little in Washington, a signatory is obliged to spend an amount equivalent to about 12% of its payroll and a substantial amount of executive time on social programmes. In 1987-88 the signatories spent more than R86 million but with disinvestment their numbers has dropped from 183 in 1985-86 to 92 in 1986-87 to 70 in 1987-88. Given their reduced numbers it is hardly surprising that the signatories were unable to increase their 1986-87 total spending on such areas as social justice and education for non-employees and community development. They did, however, increase spending on Adopt-a-school programmes and promoting black business. They increased their purchases of goods and services from black-owned businesses from R27 million to R45 million.

Many of the companies interviewed for the FM survey reported an increase in the number of appeals received, which they attributed to the cutback in social spending resulting from North American and European companies' withdrawal in the last three years.

In a study of the impact of corporate disinvestment, the Investor Responsibility Research Centre of the USA concluded that "The most noticeable change following disinvestment is a cutback in corporate funding of community development programmes and organisations that challenge apartheid policies".

Since those words were written last year South African companies have become far more active in challenging apartheid, but the writer totally agrees about the cutbacks in funding for existing programmes, which new programmes are not always replacing. First National Bank (formerly Barclays) budgeted 2.5% of pre-tax profit, about 40

R7.5 million for subprogrammes because "as a bank we need to be seen to be a good citizen" according to senior general manager Jimmy McKenzie. It is being bombarded with requests for assistance as disinvestment takes its toll. "I would appeal to all profitable companies and organisations to play a part in allocating a percentage of their profits to social responsibility programmes if they are not doing so already", he adds.

BOKSBURG

A major feature of the election was the failure of the Conservative Party

to break through electorally in a big way. Conservative gains were made, and the party remains the official opposition, driving the government, with its slim majority, into alliance with Democratic Party. Depending on the level of unrest and the pace or otherwise of reform, the National Party could suffer defections to the right - which has probably lost its chance of power in practice.

Part of the reason was its electoral successes in the municipal elections last year, and the actions of such new Conservative councils as Boksburg in reimposing petty apartheid restrictions such as "Whites Only" notices. The blacks retaliated, predictably, by instituting a consumer boycott which is still more-or-less in force a year later. Some blacks are shopping in Boksburg again, but their numbers are certainly much lower than before the municipal election. Moreover the boycott is broadly supported by a large number of less racist whites who find petty apartheid restoration equally offensive.

It is a positive disadvantage to any company to have a Boksburg business address today - so much so that Colgate Palmolive applied for its factory to be rezoned. The application was unsuccessful, since the plant is well within the municipal boundary, but Boksburg has for whites as well as blacks become a symbol of the unacceptable, and we know of maintenance work, for example, which has been refused to Boksburg customers simply by virtue of their physical addresses elsewhere.

Businesses of their physical addresses elsewhere.

RESTRUCTURING AHEAD

As South Africa approaches the post-apartheid era, there will have to be restructuring of the ownership of the corporate sector, along with an end to "swart gevaar" and paternalistic attitudes according to Murray Hofmeyr, chairman of JCI, when giving the Andries van Riet lecture at the opening of the SA Property Owners' Association recently.

"If the reorganisation and survival of the market system is conducted without regard to black interests, the result will be an aggravation of political conflict. He cannot escape the fact that blacks comprise three quarters of our total population and that their current entrepreneurial exclusion is a grave defect of our economy."

He called for new ways of working with rather than against black ideological preferences, which might mean helping blacks to establish co-operative

enterprises. He pointed out that big business has not responded cohesively to changing political circumstances because it was unable to reconcile its diverse political strains, and looked to the government to do that job. At which "Government has failed because it is, itself, trapped in power conflict."

The run-away growth in net capital outflow of R25 billion from 1985-88 was a direct result of a marked deterioration of overseas perceptions of the political situation in South Africa, he said (quoting the late Dr Gerhard de Kock). As the latter said. "The ideals of optimal growth, low inflation, a strong currency and a rising standard of living will not be achieved without adequate progress in the field of political and constitutional reform and a consequential easing of the stresses and strains in relations with other countries." .

Table 3.1: South African consumption of coal by type of consumer in 1984, (immediately before deregulation).

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 Exports 44 25 . w
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 Iscor 9 g , - muawmumm. Fig 3.1
 Railways 1 1
 General 18 11
 Natal Coal 3 2
 Independents 3 2
 Source: TCOA

Table 3.2.- Comparative costs of firing a 5000 kg/hour 1008C steam boiler operating for 11 months, immediately before deregulation.

1. L.F.O. (diesel-fired) - R603 559.00
2. H.F.O. fired - R465 680.00
3. Gas fired - R284 229.00
4. Coal fired - R 48 125.00

Source : PVD

Fig 3.2.- Typical water tube utility boiler construction .

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CHAPTER 3:

SOUTH AFRICA, in energy terms, is primarily a coal producer despite the interest in oil and gas generated by the Mosse Bay project. Even Sasol is dependent on coal for its feedstock. COAL

The Petric Commission of 1975 judged South Africa's total coal reserve to be just over 81 000 million tons. This was a conservative estimate and a later figure, published by Eskom ten years later amounted to 92 000 million tons despite intervening consumption. Part of the expansion is due to the later inclusion of very-low-grade coal used by Eskom for electric power generation at Lethabo power station (Chapter 4). Not only does it extend the coal option but, perhaps more important, it allows the better grade coals to be used for other purposes.

In 1984 South Africa's consumption of coal by type of consumer was: (Table 3.1)

The figures were provided by the Transvaal Coal Owners' Association (TCOA), an umbrella body for the major producers which has been reduced in size and function to an export co-operative. They take no account of the widely differing quality of coal consumed by the different classes of user, nor do they reflect coal usage with any accuracy. Electricity generation is clearly the largest use, accounting for a higher percentage than the figures indicate owing to the number of municipalities and private industries generating their own power, which are included under 'General'. Eskom, however, is managing with increasingly low-grade coal,

allowing the best to be used for export or metallurgical purposes (Iskor and part of General) as well as for conversion to oil and chemicals by the Sasol process.

ENERGY

By far the largest proportion of coal is used to raise steam, for electricity generation or industrial process purposes. Since coal, in South Africa, is easily the cheapest fuel for any purpose, it should be the automatic choice for any boiler or furnace except where the need for cleanliness or precise controllability dictates otherwise. In practice it is perhaps a less automatic choice than one might expect owing to the rapid escalation in price of the better grades since deregulation in 1986. For price comparison of various fuels for equivalent boiler firing see Table 3.2, which relates to the same period.

At that time, indeed for as long as there had been a coal industry, the pithead price to customers was controlled. The sudden removal of price control led to uncomfortably rapid adjustment to market forces. A year after deregulation it was stated by TCOA that price increases had not been general, and that coal had not increased in price at all. The better grades, however, increased by more than 20% in the first year, with a weighted average increase of 12.41 - sufficient to give rise to pointed comment by consumers that the producers were trying to recover from the local market what they were losing in export revenue as a result of sanctions! If they were, their efforts were unsuccessful, since larger local customers such as Eskom, Iscor, Sasol, Railways, municipalities and even private users negotiated their own prices, frequently on an individual pit-to-plant basis, and the Monopolies Commission constrained TCOA to confine its activities to the export market.

The oversupply of steam coal to the world market coinciding with the imposition of sanctions caused export prices for South African coal to suffer severely two years ago. but

the position stabilised and then improved. In 1986, the crunch year, exports of South African coal totalled 45.5 million tons - marginally higher than the 1985 figure of 44.7 million tons. Most of it went out via the Richards Bay coal terminal (40.3 million tons, up from 39.6 million tons in 1985). South Africa's foreign exchange earnings from coal exports in 1986 amounted to R3.2 billion despite which "... with current cost levels and exchange rates the viability of many export operations is in question" according to the chairman of Amcoal in that company's annual report for the financial year to 31 March 1987 when Amcoal's earnings declined 6.2%. Since then the company's and the industry's performance has improved twice. by 58% in the case of Amcoal's FY 1988 owing to firmer world prices and the failure of expected international competition. Trans-Natal Coal, for the financial year to 30 June 1989, transformed a R3.3 million loss after taxation into a R60.3 million profit. As a result the Richards Bay coal terminal is to be given a R239 million refurbishment including additional tippler and stacker-reclaimer plant to secure, and probably increase, the terminal's capacity of 44 million tons per year to a suggested figure of 48 million tons. Table 3.3.

Financially, perhaps, the recovery of the coal exporters is good news but the author is frankly doubtful as to the desirability of this activity for the country as a whole. Sure the foreign exchange earned benefits the country but the profits of the mines mostly benefit the shareholders. Even the proportion of profit retained is rarely invested in local infrastructure or community programmes. Much more likely it is used to extend the export venture or provide seed capital for another one.

South Africa, in financial terms, has a simplistic, mining camp mentality with a short-term, almost piratical approach to profits. If the result of sanctions is to limit the more blatant exploitation and to force

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a longer term view of non-renewable resources, it may be beneficial in the long run.

No financial commentator could be against exports in principle. Neither is the writer, provided the profit is plowed back directly or indirectly for the benefit of the community. This is too rarely the case in South Africa today.

To quote Dr Louw Alberts, then Director General of the Department of Mineral and Energy Affairs in a paper presented

as long ago as 1985, coal "is both an important mineral resource for exploitation in its own right (at present it is our second largest earner, next to gold, of foreign exchange) and at the same time it is our most important energy source as well as being of crucial value as a chemical feedstock. We have limited resources of coal occurring in varying grades with five principal areas of application, all of vital importance:

- (1) Electricity generation
- (2) Synthetic fuel production
- (3) Metallurgical applications
- (4) Indigenous use as a heat source
- (5) As an export commodity.

"Questions such as what fraction and what kind of coal is to be utilised in these different areas have to be considered with the utmost sense of responsibility. The balance of short-term and long-term national needs; the interplay with other energy sources such as uranium in nuclear power stations; the relative multi-purpose uses in one mine for the various areas of application are but some of the problems that policy makers have to contend with..."

Notice that export is listed last by Louw Alberts, despite his recognition of its financial importance. He is a technical man, whose policies, including those put forward by the more recent National Energy Council, have been largely instrumental in taking energy questions out of the political arena so that they can be decided on an assessment of experts' figures. These of course are large. South Africa's total energy bill amounts to some R10 billion annually - approximately half the budget for minerals which previously fell under the same department.

Interestingly, at the end of the day, experts' recommendations are no more free of political bias than those of less informed people, or perhaps it is a case of experts disagreeing. For whatever reason the author strongly disagrees with Louw Alberts' recent advocacy of nuclear power as the primary energy source for South Africa in the next century. It is considered both unnecessary and highly undesirable. Whether the lesser expertise of the author is sufficient to generate serious support for his preferred alternative of large-scale solar power in conjunction with massive pumped storage remains to be seen.-

It should also be noted that the coal used by Eskom for generation is not the best but rather the worst grades, ranging down to "rocks, rubbish or real estate" as we have heard the Lethabo coal described. Technically it has a calorific value of only

about 16 MJ/kg, a volatiles content of around 15% and an ash content ranging up to 42% according to the design parameters for Lethabo, compared to power station coals used in Europe having calorific values in the twenties and ash content of perhaps 12%. The actuality at Lethabo was slightly worse at the time of its official opening, and the whole 600 million tons of marginal coal remaining in the area is of such poor quality that for many years it was not listed in the country's coal reserves since it was thought, as recently as 1970, that it would have to be abandoned.

Experiments

Babcock, the

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carried out by Eskom.

British National Coal

Central Electricity Generating

Board and others in the seventies

showed that it would be possible to burn the Maccauvlei (Lethabo) coal in order to generate electricity from it economically using modified

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(heightened) boilers. specially designed and individually controlled burners which caused such trouble in their practical implementation that they were already in a Mark 4 realisation at the time of the official opening with a Mark V on the drawing board. About R2 million was spent on burner development, with further minor changes probable. Normal thermal efficiency (about 37%) is achieved. but at added cost.

while Lethabo uses formerly reject coal from an abandoned colliery, Matimba uses Iscor rejects, i.e. th second-wash tailings from Iscor's coking coal extraction from the adjoining Grootgeluk colliery. This has an energy content of 22 MJ/kg and an ash content of 33% which is still worse than one would wish. Even at Matla, where Eskom is using prime coal. not reject, the quality is lower than is normally accepted in Europe, as is South African coal generally. The best coal tends to be exported, while South African users have, so far as practical, learned to use the lower grades.

INDUSTRIAL PRACTICE

Outside the electric power utility area, the above remarks apply also to South Africa's industrial boiler users, or at least the major boiler manufacturers John Thompson (Africa) and International Combustion Africa Ltd (ICAL) - both members of the NET Africa group. who between them hold a near monopoly of the non-utility boiler market. There are other makes, including Benco and Robey Lincoln - now part of Babcock, which also supplies large industrial boilers

directly, but John Thompson (Africa) holds the lion's share of the packaged (shell-and-tube) industrial boiler market. with standard units made at its Belville (Cape Town) works, where it also manufactures larger watertube boilers. concentrating on bagasse-fired types (fuelled by sugar cane waste). These are individually designed, and now marketed by sister company ICAL, which also markets and erects most of the larger watertube boilers used in industry.

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Fig 3.3: Configuration of Mossel Bay platform (topsides). H1 process. H2 wellhead, M3 utilities, H4 power generation, M5 compression, H6 drilling derrick, M7 drilling/mud, M8 accommodation, M9 helideck and NSF module support frame.

These may be manufactured by International Combustion (UK) or by other overseas producers. The larger water-tube boilers are designed and manufactured to specific requirements and often ordered directly by the client, but ICAL is usually involved in local erection. Fig 3.1.

It is the personal opinion of a John. Thompson spokesman that South African boiler design and engineering practice are technically ahead of First World norms, because of the poor quality of South African fuel. In the specific areas where South African engineers have experience, local expertise is certainly up to First World norms. Furnaces are of many types, mostly purpose-built for their applications. So mainly imported.

Boiler and furnace maintenance services are well developed, often independently of original vendors. The local company Halro Flex specialises in replacement furnace cable. Others specialise in refractory linings and repairs. More standardised energy equipment, notably heat exchangers, are mostly manufactured in South Africa, up to and including the finned tube bundles for the dry cooling of Matimba power station, for which GEA established a local factory.

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South Africa has no known commercial oil deposits, so four refineries are established in the coastal cities of Durban and Cape Town to process imported crude. Durban is linked to the Witwatersrand by an oil pipeline designed specifically to transport the output of the Durban refineries to the PNV area where most of the refined product is consumed. Few figures are available, and none are published in South Africa today owing to the Petroleum Act - specifically implemented to prohibit publication of strategically sensitive information on this serious South African weakness. To this outside observer the impression is conveyed that South Africa has little difficulty in practice in buying crude oil from international vendors who are understandably reluctant to be named. The major 'foreign-based oil companies Shell, Caltex and BP are under enormous pressure, internationally, to cut their links with South Africa as Mobil has just done (selling out to Gencor). Other companies such as Esso (Exxon) which

did not have refineries have been less reluctant to leave, while the South African company Trek will stay. As well as importing enough crude for its needs, which it has done except for a short period in the seventies when the Arab oil crisis was at its peak, South Africa has reputedly laid down strategic stocks in abandoned mine workings sufficient to supply the country's needs for a considerable time.

It has also aimed for self-sufficiency in two other ways, the extraction of oil from coal (Sasol), and oil from gas (Mossel Bay), which activities will be considered individually.

Sasol

Sasol is now a public company, set up for public financial participation in the process of extracting oil from coal, pioneered at Sasol 1, originally on a pilot scale, at Sasolburg in the northern Orange Free State. Having proved the process

in the sixties, original plant was extended, and is recently been updated. More important, after the world oil crisis of the mid-seventies, the decisions were taken to build two much larger Sasol plants at Secunda which was then a small town near Ermelo in the Transvaal. It was to finance Sasol 2 that the public company was launched.

Since the company is public and the process is now well-documented it will not be described in the main text, except to point out that Sasol leads the world in the conversion of coal to oil and gas, and is a substantial producer of chemical byproducts. Sasol 2/3 at Secunda (there are two separate plants, on adjacent sites, with some shared services) is easily the largest complex for extracting oil from coal anywhere, and one of the largest process plants in the world. Sasol 1 and 2 are wholly owned by the Sasol company while Sasol 3 is still partly in the public domain. Sasol 3 is still in partial production following a major fire, but recovery has been faster than first anticipated.

Partly for this reason, but mostly due to depressed world oil prices, Sasol's operating profit from synfuel production has been declining, to "considerably less than 40%" for the six months to 31 December 1988, despite additional protection of 2.4 cents per litre for the domestic fuel industry. This was offset financially by buoyant chemical sales. Production figures are not available, but it is understood that Sasol makes a majority of all petroleum sold in the PHV area - not only that sold under the Sasol brand name, but all

other brands, with which it is blended. The Sasol Secunda complex is strategically the most important plant within the borders of the Republic, giving a degree of self-sufficiency in petroleum products. Offshore it is about to be supplemented by another: the Mossel Bay oil and gas platform.

Mossel Bay

The absence of known oil reserves led to the formation of Soekor in

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shore. The FA gas field off Mossei Bay was discovered by drilling in 1980, leading in 1985 to a decision to develop the field, which is now being implemented. The twin Moss gas and Mossref projects (the offshore and onshore plants) are the largest industrial projects under construction in South Africa at this time, being rivalled in size in the region only by the Lesotho Highlands water scheme. Moss gas, the offshore project which is the more advanced, was originally-costed at R4.5 billion, or R6.5 billion allowing for inflation. The latest figure is R7.8 billion with a variance of R1.3 billion. Further escalation seems probable, though the project is well up to schedule. Assuming there are no further over-runs, break even will be achieved with a price of \$19 a barrel of crude, which figure is too high at present but not implausible when the first oil and gas come ashore in 1991, via two separate 85 km undersea pipelines. The refinery should come on stream in 1992 producing 4 Megalitres of petrol (53% of output) and diesel (47%). Figs 3.3 and 3.4.

The project (offshore and on-shore) is owned and developed by Moss Gas (Pty) Ltd. The CentraT Energy Fund holds 50%, Gencor 30% and IDC 20% with Gencor as project manager. The three partners are providing 40% of the cost while the CEF is financing an additional 40% with soft loans. By imposing countertrade obligations on overseas participants, the whole project is being financed without foreign currency. Within the overall objectives of safe and cost-effective plant, maximum opportunities are being created for local industry where necessary with overseas technology partners. About 80% of on-shore project costs should go to local business, but the local proportion of the offshore plant is thought to be lower.

South Africa has no previous experience of offshore oil rigs or on-shore oil-from-gas processing plants. Nevertheless the contract for conceptual design and engineering, and overall project management was awarded to EMS Offshore (Murray & Roberts group), with Crawford & Russell as overseas technology partners. Choice of EMSO was almost a formality since it was employed from the first conceptual studies. Nevertheless it was a landmark decision, being the first time that management of such a mega-project was awarded to a South African company rather than an international group. ESasol, for example, was designed and implemented by Fluor of the USA, though the local affiliate has since been locally bought out. EMSO, in turn, has awarded the major contracts to South African companies, with the technical proviso that they form tie-ups with suitably qualified international firms who were not allowed to bid directly, or not considered if they did.

The offshore platform comprises a conventional 8-legged piled steel structure with processing, drilling, power, utility and accommodation facilities fabricated on a modular basis and mounted on top of the jacket on a modular support frame. Gas and condensate are transported to the

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on-shore processing unit by separate 85 km pipelines. Our requirements for the offshore plant are about 2000 people directly, in addition to which many outside engineering firms are acting as sub-contractors. The on-shore plant utilises the Sasol synthol process.

As regards the offshore platform, Genrec is constructing the jacket at Saldanha Bay, Dorbyl is constructing the accommodation module and modular support frame at Durban, Babcock is constructing the process wellhead,

utilities and power generation modules in Port Elizabeth and ICAL has begun work on the drilling module, derrick and flare boom. Thousands of sub-contracts for the manufacture and supply of smaller systems and components are now being implemented, as well as first contracts for the on-shore refinery which is less advanced. Orders worth more than R40 million for boiler plant, heat exchangers and fired heaters for the Mossel Bay on-shore refinery (Mossref) have been placed with ICAL. Calls for cancellation have been rejected by the Minister of Economic Affairs and Technology on the grounds that the project will increase the country's self-sufficiency whatever its strict economics.

A more valid criticism is the over-use of expatriate labour on the project in order to keep to schedule, rather than local labour which often has to be trained. Since a large part of the purpose of implementing the project locally is to acquire expertise for the country, it would make more sense to train locals, even at the sacrifice of the original timescale, which cannot be regarded as critical. Expatriate engineers engaged on the Mossel Bay project are reported to be taking home pay in the region of R30 000 per month, which the author lived on for most of the year before last. The projected yield is at least 27 000 barrels/day from the FA platform. A second offshore platform is due to come into operation 17 years after the FA platform at a further capital cost of R1.3 billion (1986 prices).

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The life of the project is estimated to be at least 3 years, during which the imported fuel bill should be reduced by some R500 million p.a. (separately stated as 5-10% of the country's requirements).

Oil industry experts can perhaps find more authoritative estimates than the isolated figures published in South Africa which escape the information blackout imposed by the Petroleum Act, but the scale of the Mossel Bay project is clear. It will make a significant but by no means decisive contribution towards South African self-sufficiency in an area where the country is heavily dependent on imports. Financially the Mossel Bay project is on a similar scale to any one of the latest Eskom six-unit power stations, and its contribution to the country's energy budget is thought to be similar. In energy terms a bigger contribution could

probably be made by the implementation of a Sasol 4, but the psychological impact on the electorate, and the technical spin-off for the South African engineering industry, would not be as great.

The whole project, for one reason or another, has come in for a great deal of criticism, one major reason

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for starting it, according to the sceptics, being the fact that it fell within P. N. Botha's constituency. Having been started, it should be completed, for psychological, technical and economic reasons, but it will be interesting to watch what happens to the urgency for completion with the forced retirement of the former State President.

AECI Synfuels

The AECI synfuel project, to be implemented over a period of 8 years, will be about the same size as Sasol 2, with approximately twice the output of the Mossref project. It will be capable of producing equal quantities of petrol and diesel or a considerably higher proportion of petrol, according to demand. The plant will be located on a greenfield site close to a dedicated mine on the Eastern Transvaal coalfields, with an output 3.5 times greater than that of the Targest existing methanol plant, emphasising South Africa's role as the world's foremost synfuel proving ground. A small proportion of the methanol produced will not be converted to conventional fuels but earmarked to develop methanol fuel markets.

44 million tonnes

per annum

will be

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Natural by-products will also be produced including ammonia, ethylene, Sulphur and phenols, the cumulative import replacement value of which will be considerable. Figs 3.5 and 3.6.

OTHER OIL AND GAS

Light and heavy fuel oils are used directly for heating, as is liquid petroleum gas (LPG) manufactured in South Africa by Afrox, Sasol and others. Town gas is produced by some municipalities including Johannesburg and Port Elizabeth, but is not widely distributed. Natural gas, the first of which is now being brought ashore at Mossel Bay, may be marketed as such eventually, but will mostly be converted to oil.

Greater exploitation of the country's petrochemical industries could make South Africa a key player in the future world market.

Another projected source is torbanite, which Gencor proposes to develop commercially as a synthetic fuel source.

Sugar cane is being considered for commercial ethanol production, in the commercial growing area of Natal. There is one major snag - lack of technical skills. It has been credibly reported that the AECI synfuels project will require 400 engineers who simply don't exist in South Africa today. The bulk of the shortfall will, as in the past, be made good by importing overseas experts - an expensive expedient which provides no more than a temporary palliative and no real alternative to training South Africa's own people.

ELECTRICITY

Electric power generation and transmission are discussed in Chapter 4, distribution and applications in Chapter 5. Here we will merely observe that electricity is a secondary source, not a primary source, and comment briefly on the primary sources from which it is derived. These are chiefly coal, uranium and hydro power.

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URANIUM

South Africa is one of the world's leading producers of uranium, but had no enrichment facility, so the nuclear fuel for Koeberg power station was first imported. This caused problems owing to the USA unilaterally abrogating its contract to supply, so enriched uranium fuel was obtained from France until South Africa could complete its own uranium enrichment facility at Valindaba. Spent fuel from Koeberg is stored in a desert site in the north west Cape. It has been suggested by European nuclear power users that a major site for the disposal of spent fuel be estab-

lished in the desert in Namibia, for which the user countries would be prepared to pay substantial revenue. Whether the newly independent Namibia will go for this is not yet known. Although South Africa has sufficient coal reserves to last at least until 2030, Eskom's management and the National Energy Council are apparently enamoured of nuclear power. for which a new site has been selected in the Eastern Cape. It will not be developed this century, and the author questions the need to develop it at all.

It makes sense to have some nuclear power, partly to keep abreast of the technology and partly to safeguard supplies to the Western Cape, for which the single nuclear station at Koeberg suffices. When both Units are working it produces more than enough power for the Western Cape at considerably higher cost than generation from coal. Apart from the economic penalty there are three intractable technical problems: transport and handling of the fuel, eventual decommissioning of the station (the cost of which has seriously impeded Britain's electric power privatisation plans), and long-term storage of the spent fuel (which cannot be technically disposed of). Instead we try to contain it, in what must be the ultimate Pandora's box, which will be a danger for future generations. We cannot, responsibly, assume continuity of our present technological civilisation for the unsafe life,

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or even half life, of the spent fuel nor are the people living where we are planning to store it technologically sophisticated even today. Added to that the Koeberg station has been sited too close to Cape Town for safety in the event of a Chernobyl-type accident (which Eskom hastens to assure one could not happen). Sure, the same type of accident could not happen from the same cause due to the superior design of the Koeberg station, but major accidents do happen. due to human error or whatever reason.

'HYDRO POWER

Water is used to provide some hydro-electric power but not as much as in many countries, partly owing to the prevalence of coal. and partly to the very seasonal nature of the rainfall. Large quantities of water for straight hydro-electric purposes are only available intermittently. Relatively greater use is made of pumped storage? (Chapter 4).

A new, spectacular, and specifically South African development is hydro

power in mining (Chapter 6).
Tidal power is not applicable in South Africa where tides are generally low. There may be, but little research has been done.

ALTERNATIVES

With coal providing sufficient energy for South Africa's needs for at least another 40 years, and the known dangers of nuclear, South Africa should undertake major research, with a view to large-scale development of possible, and preferably renewable alternatives, of which solar, wind, water and biomass are singled out. All are used, and are subject to research, so far in a small way. Photo-electric solar cells are used to power remote equipment, particularly communications gear. Even such relatively accessible sites as motorways (including the Johannesburg ring road) are being equipped with solar-powered emergency radio telephones. Larger solar panels, fitted to the roofs of some houses, as well as larger buildings such as hospitals and office blocks, are used to heat water directly, but the economics of all such installations seem to be marginal.

Wind power is used widely to pump water from boreholes at remote sites, and in a much smaller way to generate electricity. Where electric mains power is available it tends to be preferred for powering borehole pumps, but where the borehole is remote, or where the farm's electricity is provided by its own diesel generator, the windmill is a familiar sight, as well as in wilderness areas such as the Kruger National Park. Wind power is in fact extensively used throughout southern Africa for that specific purpose but very little otherwise.

Methane gas is used for the systematic powering of machinery in the area of waste disposals

Are there realistic large-scale alternatives to coal and nuclear?

Tentatively, yes. A great deal more hydro-electric power could be generated from the Lesotho Highlands water scheme than is presently planned, and the scheme could, additionally, be modified to include much more pumped storage. This is not necessary at present when Eskom's load factor is relatively high. It may be needed later if, as is proposed. South Africa develops solar power on a massive scale for electricity generation. At least two methods seem possible: photoelectric cells generating electricity directly from sunlight, and steerable mirrors used to focus the sun's rays to heat up a boiler driving a turbine and generator. Alternatively it may prove possible to generate

electricity on a large scale using
solar ponds, fuel cells or some other
method.

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 large-scale
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CHAPTER 4:

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Overseas, and in some circles locally,
there is a perception of South Africa
as a technical backwater which in
many areas is simply not so. In elec-
tric power generation and transmission
South African practice fully meets
First World standards and in three
technical respects the country is
a world leader:

- t The use of very-low-grade coal
- t The use of dry cooling methods
- t Extra-high voltage transmission
at high altitudes.

Eskom

These technical pioneering activities
are considered in context in this
chapter. First it should be noted
that all three fall within the province
of Eskom, the former Electricity
Supply Commission and the largest
South African undertaking, which
is one of the ten largest electricity
supply authorities in the world.
The utility has balance sheet assets
of R31 billion (written up to R35
billion by Financial Mail), a staff
of nearly 57 000 even after recent
pruning, revenue of R8,2 billion
and net income of R816 million, giving
a return on revenue of 10% for the
1988 calendar (and financial) year.
As a result it is considered to be
in excellent shape for privatisation,
which is apparently not anticipated
before 1991.

Eskom generates 60% of all the elec-
tricity produced on the African contin-
ent, including 94% of South Africa's
requirements, and almost all the
power consumed in client TBVC countries
as well as the neighbouring states
of Lesotho, Swaziland, Botswana and
Mozambique. The only power consumed
within the Republic's borders which
is not produced by Eskom is that
generated locally by a few of the
larger municipalities, whose generation
activities are being progressively
phased out in favour of more economic

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GENERATION AND TRANSMISSION

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to be situated on the coal fields, rather than in the cities to which coal has to be transported, Eskom has come into its own since the major post-war power stations of Kriel, Matla and Duvha (all coal-fired), Koeberg (nuclear) and Drakensberg (pumped storage), to which it has just added a second pumped storage at Palmiet. It is in the process of adding five new major coal-fired stations, all in excess of 6 x 600 MH capacity, at Tutuka, Lethabo, Matimba, Kendal and Majuba. These five are at various stages of completion, with the last unit of Tutuka due to come on stream mid 1990, the first unit of Majuba (which has been implemented of bulk stations delayed five years) in 1996. The last unit will now be commissioned in 2001 (Table 4.1). Other Eskom statistics taken from its 1988 annual report are shown in Figs 4.1-5. The dry cooling methods shown in Figs 4.6-8. Nuclear power and pumped storage Eskom's nuclear station at Koeberg is situated in the Western Cape, more than 1000 km from the Transvaal coalfields where most of the bulk power is generated. When both units are working, Koeberg supplies the whole Western Cape and sends some power up country. Its output of 2 x 965 MW is supplemented by the pumped storage scheme of Palmiet (2 x 200MW) supplied during peak demand when water is allowed to flow from the upper to the lower reservoir through the reversible generator-motor/pump-turbine sets. When excess generating capacity is available due to low

energy. Hence the same water is pumped back up from the lower to the higher reservoir by the reversible sets. Using the surplus generating capacity in the off-peak periods effectively flattens the electrical system's load demand curve. Like the larger Drakensberg scheme (1000MW) before it, Palmiet is a dual-purpose scheme, also serving the needs of the Department of Water Affairs in supplementing water supplies to Cape Town (Palmiet) and the PHV area (Drakensberg). See Chapter 6.

Coal

With minimum capacities of 600 MW the five stations under construction are as large as any coal-fired stations anywhere, and about as technically advanced. So they should be, since the boilers, turbo-generators and other major technical equipment are not manufactured locally but purchased internationally from the world's leading vendors. Most of the civil engineering work and much of the secondary technical equipment up to and including main boiler feedwater pumps are manufactured locally, however, and design of the stations is tailored, not just to South African conditions, but individually to each site.

Considering them individually, Tutuka is a conventional wet-cooled station situated on the Transvaal coalfields at a considerable distance from the Orange Free State goldfields where the power generated is mostly needed. The station is technically linked to the goldfields by twin 765 kV AC transmission lines - the highest voltage yet employed by Eskom and the highest used anywhere at the altitude of the South African highveld. Unique six-bundle conductors were developed by Eskom and its contractor, Powerlines (Pty) Ltd for the purpose. They will be used in time to develop a larger 765 kV supergrid to be superimposed on the 400 kV and 275 kV transmission network (Fig 4.9) which is in place. Power stations as Table 4.2. i Excluding the 1500 kV DC inter-system link from Cahora Basso (Mozambique) to Apollo substation (Pretoria).

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Lethabo is another wet-cooled station closely modelled on its predecessor (Matla) except that it is designed to use by far the lowest grade of coal employed for bulk generation anywhere (Chapter 3). To cope with the very low grade coal, of which a greater quantity is required for a given power output, coal-handling and milling systems had to be enhanced, as did the electrostatic precipitators and of course the ash-handling system, so that Lethabo has easily the largest coal and ash-handling facilities of any power station anywhere. Its

construction also necessitated the largest piling contract in the region to permit erection on the heaving clays of the Vereeniging area, and the circulated cooling water is treated in the largest tubular reverse osmosis (TRO) plant in the world.

Hatimba power station, near Ellisras, in the dry north-western Transvaal, is easily the largest direct dry-cooled power station in the world. BEA, which pioneered the direct dry-cooled steam condensing principle nearly 50 years ago, is the main contractor for the 'air-cooled condensing system (Fig 4.1) which uses elliptical galvanised finned steel tubes with rectangular cooling fins to condense the steam passing out of the turbines, instead of the usual cooling towers which are 'familiar landmarks in Britain and most of the world (including South Africa). The concept is simple, but the practical design and construction are demanding, owing to the fact that the finned tubes are exposed in all weathers, subject to widely varying internal temperatures and pressures, and are required to last for an operating life of 20-30 years.

The scale of the cooling system is massive. The complete installation is 56 m high and will cover an area of 510 x 72 m containing 2.5 million metres of finned tubing. Some 42 000 tons of steel are required overall. There are 48 cooling fans, each more than 9 m in diameter, for each unit of the station, or 228 fans in all. Some 11 MW of power are required to run the fans of each unit.

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Even the Matimba coal is of relatively poor quality by overseas standards. Despite this the thermal efficiency of Unit 1 averaged 37.7% when it came on stream in 1987, surprising observers by performing better than Lethabo (about 37%) despite an anticipated 5-10% sacrifice of efficiency due to the choice of cooling method, the economic justification for which was the low cost of the otherwise reject Grootgeluk coal.

The assumed drop in thermal efficiency of direct dry cooling (which is less in practice than was anticipated) led Eskom to adopt indirect dry cooling for its next major station at Kendal, the first unit of which is now on stream with the second coming on as we go to press. Kendal is another pioneering design, only possible on this scale because of the novel construction method developed by DB Thermal, cooling system contractor. The resultant cooling towers are easily the largest in the world, each being large enough to accommodate four rugby fields! They are mounted

on massive prefabricated concrete supports. Each contains 500 bundles of finned tubing arranged in delta formation, which are subject to natural convection cooling. Thermal efficiency should be similar to that of a conventional wet-cooled station, and significantly better than that of the direct dry-cooled station at Matimba. Against that, the Kendal cooling system is the most expensive (R225 million, against R125 million for Matimba and R25 million for an equivalent wet-cooling system such as that at Tutuka or Lethabo, and R4-5000 million for a complete station).

Hajuba is a close analogue of the Matimba design.

Technical choice justification

Technically, all five stations are adventurous, if not in themselves then in their connections to the outside world. but such choices as dry cooling are easily justified in the climatic circumstances of the region. They are significantly cheaper options than transporting the coal to hypotheticale areas of abundant water, of which there is really none available in the interior. This is true even on the Vaal river, where Lethabo has to make do with really poor quality coal. This is acceptable at Lethabo, because its situation in the heart of the Vaal triangle gives immediate access to large industrial users. It would be much less acceptable at Matimba. from whose remote location there are significant transmission losses. nor would it be acceptable at Lethabo if the coal had to be transported. Technically dry cooling and the use of very-low-grade coal for power generation are now better understood by Eskom than any other electricity supply authority in the world. This experience may be valuable to others, particularly if the world's climate is changing radically. Perhaps there is low grade coal sufficient for a Lethabo-like station in abandoned pit workings in Yorkshire or South Hales? There are certainly other major (high and low-grade) coal deposits in regions which today are semi-desert. If they are of low quality, that is no longer a bar to working them. Eskom and other authorities could easily combine the technologies of dry cooling and very-low-grade coal usage in some future station. In South Africa, no such development is anticipated this century because the country is over-committed on the generation front, for which reason Majuba was recently postponed for five years. The reason for overcommitment is that the historical demand growth rate of the early eighties of around 7% was greater than the

present figure (closer to 4%) which is still respectable, but insufficient to justify the amount of new plant previously on order. Indeed five 6 x GOOMH power stations is a huge number for any country to commission simultaneously.

Transmission

Being over-committed on generation, the Eskom spotlight has to some extent

Fig 4.9: The grid network

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shifted to transmission and distribution. In several areas, Eskom is extending its network. starting at the new supergrid voltage of 765kV. In basic grid network philosophy. all trunk routes must be duplicated, so that there is always an alternative route for transmission if any route fails. A glance at the Eskom grid network (Fig 4.9) shows that not all routes are duplicated today. It is an objective of Eskom to do this, beginning with that portion of the Orange Free State where the western Cape is linked to the Transvaal by a single line.

network is

superimposed on 275

The major transmission

at 400kV today,

kV, 132kV and lower distribution voltages.

Unlike generation, where most of the equipment is imported, in transmission the bulk of equipment is made in South Africa. up to and including the largest transformers, switchgear, conductors, insulators and transmission towers.

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Network control

As with any country having an extensive electric power network, South Africa's network is centrally controlled by computer. Eskom has recently purchased new network control computer hardware, not because it was yet needed but because Eskom may have political difficulty in purchasing the desired DEC equipment in the future.

Maintenance

being geographically isolated rfrom its major equipment suppliers, Eskom has extensive maintenance workshops. Its Central Maintenance Services at Rosherville are the largest in the southern hemisphere. They are equipped, for example, with dynanic balancing facilities able to handle the largest Eskom turbine or generator rotor. Eskom is the first supply authority in the world to equip itself to this degree. The facilities are also available to its suppliers and outside industry.

M Table 4.2 "

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Apart from the enance of its largest equipment, the Rosherville workshops are involved in mechanical design and testing, e.g. of transmission towers, which are made by a number of vendors to Eskom needs. Overhead powerline conductors for the transmission network are made primarily by Alustang (Alusaf) and insulators by Cullinan Refractories. Other major high-voltage electrical test facilities are situated near the Eskom headquarters at Megawatt Park, where the six-bundle 765kV conductors were tested, and at the SABS Apollo station near Pretoria which has a massive Faraday cage (for interference-free tests). Many of the major suppliers also have their own facilities, of which Brown Boveri Technologies facilities at Pretoria Nest are the largest for transformers.

BET (formerly Ksea South Africa) is the sole SA manufacturer of generator transformers.

In the mechanical area Sulzer is largely responsible for main boiler feedwater pumps. Dorbyl is responsible for a wide range of heavy engineering work up to and including the low-pressure turbine casings for the new Kendal sets, and Hurray & Roberts for probably the majority of Eskom civil engineering work. At Lethabo power station, which is typical, there are more than 500 contractors and major sub-contractors, mostly local firms, supplying as much local content as possible, which does not include the key technical components of the station.

Finance and-management

In the technical area, Eskom's strategic decision to opt for such choices as dry cooling was both courageous

and far-sighted, and totally vindicated by events. Far more questionable has been the financial decision-making. while past financial controls were simply sloppy.

As regards the basic over-ordering of plant, this is readily understandable, and the decisions were correct on historical grounds. Faced with ' the actual economic performance of South Africa in the past five years rather than a projection of its performance from the previous five, the authority has been faced with the need to trim its capital investment repeatedly, but the mistake was inevitable. Partly owing to this, and partly to poor financial controls allowing some spectacular antics by an absconding Deputy Chief Accountant (who turned out to have no accounting qualifications, but some talent for acting and embezzlement), the authority was financially restructured in the mid eighties, starting with appointment of a new Chairman, John Maree, from outside industry. Under Maree and his Senior General Manager (Ian McRae, the top Eskom technical man), the undertaking has been successfully overhauled along fairly strict business lines - so much so that the 1988 annual report conveys a strong feeling that the authority is patting itself of the back, perhaps not unjustifiably. The tightening up was overdue. It is also a major step towards the reshaping of Eskom for its eventual disposal to private investors a la Thatcher/CEGB (hopefully without the British nuclear hiccup). As it stands, Eskom is a semi-government body falling squarely in the public sector despite a requirement that it also operates as a business. It is not only South Africa's largest undertaking but the public sector body in the best shape, financially and managerially. for disposal to the private sector, from which the government needs, and expects to raise, substantial funds.

In opting to dispose of public sector assets the South African government has an undeclared motive, in that public sector employees are traditional government supporters who are more dependent on the public purse than the government can continue to afford. Not only Eskom, but every public sector body is due for more financial streamlining, and the government would prefer that the private sector

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take the blame for the inevitable
redundancies.

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Considering Eskom specifically. which
is still in the public sector (and
despite government thinking in one
sense always will be), each power
station and distribution region is
now a strategic business unit (SBU),
which is claimed to have revitalised
the organisation. Partly as a result.
the availability of Eskom's large
units (boiler/turbine/generator sets)
is now exceeding 80% and Matla. the
star performer is exceeding 90% -
significantly better than the world
average. All the major Eskom stations
are steadily improving in performance.
while Matla announces new world records
for continuous generation, almost
on a routine basis.

With technically excellent equipment
which is being thoroughly run in,
the only technical danger seems to
be cost-cutting in the maintenance
area, with the temptation to go for
a new record rather than attend to
necessary maintenance work now. The
appointment of divisional managers
to oversee the running of the SBUs
forces then to contain costs without
cutting corners dangerously, but
if Eskom were to move from its present
situation of surplus capacity to
one of capacity shortage, one can
imagine certain policies reversed.

Capital needs

Apart from its 'need to cut back from
a basically over-ordered position,
Eskom has a major financial problem
which is not of its own making but
of the government's, in the financial
sanctions imposed on the country
in 1985. Traditionally the authority
borrowed abroad for' its construction
programme, but its sources of overseas
funding suddenly dried up. they have
been replaced with others, including
local sources and equipment vendors.
and some of the original overseas
sources are staying in for the ride.
According to its 1988 annual report
and later statements, Eskom has suffic-
ient funds available or on offer,

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mostly from local sources, to complete
its present programme, and the intro-
duction of more local funding would
be seen as a move towards privatisation
on the JSE. There has also been a
significant move towards self-funding
of Eskom projects from Eskom revenue.
Nevertheless, as it moves into the
next cycle of ordering new plant,
in the early nineties, the majority
of funds must come from outside,
and the absence or withdrawal of
traditional sources is certainly
a long-term headache for the authority

if not an immediate problem. Eskom could, right now, raise sufficient to fund its next power station from local sources. Will it still be able to do so when the need arises in the next decade? Because of the long-term nature of the power station commissioning cycle the problem is likely to arise for Eskom before it affects most other public bodies or SA industry at large - I perhaps before political acceptability has been achieved. i

PROSPECTS

Long-term forecasts are notorious for the frequency with which they are quite wrong, but with a 8-year lead time from a decision to go ahead to commissioning of the first unit of a new power station, a normal five-year forecast is insufficient for Eskom's purpose. Because Eskom itself necessarily takes a longer term view, it is possible for industrial users to be fairly confident that, for the rest of this century, Eskom will have sufficient capacity to cope with unscheduled economic upturn, including upturn in the region hopefully following the final laying to rest of apartheid. For the present, and probably until the mid nineties, Eskom is operating with excess generating capacity, despite decommissioning small, older stations ahead of schedule and delaying the commissioning of Majuba. 1

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Demand is still increasing. The forecast long-term growth rate for 1990-2000 is about 5% p.a. in sent-out units, which reduces to a maximum an

demand growth of about 4% due to demand side management programmes. Plant at present on order will be able to meet demand until about 2000. It seems probable that no new hydro or pumped storage plant could be justified today, or until after the year 2000, and not more than 'SOOMH of this type of plant will be added between 2000 and 2005. A limited but expanding programme of adding nuclear plant seems probable, possibly starting in the year 2000, but for at least the next 40 years the bulk of new generating plant will be coal-fired. No further stations of this type are planned yet, nor any nuclear station in this century, despite which Eskom has earmarked a site for a new nuclear station in the eastern Cape, and Dr Louw Alberts of the National Energy Council is publicly advocating nuclear power for the future (with which the author disagrees - see Chapter 3). . Eskom is also looking at the next generation of coal-fired stations and has the name for the next project

(Lekwe). There is no urgency about this, and no intention to go much above 6-700MH on the boiler side. Poor coal is endemic in South Africa, and the very low grade of coal used at Lethabo means that the boilers of that station are equivalent to those of 900M" units where the boilers burn a conventional grade' of coal. It is possible to go larger, but Eskom sees no advantage and new problems in doing so, as its latest six-unit power stations are as large as any coal-fired stations in the world.

For the future, Eskom is investigating coal gasification and combined cycle heat and power stations, and may encourage cogeneration by industrial customers with suitable "fuel. For the present such customers. will probably do better financially to negotiate better rates with Eskom's marketing department.

Eskom has been admitted as a full member .of the World Association of Nuclear Operators, formed in Moscow in June with the purpose of pooling information for the prevention of any future Chernobyl-type acctdent. in to its excess capacity. 'Eskom 0:1 cglosing many older. less'efflclent stations. and may find foreign buyers for some redundant plant, which_ 15 considered broadly suitable for limited Third World needs. Red China was reported to be interested in_ purchasmg according to Financial Mail although the identity 0? prospective purchasers was not confirmed by Eskom.

BOP BLUNDER

Hhile Eskom successfully implements massive electric power generation projects. subject to minor misjudgment of needs in the case of Majuba, the nominally independent state of Bophuthatswana miscalculated completely. It erected the first unit of a planned 4-unit R700 m station without havmg the money to proceed to phase two or com'nence coal mining to fire the boiler. Meanwhile the first 60W unit of the station, erected at a cost of R123 million, is lying derelict two years after completion, and most of the equipment guarantees have lapsed, while rumours of dismantling and resale have come to nothing. Hho provided the money for the ill-conceived venture is not known, though the question has been asked by some determined investigative journalists.

Fig 4.10 '

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GROWTH IN ELECTRICITY SALES
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Fig 5. 2 IN SOUTH AFRICA
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Fig 5 . 3
ELECTRICITY SALES, 1988
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Electricity demand
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. CHAPTER 5:

ELECTRIC POWER (2)

DISTRIBUTION AND APPLICATION

While generation and transmission in South Africa are essentially the province of a single body (Eskom, see preceding chapter). Electric power distribution and application are for all. Well nearly. At the substation level the municipality or individual factory prunes the power passes out of Eskom hands into those of the municipality for distribution to individual consumers, or to the factory. management for distribution to technical equipment etc. Other major classes of user are mines and railways. Figs 5.1-10 from Eskom show consumption by the major categories of user. Industry, and bulk sales to municipalities for domestic users are the two largest categories, followed by mining, with traction a much smaller fourth.

DISTRIBUTION

This is similar in principle to transmission, but its extent is far greater, while the practical design of equipment reflects the generally higher voltages at which electricity is distributed. Despite this, the great majority of distribution is nominally carried out at 'high voltage', i.e. higher than the voltage at which the power is ultimately used. Distribution technology is mature, and the high-voltage market is overtraded, in South Africa as in the world at large. On the world scene this resulted in the recent merger of Asea and Brown Boveri, and the relinquishing by Sprecher & Schuh of their high-voltage activities. Both moves are reflected by South African affiliates; Transformers, circuit breakers, fuses, switches, plugs and sockets, cables; these and other standard items of electric power distribution equipment are made in South Africa as in other countries, mostly by several different concerns. In times of shortage when the local industry cannot supply,

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or when it is uncompetitive for any reason, local production is supplemented by imports, but South Africa is essentially self-sufficient in the distribution area.

Considering the major equipment categories, most transformers are oil-filled. They are available from many different suppliers. Where there is a recognised fire hazard, solid encapsulation may be preferred, for which the only SA supplier is Siemens. Its Geafol range is produced at Spartan where the largest transformer of this type in the world was made. Another supplier, and wholly SA

producer of dry-type transformers is Brown Boveri Technologies (BBT), which has been in the process of introducing locally-made dry-type units since 1985 to 06% knowledge. The problem is that dry-type transformers are substantially more expensive than oil-filled, which restricts their sale to known fire hazard situations, and only those where someone in authority feels strongly about the matter. In mines, for example, one might expect massive sales of dry-type transformers since the Kinross disaster of 1986, when many workers lost their lives due to underground fire. In practice dry-type transformers are dismissed as too expensive by mine management, and they will continue to be brushed aside unless the Government Mining Inspector insists on their use. Meanwhile South Africa's use of dry-type transformers compared to wet-type is far less than that of First World nations with which the country likes to be compared. In distribution switchgear South African practice is perhaps more mature, with SF6 and vacuum types both favoured. Circuit breakers (which are made locally) are generally fitted in preference to fuses (which are not). This is not due to technical

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preference but
ignorance and
rather to
laziness.
operator
reflecting

. the ease with which a circuit breaker
can be reset compared to the hassle
of changing a fuse. With proper training
and discipline, neither procedure
is particularly troublesome but South
African users are often ill-informed.
Viewed in that light, it remains
to be seen whether a South African-
designed circuit breaker fault trip
counter developed by Control Logic
will be well-received, or dismissed
- another victim of ignorance.

Not all South African developments
are swept aside when they meet real
needs. Earth leakage circuit breakers
(ELCBs) are a special category of
protective equipment developed in
South Africa for local conditions,
and now SABS specified for widespread
use. They deserve general adoption
throughout the Third World.

Plugs, sockets and switches are manufactured
in South Africa, but also
imported in quantity. A majority
of cable is made locally, but most
special cable is imported.

Many of the standard items of high-
voltage distribution equipment have
their counterparts at low voltage,
i.e. the voltage at which the power
is actually used. Low-voltage distribution
equipment is even more standardised
than high-voltage, but though
the equipment is essentially standard,
the market is a little less saturated;
though extremely well established
in South Africa as overseas.

Some items of low-voltage distribution
equipment such as moulded-case circuit
breakers . (MCCBs) are manufactured
locally in quantity (by Circuit Breaker
Industries - formerly Heinemann/Fuchs,
which has the bulk of the SA market).
Apart from this anomaly, as products
become more standardised and production
runs lengthen, overseas products
tend to be favoured on cost.

Also favoured is the wholesaling
of standard products rather than
the engineering of customised systems.
These last lead to elegant solutions

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for industrial users of electric
power but are rarely the most economical
approach for the manufacturer
of electric products. For this reason
the manufacturers are increasingly
marketing through very few wholesalers,
especially Elcentre, leaving the
engineering of systems to contractors,
consultants. and customers' plant
engineers. In most cases industrial
plant engineers are quite competent
to design simple systems. Complex

systems are designed by independent consulting engineering firms.

While the largest number of consumers are supplied individually 'by the municipalities. it should not be forgotten that Eskom is itself a distributor, and an innovative one since it finds itself with excess generating plant (see last chapter).

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An interesting political conundrum with which Eskom has involved itself is the provision of supplies to Soweto, the black township south-west of Johannesburg which has an estimated 2.5 million population. For the last three years the inhabitants have been refusing to pay rent, electricity and water.

As a result, the Soweto Town Council, elected by only 11% of qualified voters, has run up debts of R1 million which will have to be written off. The government wants to do it quietly, while the Soweto Peoples' Delegation wants to proclaim it loudly as a victory for the oppressed masses over the forces of apartheid.

Eskom has proposed taking over electricity distribution, sales and servicing in Soweto from the city council, which presently buys electricity from Eskom to sell to Sowetans, in an operation which is chaotic and corrupt. SPD apparently likes Eskom's proposal, and according to a report in the London Sunda Tele ra h has said that Sowetans want to pay for an efficient, affordable service provided arrears are wiped clean. i

Mains electricity is supplied to only 11 million South Africans by Eskom or the municipalities. Now Eskom wants

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to supply everyone, and is working towards its own distribution company, in which GEC may become a shareholder. Its objective is to supply electricity to the entire population. According to the newspaper report, the question of face saving in Soweto would be solved by letting SPO announce 'that it had solved the crisis by invlting Eskom in. A confidential Eskom memo is quoted: "Part of the reason for Eskom agreeing to this was based on its belief that in ten years it was probable that there would exist legitimate local government structures."

The local manufacturer Control Logic has been awarded an Eskom contract for a pilot batch of 7000 prepayment control devices known as budget energy controllers (BECs). They were designed and will be made by Conlog at its Durban factory. And proven in Soweto? Pick 'n Pay is reported to be saving thousands of Rand per month on electricity charges, thanks to installation

of the Microcon II locally designed and developed energy management system from Conlog.

SAFETY

Since most of the Black areas have not had electricity before, its introduction is accompanied by a safety campaign. This is considered very necessary in view of some types of accident reported, such as carrying irrigation pipes against the lines. Used properly, of course, electricity is perfectly safe, but while it is an invaluable servant, essential in any transition to a First World style of living, it brings considerable danger to Third World people unsophisticated in its usage, which First World people often do not realise. As regards cost, Eskom power is the cheapest in the world, but also the most rapidly rising in price. The South African municipalities, which buy in bulk from Eskom for distribution and resale to individual consumers, generally follow Eskom pricing policy guidelines.

APPLICATIONS

As in other countries, electric power is used for many purposes, of which heating, lighting and motive power may be singled out. Electric power for industry - we are less concerned with its domestic application - is passing through a period of rapid technical change initiated by the application of electronics. While the basic applications of electricity are unchanged and the basic electrical technology is essentially mature, electronic control - far more flexible than electromechanical control - has upset the established hierarchy of electric motor types. For example, by the introduction of electronic soft starting and AC variable speed drives. It allows even more precise control of heating and lighting and creates the whole new category of programmable logic controllers (PLCs) which are far more flexible than the old hard-wired interlocking relay controls.

Motor choice .

In South Africa, as in most countries, easily the biggest application of electric power in industry is to provide motive power precisely where needed. Faraday's laws have been utilised for more than a century in the electric motor which has reached a high state of development, and manufacture by several South African companies, of whom EEC, Fence, Sianens and BET are singled out.

DC motors utilising the commutator have traditionally been used for traction and other load-hauling duties, in South Africa and worldwide. They are still strongly entrenched wherever precise positional control is required,

such as machine tool drives and robotics, neither of which are strong in the South African market. For traction and such industrial duties as materials handling in South Africa's mines and process industries, DC motors are being displaced by AC variable speed drives. which utilise a solid-state inverter to produce a variable frequency output to drive a simple squirrel-cage induction motor.

In the smaller sizes direct-on-line (DOL) starting has been favoured, the system being over-specified to accommodate a severe mechanical jolt. For some typical South African uses, such as slurry pumping, a jolt is necessary or desirable to overcome the initial stiction of the mechanical load. Electrically and mechanically, however, it puts a severe strain on the motor and the system. as a result of which special starting provision such as star-delta starting, or more sophisticated variable resistance starting is favoured.

Alternatively, electronic soft starting may be used, in which the current is limited electronically, and the power increased progressively as the motor builds up speed. A large number of vendors are able to offer equipment in this category, including Saftronics and Siliconix with wholly South African designs.

The electronic soft start approach is increasingly favoured for large. motors by mechanical engineers in South Africa, who see the major disadvantage as the relatively high cost of the electronics which is for them something of a black art. Electrically. however, there is another serious disadvantage in the distortion of the mains waveform with unwanted harmonics. This makes soft starting and its outgrowth, the electronic variable speed (frequency) drive, unpopular with Eskom. the municipalities and probably the neighbours, who do not appreciate what the electronic soft 'starting of a megawatt motor is likely to do to the mains supplied to their control systems or computers. Despite this, motors as large as mine winders are increasingly of the AC type, which is creating a brand new technical problem in South Africa.

It is this consideration as much as mains interruptions and lightning surges (both common problems with Eskom power) which has led to the rapidly growing importance of uninterruptable power supplies (UPS) whose function is to clean up the harmonics as much as to safeguard the mains

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electronic

Supply. For that onse a standby system such as a diesel generating set is frequently sufficient. Meissner Power Systems (NEI group), representing the Emerson range and its own smaller local designs is probably the leader in industrial UPS and standby diesel generator sets, but there are several other suppliers of both categories. Returning to the soft start and the variable speed drive, and related areas such as motor protection and control gear, there are many suppliers

of both local and imported equipment, such as Siemens, BBT and Saftronics. CHI Control, which specialises in motor control gear, does not compete, surprisingly, in variable speed drives. The falling price of electronics and the increasing ruggedness of the electronic controllers is leading to a steady increase in AC motor business compared to DC which can ' only continue, owing to the disparity in cost of the motors themselves. DC motors cost in any times more than AC, but they can be very simply controlled electrically. For this reason in South Africa (and probably world-wide) there are still many more DC variable speed drives than AC, but traction is steadily falling to AC, as are mine winders and large South African industrial drives, e.g. for materials handling at Eskom power stations and primary process plants. Moreover the increasing facility with which AC drives can be fitted, even retrospectively, is leading to their application in formerly non-variable-speed applications such as pumping and fan motor drives. where variable speed allows significant energy savings. In such variable speed drive usage the squirrel-cage motor must be derated, but type of application where it is economic to fit a variable speed drive retrospectively. the motor's full rated output is required very little of the time in any case. With proper design, harmonics due to electronic control can be minimised, but the more sophisticated solutions such as synchro cycling are more in the,

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expensive than 'e-angle firing, able for motor and not always control.

Heating

While electric motors account for the largest consumption of electric power in industry, heating and lighting are almost equally important. Electric heating, particularly space heating, is expensive but nevertheless widely practised in South Africa where the cost of electricity, though rising rapidly, is still relatively low. Compared to other methods of heating, electricity is the most expensive. It is also the cleanest and by far the most accurately control 1 abl e, so widely wused in process heating applications. A few South African companies offer very simple control equipment, against a broad range of mainly more sophisticated imports. Most electric heating involves resistive elements, perhaps in conjunction with fans, ducts and thermocouples or other sensing elements and electron-

ic controls. Most resistive heating elements are imported, but resistive heating equipment is made locally by a number of concerns. Other methods are induction heating, in which there are South African contenders; and electric arc furnaces are popular. Arc furnace sales are depressed, as is the foundry business generally, and not catered for by South African manufacturers except for replacement arc furnace cable and other consumables.

Lighting ,
Incandescent lighting is also dependent on resistive elements. Fluorescent lighting is more popular industrially and commercially, and more economical. Several companies offer South African-manufactured lighting ranges including Thorn and Philips/EEC, which Jointly own Electric Lamp Manufacturers of South Africa (ELMOSA). Most of the lamps sold locally are made at the Thorn or ELMOSA factories. Luminaires are offered by many more suppliers, together with switching, wiring and accessories.

Electric lighting, like heating, is precisely applicable and controllable, as is electric power generally. It is essentially convenience power, which can be brought anywhere with the aid of cable, transformed down (or up) with high efficiency in the case of AC, supplied via socket outlets for use with small fixed and mobile appliances, and permanently wired into larger items including most industrial equipment.

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PLCs

Where complicated control sequences are required, programmable logic controllers (PLCs) are proving ideal, ranging in complexity from very simple stand-alone controllers to elaborate PLC-based control systems, capable of process control with the aid of analogue/digital interfaces, networking and, of course, overall control by computer. Very many suppliers are active in the PLC market at this time, including almost every company marketing low-voltage electrical equipment. Surprisingly, there seems to be no South African-manufactured PLC yet - which omission will doubtless be rectified in time.

The simpler PLCs are essentially electronic replacements for relay logic, but the PLC has far outstripped its origins, in South Africa as in the world at large. Interestingly, there has been relatively little fall-off in demand for individual relays, which provide electrical isolation of the controlled and controlling circuitry. This is often felt to be a virtue in the lightning-prone reaches of the South African

highveld, where a single strike .can
do enormous damage to electrical
equipment if allowed to spread freely.
There is also a brand new Problem
in the ease with which control circuits
can be modified, making it difficult
to fault-find without the engineer
who designed the logic. In South
Africa he has, most likely, moved
on. In cases of difficulty it is
often simplest to reprogram the con-
troller to perform the required task,
for which purpose the programming
unit is a must. There is much truth

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in the half-serious assertion in a South African technical journal that the usefulness of a PLC is inversely proportional to the square of the distance from the nearest programming unit!

Most applications are at low voltage, i.e. 220V AC single phase or 380V three phase (500V in the case of the mines), but higher voltages are often used for large motors, as they are for distribution.

Distribution within private premises, whether industrial, commercial or domestic, is a direct concern of the user, whose fixed installation must be approved by the authority before mains power is supplied. Despite this one often sees later, Robinson additions to private distribution installations which would be: unacceptable in the First World, and decidedly dangerous anywhere but for the very widespread usage of ELCBs.

THE COMPANIES

Financially the largest electrical company is Brown Boveri Technologies, linked with Powertech - the umbrella body for Bill Venter's financial empire in the electric power field. Another major Powertech affiliate is Aberdare, the leading cable company. Other major players are Siemens, GEC and the NEI subsidiaries Meissner Power Systems and CH1 Control. The list is extensive, names are familiar internationally. In South Africa, even internationally-known companies often have local shareholdings, amounting in some cases to 100% of an apparently international company which is no more than a local agent for its ostensible foreign parent. South African companies in that category are frequently engaged in local manufacture of equipment not derived from the foreign company of the same name and/or the marketing of other major agency lines.

To avoid the necessity for going into explanations of the circumstances of individual companies as they are

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and many of the mentioned in the text, the activities of the more significant are summarised in Appendix A, which is representative rather than exhaustive. These companies and others not mentioned are capable of meeting South African needs for electrical goods from locally manufactured products, which are broadly supplemented by imports. Such imports are necessary, and desirable in the case of new categories such as PLCs, and perhaps sophisticated equipment of any category which cannot be manufactured economically in South Africa. Should the sanctions noose

tighten further, however, economic considerations will be replaced by strategic concern.

Far more electrical equipment could be manufactured in South Africa than is actually occurring today, and in the event of major sanctions it certainly will be.

The following members of the Electrical Manufacturers Association of South Africa are all engaged in manufacture of some kind. The membership, however, does not include all the companies manufacturing, nor every company referred to in this chapter whose activities are considered significant. It is perhaps indicative that Siemens has just launched a range of solar products including television sets, refrigerators, pumps and light fittings which may find wide application in remote areas of Africa, having reached agreement to buy Arco Solar Inc from its parent company Atlantic Richfield. Not only Siemens but the only company BP is intensely active in the area of photovoltaics. It remains to be seen when and whether it is: capable of moving from the area of marginal generation for remote users to central generation for commercial sale;

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Table 5.1: Members of the Electrical Manufacturers ' Africa (EMASA) .

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Cadweld

Crabtree SA.

Crompton Instrumental (SA)

Crompton Parkinson (SA)

Cutler Hammer Control

Egalube

Heineman Electric SA '

Klippon Electricals

Lilemasler Products

Livanos Bros Electrical

Lumex

MRT Barlons

Association of

South

Oak Industries

Fralley Manufacturing Engineer

mg

Protea Cables

Siemens Ltd (Standard Products Div)

Sprecher 8: Schuh (Ply)

SW Products

Telemecanique SA

Thorn EMI (SA)

3M Co SA

Waco Distributors

' Now Circuitbreaker Industries.

Fig 5.12.- How engineering

News saw the announcement

by Siemens of a range
of solar-powered electrical
equipment . The author
prefers the concept of
central generation combined
with pumped storage, using
reversible pump/turbine-
generator/motors similar
to those installed at
Palmiet, shown in fig 5.14
below.

Mr;

CHAPTER 6:

OF THE MAJOR problems facing South Africa, water is the most intractable. This may seem surprising since southern Africa is, geographically, a massive peninsula dividing the Indian and Atlantic oceans. which are continuous with the Southern ocean to the south - the largest continuous uninterrupted stretch of water in the world. Be that as it may, South Africa, at its present profligate rate of usage, would run out of water around the turn of the century and in any case within a generation were it not for major water schemes now being implemented.

This is the consensus of opinion of a number of leading authorities. Whether or not it is precisely accurate the availability of usable water is possibly the severest limitation on the country's future economic and population growth, even ignoring the recurring problem of drought. That problem has receded for the present. but it recurs regularly on about an 18-year cycle. roughly following sunspot incidence (Fig .1

Even without drought, most of the highveld plateau of the interior suffers from rather meagre, strictly seasonal rainfall, reducing in the north west to a level characteristic of semi-desert. Other parts of the country, particularly the eastern lowlands, tend to have excessive rainfall. Only the escarpment, the central mountain range of the Drakensberg and a relatively small region of the western Cape enjoy the sort of rainfall with which Europe is familiar. Even there the similarity is marginal owing to the alternation of drought and downpour.

After rain, in the strong African sunshine the ground dries faster than in Europe, allowing the water

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less time to soak in, which it is less inclined to do anyway owing to the nature of the terrain. There IS underground water, but generally less than is normal in Europe. Many streams and rivers are dry, or nearly dry, for much if not most of the year, but are transformed intermittently into torrents.

The Department of Water Affairs is the authority responsible for water, ensuring adequate supplies where possible, generally regulating water usage, monitoring and controlling quality. The municipalities have major responsibilities in their own areas. Such bodies as the Rand Water Board are responsible for major

engineering works, infrastructure and supplying consumers in the Hitwatersrand area.

Usually the municipalities formulate restrictions on the Board's instruction e.g. prohibiting the use of mains water for gardening, or restricting its use for this purpose to some hours of some days towards the end of the winter when the dam levels are getting low.

At this time there is generally no restriction on the use of water from private boreholes for such purposes, provided there is underground water to raise. For this reason the sinking of private boreholes is common, even in municipal areas.

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Beyond the bound of the major municipalities, privately-sunk boreholes are often the only source of water available, and not necessarily on a regular basis. Because of this, the construction of private dams and reservoirs is commonplace, as is the erection of large storage tanks. Local municipalities, quasi-municipal bodies such as the Rand Water Board and the Department of Water Affairs erect dams, reservoirs and water engineering works on a massive scale.

It is, in South Africa, partly the endemic water shortage which makes the private swimming pool such a prominent status symbol - significantly more so than the comfort of submerging oneself in hot weather justifies. Speaking from personal experience, the comfort of submerging oneself is undeniable, but the only large group of people who do so regularly throughout the summer are white children, mostly of the AB income group. When water is so precious, can one truly belong to this group unless one's children are free to use one's private pool of it? Most residents of northern Johannesburg would question it.

The majority of legislation and official pronouncements on the subject seem to be aimed at curbing water usage by the private user. Individual consumers are, in total, the biggest users of water in the country. But mining, processing and manufacturing industry run the private sector a close second.

The biggest individual the large mines, processing plants and public utilities. Their usage is particularly crucial because of the volume of their consumption, and the volume and nature of their effluent. A reduction in a large plant's water consumption, or an improvement in the quality of its

effluent, has the same or greater effect on the availability and quality of water as does reduced use by a large number of private consumers.

users are

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It is for this reason that recent amendments to the Water Act imposed far stricter controls on industrial use and far heavier penalties for non-compliance, ranging from incgesad fines to imprisonment to plant closure.

OVER STRICT?

South African legislation concerning the disposal of effluent is now in some ways over-strict, resulting in temporary suspension when there is no tangible benefit. Thus the insistence on phosphate removal from sewage when 98% of the phOSphates in the catchment result from agriculture is pointless, as is the removal of salinity from effluent discharging to the sea.

Many industries, of course, cannot function without a large water intake, for example brewing. The biggest effluent offenders are considered to be textiles and tanneries, due to the very high cost of removing salinity from such effluents, as a result of which they are mostly located on the coast.

Water Consumption per unit of manufactured product is claimed to be much lower than the average world figures for almost every product manufactured in South Africa. At the end of the line the effluents are returned to waste treatment plants, purified and made useful for a second time. Industries adding salinity remain a problem, which is lessened by the policy of relocation to the coast. It is not always appreciated that solid waste dumps can be a serious source of pollution through leakage into watercourses. The country is perhaps fortunate that it is not yet a major producer of many of the very toxic products of more industrial nations.

Despite South Africa's increasing industrialisation it is not industry that is the biggest offender in terms of organic pollution, but farming and the wealthier suburbs. Excessive

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fertilisation of agricultural land and suburban Towns is an intractable problem contributing greatly to enrichment of. Takes with algae, because the sources of pollution are too diffuse for treatment. Many industries discharge contaminated flows. often knowingly but sometimes inadvertently, from which they reach watercourses. Most large plants are obliged to follow a policy of zero discharge. Coal mining has led to pollution by acid mine water drainage, which however is restricted to open worked out mines. Better control and strip mining have eliminated much of the problem.

The Hitbank problem is aggravated by a burning underground coalmine which has been doused with acid water and sometimes sewage which has failed to put the blaze out. merely established a 3 x 5 km underground lake whose seepage is causing extensive environmental damage.

TREATMENT

Pollution of inland water resources is a major headache for the authorities and consumers, and a problem which can only become worse. South Africa is claimed to be well-advanced in the use of membrane technology for special applications, while in terms of biological treatment of organic wastes, South Africa leads the world, according to Dr James Barnard, president of the Water Institute of SA recently.

The most prevalent methods of treating domestic organic wastes in South Africa are locally developed biological methods for removing nitrogen and phosphates from wastewater. in addition to the removal of virtually all the biological available carbon.

Nitrogen and phosphates assist in the growth of algae, and alternative methods of treatment are very expensive and add salinity. Effluent standards in some areas require that the water be treated almost to potable standards before discharge.

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The methods developed in South Africa are now in great demand overseas. South African technologists are now assisting designers in a number of other countries to construct biological treatment plants. i

Plateau Agencies of Grasfontein has developed a process that quickly and efficiently turns human sewage into a viable, high-quality fertiliser. Active sewage pasteurisation (ASP) connects in line to the primary treatment process and dewateres the sludge to a treatable concentration, which is then pumped through a chemical activator where full pasteurisation occurs within 10 minutes at 65°C.

The chemical reaction, generates its own heat, kiiiing off odours and pathogenic organisms, but does not remove the heavy metais. However 'the ASP process enriches the siudge with plant nutrients, the enriched product having excellent fertilising properties.

A Municipal Hater and Effluent supplement to Munisi aTe en 0 enbare Dienste was publiishea ln Juiy Egg. The main journal covering the field. is Hater Sewage & Effluent.

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Dry acid faH-out and acid rain are caused by airborne sulphur and nitrogen gases caused by burning c'oi. oil and petrol. In the Transvaai it was stated last year that around 100 million tons of coal are burned per year, releasing 3000 tons of suiphur aione each day. Ciimaticai'ly the Transvaal highveid is one of the least suitable regions on earth for coai-fired power stations owing to its dry, relativeiy windiess weather, and frequent winter temperature inversion, yet it has the biggest cluster of such power stations in the world owing to the presence of so much coal, l greatly augmented by veid fires and domestic fires in the townships, few of which were given eiectricity when :they were built. Secunda is another problem plant, as is Highveid, Middeiburg, Samancor and many other plants mentioned in this report. As a resuit, in the opi-nion of many scientists the;Tl"an'5V331 air long since sulphur saturated.

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At least three a.: Hitbank, Secunda and the Vaai Triangle are already major air pollution black spots, while the PHV in generai has one of the highest rates of ear, nose and throat complaints due to the prevailing winter smog - technically a photochemical smog - which is progressively getting worse. 'Hitbank Tung' is no faTTacy. It is due to the fact that Eskom and other industries have been licenced to subject their workers to pollution Teveis which would constitute criminal offence elsewhere in the First Horid. As with water poiution, the problem should not be over-stated. Eskom is a responsibie poliuter - if there is such. Anyway it is spending R120 miiion abating what it claims is not a problem, and South Africa's iow-grade brown coal is less suphur-rich than some. Nevertheless its air-borne deposits are changing the characteristics of the soil in the-Transvaai maize and timber belts.

Acid rain, which is a very serious problem in Europe and North America, is not a serious threat in South Africa at this stage though the problem is being monitored on a continuing basis. One aspect being watched is enrichment of the soil with suiphates,

and their eventual breakthrough to water supplies. However deliberate enrichment from fertilisers is more serious at this stage.

Despite the endemic problem, the efforts of the Water Institute of Southern Africa, Department of Water Affairs, research organisations, Water Research Commission and private industry have developed methods for the optimal use of water for industry and mines in the country.

THE OTHER VIEW

While some experts claim the problem is beaten, others claim exactly the reverse - namely that the quality of drinking water is deteriorating to such an extent that pressure groups are urgently needed to spur government and big business into taking greater action. As long ago as 1986 a CSIR researcher warned that overseas experts were coming to South Africa to see Hartbeespoort Dam because it is the most polluted body of water of that size in the world. A year later he warned that the pumping of effluents and waste into the ocean not only endangers marine life but poses direct dangers for human health. Certainly it will eventually make many places unfit to swim in.

The effluents and solid wastes of South Africa's major process industries must remain a major problem, unlikely to go away as the emergent Third world element industrialises, but the problem should be better contained than it is. What is needed is a change of attitude by government, industry and the general public, who must be brought to the realisation that South Africa is no longer a frontier society with unlimited space and resources to degrade as they wish. (Fig 6.2 below)

Pollution has become the bogeyman of the age. Its effects are serious, and potentially devastating in South Africa, but easily overstated.

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If Britain had its present water regulations before the industrial revolution, that event would never have occurred. It is only because it occurred that Britain today can afford the luxury of cleaning up its environment.

South Africa today is going through its own industrial revolution. A degree of environmental pollution is an inevitable byproduct and a necessary sacrifice to the lifting of the majority of its people from Third World conditions.

Meanwhile the water problem, which is no longer critical with the ending of the drought of the early eighties is being tackled on a broad front, from the implementation of massive water schemes to the redesign and re-engineering of a broad range of water-handling products, and water-using processes, most of which were imported to South Africa in essentially unmodified form from countries where water was not, traditionally, a major issue. Whether that will remain the case if the world's climate is changing radically is at present unclear. If water becomes a major issue in the developed economies of Europe, it seems possible that South Africa's long-standing water problem and sometimes unique ways of tackling it will benefit the First World.¹

QUALITY CONSIDERATION

With the limited water resources of southern Africa, water quality is a major consideration in the selection and planning of future schemes, and existing schemes. It played a decisive role in the selection of the Lesotho Highlands water scheme in preference to the Orange Vaal transfer scheme, which was rejected due to elevated salt concentrations caused by trapping of salts flushed from the PW area. The traditional considerations in water planning are volume, distance, elevation and time, but water quality is now becoming paramount. Relentless catchment development has caused heavily polluted

run-offs. Thus Hartileespoort Dam is noted for its eu' iic pollution catchment for - ,

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msol poqmuu

and the Fish-Sundays
its salinity problem. There is also
a relentless rise in total dissolved .
solids (TDS) in the Vaal barrage,
from which a third of the PHV region's
water demand is met. Increasingly
sophisticated computer models are
now available to simulate water systems
and so select the best available
solutions.

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The cluster of power stations in
the eastern Transvaal has resulted
in very sophisticated interlinking
of the river systems. such that it
is possible to move Tugela water
to the power stations in times of
drought. This has led to optimal
use of water for power stations,
where high quality water is necessary
for the boilers while lower quality
is adequate for cooling.

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While it is frequently stated that
South Africa is short of water that
is not, strictly speaking, quite
correct. Nhat South Africa is short
of is water in the places where it
is most needed, which can, very largely
be rectified by water engineering

schemes.

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Of these by far the largest, most spectacular and best publicised is the Lesotho Highlands water scheme - or project since it is nowhere near completion. Phase 1 is due to be finished in 1995 and the final Phase 3 between 2010 and 2020.

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Phase 1A is designed to yield 18.2 m³/second and the final Phase 4 a cumulative yield of 70 m³/sec, effectively doubling the flow of water into the Vaal basin. To achieve this, - six major dams will be built, 240 km of tunnels driven, a 276W hydro-electric power station will be constructed - mtg.

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ted and a major development programme implemented, beginning with the construction of good communications and roads in the landlocked mountain - kingdom of Lesotho where none existed -

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Fig: 6,3 u
HIGHLANDS WATER PROJECT
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Fig 6.5:
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Palmiet pumped
storage scheme profile.
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before. Direct expenditure on the
project will amount to some R4000
million at base date - about the
same amount as that spent on a standard
Eskom six-unit power station, compared
to which the Lesotho Highlands water
scheme is many times more important,
for South Africa, Lesotho and the
region as a whole. In fact it is,
in the opinion of the author, the
most important project under construc-
tion in southern Africa today.
Before it can happen, good communica-
tions have to be established, with
the upgrading of 263 km of existing
dirt road and the construction of
288 km of new tarred road. which
began in 1977. Prior to that, there
were only 177 km of tarred road in
the country, linking the capital,
Maseru, with the lowlands, and 2092
km of gravelled or earth roads and
tracks providing a thin communication
web in the Lesotho highlands.
The initial phase of the water scheme
itself involves two sub-phases, the
first centering on construction of
a 155 metre high rockfill, or arch
dill with a yield of 19.9 m3:- of water
per second at Katse on the Malibamatso
river'by 1995. From Katse a 48 km
machine-bored transfer tunnel will
drive under the Maluti mountains
to the headpond of the hydro-electric
station at Sentelina on the Noquoe
river, a tributary of the Caledon.
After passing through a 110MH power
station (financed, designed, built
and commissioned by the EEC) the
water will discharge into the Tlhaka
tailpond on the Hololo river (also
a Caledon tributary). The head and
tailponds will be major dans in their
own right, with wall heights between
62 and 70 metres. From the tailpond
a 34 km tunnel will be driven under
the Caledon, the Little Caledon and
the Rooiberg range of hills to the
Ash River outlet. Riverbed improvements
will be carried out on the route

from Ash. River to Liebenbergsvlei and the Hilge river into the Vaal Dam -- the principal source of water for the Witwatersrand, which is itself being increased in capacity by raising of the wall.

The second part of the first phase comprises a 153 metre high dam on the Senqunyane river at Mohale and a 32 km connecting tunnel with the Katse dam. This phase will add a further 1.01 m³/sec to the delivery capacity of the scheme.

The second phase will harness the waters of the lower Malibamatso (or Semena) river and will include construction of a 181 metre high dam at Mashai. From thence the water will be delivered via a low-level tunnel to Tlhaka or pumped into Katse - in which case the capacity of the 48 km tunnel from Katse to Sentelina will be doubled. Either option is considered viable. and there is no immediate pressure for a decision on work not scheduled to commence before 1995. When the water from this phase comes on stream in 2007 it will increase the supply capacity of the project by 28 m³/s which according to projections will be sufficient to meet water demand in the PHV area until 2017.

The third phase will involve construction of a 155 metre high dam at Tsoelike with a pumping station to send water up to Mashai where it will be fed into the established system, adding a further 8.6 m³/s to capacity, raising it to 63.6 m³/sec. According to the planners the full capacity of 70 m³/sec can or will be achieved by adding dams downstream of the collection and storage points developed in the three phases, and providing facilities for pumping water back into the system.

The project has been discussed in such detail because it is easily the largest and most important in the region. The Republic of South Africa will be the primary beneficiary, but the project will enormously benefit Lesotho. both financially from the sale of bulk water supplies to the Republic, and directly from the provision in Lesotho of roads. electric power and other infrastructure which was previously non-existent.

The scheme was first mooted more than 30 years ago, but no progress

was made at that time. at least partly owing to the anti-South African policies of Chief Jonathan, the former Lesotho premier. The present Lesotho administration is, if not friendlier, then more realistic in its dealings with the Republic, which totally surrounds the mountain kingdom (Fig 6.3).

The Lesotho Highlands water scheme is the most notable result of this greater realism, which should be of material benefit to both countries. Interestingly, Lesotho has raised the money internationally, from sources which were not then available to the Republic, all countries involved knowing that the Republic will be a major beneficiary.

The basic contractual agreement between Lesotho and the Republic of South Africa governing the implementation and operation of the project and the export of water to South Africa is embodied in a treaty signed in October 1985. It covers the rights and obligations of the parties and lays down the quantities of water to be delivered. In terms of the treaty the Lesotho Highlands Development Authority (LHDA) has the obligation to raise the finances for that part of the project within Lesotho. It is presently planned to raise a substantial portion of the total finance from international sources, which is taking time. To ensure that the timetable agreed to by the treaty is adhered to, LHDA approached the Development Bank of Southern Africa (DBSA), which is funding certain advance infrastructural elements. The latest cost estimate for Phase 1A of the project is R3.3 billion (August 1988 values).

whether the bulk of the money will be raised internationally is unclear at this stage. If not it will be forthcoming, in one way or another from South Africa, for which there is no more important project in the region.

South African engineering contractors are expected to play a major role.

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The Republic of course is the economic superpower of the region while Lesotho is one of the poorest countries though this seems likely to change. It has been agreed that the direct financial benefits of the scheme will be divided 56:44 in Lesotho's favour, which means that at 1985 prices Lesotho will receive an estimated total of R1.3 billion, made up of a capital-related royalty of which R378.6 million will be paid to Lesotho indirectly through the South African Customs Union agreement even before any water is supplied. The remainder will be made up of a monthly payment

of a capital-related royalty based on the difference between the estimated capital cash flows from the Orange Vaal transfer scheme (which was accepted as RSA's best alternative to the .Lesotho Highlands water scheme) and a running cost-related sum based on the amount of water actually delivered to RSA. An indexing system has been agreed to avoid any devaluation of the payments as a result of devaluation of the currency or fluctuation of the exchange rates.

The last two royalty payments add an estimated R124 million (1985 prices) to Lesotho's exchequer in 1995 when the first water from the project is channeled to RSA. Added to this, special provision has been made for charging RSA half the running will

cost-related royalty rate for any additional water that may emanate from the schane.

To put these figures in perspective, Lesotho's revenue was M127 million and its expenditure M107.9 million in 1982, when capital revenue was M77 million and expenditure M104 million. Lesotho's currency, the Moloti (M) enjoys parity with the South African Rand.

Quite apart from the fact that the water project will generate employment and money for Lesotho workers during the construction phases, the country will obtain sufficient revenue to transform its economy and educational system, build further infrastructure and, very possible, transform itself

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as it is already in the geographic sense. How far it succeeds in doing so will to some extent be indicative of the potential for achieving First World status of southern Africa as a whole.

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OTHER SCHEMES

While the Lesotho Highlands water scheme is easily the largest and most important in the region, it is only one of a number of water schemes under construction or recently completed. I mention the Drakensberg scheme completed in 1982, and the Palmiet scheme (1988). Both are joint schemes of the Department of Water Affairs and Eskom, referred to in their electrical contexts in Chapter 4. They are both pumped storage schemes comprising an upper and a lower reservoir, of 1000MN and 400MH respectively. The Drakensberg scheme pumps water from the Tugela river to the Vaal basin via the Hildegarde river, without which water restrictions in the PHV area would have been far more stringent during the recent drought.

Palmiet supplements water supplies to the greater Cape Town area, which is an entirely different region, hydrologically, from the highveld plateau, and never suffered the recent drought experience. Despite that the western Cape has been slowly running short of developed water resources, which consist, for the most part, of reservoirs sited to catch the rainfall on Table Mountain, and other relatively small-scale schemes such as Steenbras and Riviersonderend.

Details of the individual schemes don't matter, provided it is realised that they comprise not just reservoirs but full-scale water treatment works as necessary, of which the Blackheath water treatment works (part of the Riviersonderend scheme) is mentioned as typical. It is designed to treat 360 Megalitres per day - more than 50% of the water consumption of Cape Town at the time of its completion in the early eighties.

In most of these cases the Department of Water Affairs built the dams, in conjunction with Eskom or the local authority intended to benefit. The co-operation between the country's electricity and water authorities is claimed to be unique, though differently structured joint schemes exist in Spain and Australia.

With all such schemes, the capital cost is high, owing to the extent of civil engineering work required to convert a generally remote natural site into the dam (or two dams in the case of pumped storage) as well as to provide piping, treatment plant etc, and largely underground electro-mechanical works when hydro-electric power is provided.

No site is ideal, and every site is in some way unique, requiring individual treatment and care on the part of the contractors. Palmiet, for example, is situated in an ecologically sensitive area of the Cape,

within the Kogelberg nature reserve, established as a conservation area for mountain and riverine fynbos. Propagation of certain fynbos species depends on the eating habits of the indigenous porter ants which take the seed underground, eat the gland but leave the kernel, thus allowing the seed to germinate.

Elaborate measures were adopted to prevent the introduction of the exotic Argentinian ant, which tends to exterminate the local ant, contributing to the destruction of the fynbos by leaving the seeds exposed.

In the construction of the scheme, specific eating sites were delineated, all rubbish and waste was strictly controlled, and construction materials carefully inspected to avoid the introduction of non-indigenous plants and insects. Topsoil, which generally contains the fynbos seed, was removed and conserved, then replaced in specific areas when construction was completed. Temporary fences and markers separated construction areas, and access to sensitive sites was strictly controlled. Hunting of fauna and picking of flora were prohibited.

These environmental aspects of the project were unique, as they always are for large civil engineering works. In this case the upper (Rock-view) dam required particularly extensive working as there was no natural containment. and design aimed to minimise the obtrusiveness of non-natural features. The surge tank, in consequence, is situated away from the ridge of the escarpment. and the busbars of the adjoining substation are of unusual Tower-profile type. A considerable engineering challenge was met in defining the waterways, which are largely constructed by cut-and-cover methods. Owing to the broken nature of the terrain and the high acidity of the water, the whole 2.25 km length of the waterways between the upper and lower dams had to be steel-lined, compared to only the last 500 metres at Drakensberg. Medium-strength steel was used in the tunnels and high-tensile steel with a yield strength of 690 MPa was used in the open trench section, all steel being produced by Iscor (Chapter 8).

precautions were

A unique feature of the design is the situation of the spillway on top of the intake tower. allowing the dropping of the emergency gate under any conditions. in the First World generally, such conditions are strictly controlled to the dropping of the emergency gate at the same time as the penstock valve, which causes massive oscillation, surging and water hammer. As a result of experience at Drakensberg it was felt desirable to cater specifically for this possibility at Paimiet. The scheme is, in fact, one of the most advanced of its type in the world, discussed here in detail because it is the latest large scheme to be completed, and because it combines. in a basically South African-designed scheme, several unique features which may be adopted elsewhere in the world. All such schemes must be supported by the geography and rock mechanics of the area, in assessing which South Africa's water engineers are entirely

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avoids

competent. Outside technical consultants are sometimes called in to lend their authority, engineering effort or specific expertise, but South Africa is fully capable of going it alone in the water engineering field at this time, and contributing significantly to major water projects in the region, within the Republic or beyond the country's borders.

DRY COOLING

Supporting the major water projects are a broad range of water engineering skills, and some unique practices which are in many cases more suitable for Third World countries with endemic water shortage than the practices of Europe.

The most spectacular is dry cooling of coal-fired thermal power stations, in context in Chapter 4.

At 6 X 665W and 6 x 675MW Matimba and Kendal are of an order larger than the next largest dry-cooled station (Hydrex, USA, comprising a single unit of 365W). Each unit of Matimba saves an estimated 7 million tons of evaporation losses per year, plus 15-20% drainage losses for the dry Eilish area. The total water saving compared to a modern wet-cooled station such as Tutuka is 42 million tons per year.

Practically it should be noted that there is very little water in the Eilish area, and if Eskom is to use the cheap discard coal from the adjacent Grootegeluk colliery of Iscor, then dry cooling is the only practical solution. It is significantly cheaper than transporting the coal to an area of abundant water, of which there is really none to spare in the interior. For this reason the Department of Water Affairs is pushing Eskom strongly in the direction of dry cooling for all future inland. Even on the Vaal river, where Tutuka and Lethabo are wet-cooled, effort has been made to reduce the water consumption of their cooling systems, which has been brought down to about 2.25 litres/th from a previous norm of 4 litres/kWh.

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stations are

Technically both 'zero

effluent plants' which is a misnomer since some effluent is of course produced, and used e.g. to cake the ash. This effluent flows back into the reclaimed workings and some of it must, eventually, filter back into the river, though there is no direct discharge. Isolation from the river is now insisted on by DNA, which is as much concerned with maintaining the quality of water as with preventing unnecessary use.

The great majority of the water treatment plant at Lethabo is provided by Foster Wheeler, now independent of the overseas concern of the same name, to which it was affiliated when the plant (Fig 6.6) was designed. It uses the latest FV technology, but is essentially conventional except for a tubular reverse osmosis (TRO) section of 375 m per hour, believed to be the largest of its type in the world. It is designed to concen-

trate what would otherwise be the
biow-down from the cooling towers
for quenching the ash. The TRO plant
was Tocaiiy designed and deveioped
by Bakke Industries (Bintech). Fig 6.7.
Containerised water treatment plants
have been introduced for remote areas,
but they are essentiaily overseas
designs marketed by such international
names as Krupp. Aiso developed overseas
but extensively manufacturedi in South
Africa are pumps, up to and including
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main boiler feedwater pumps (Suizer),
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HYDRO POWER

A more spectacular, and specifically South African development is the use of hydro power in mining - the concept of using high-pressure water for a dual purpose in deep-level mining, namely for cooling the workings and powering machinery in the stopes. The existing large quantities of chilled water used for cooling the deep level gold mines are delivered at high pressure. This pressure can, at the same time, be used as a source of energy to drive water-powered hydraulic machinery. A pilot scheme at Kloof gold mine has demonstrated the feasibility of the concept. whose basic simplicity makes it attractive. Water hydraulic props and stope cleaning equipment are used routinely at Kloof, where hydraulic rockdrills, operating on oil-water emulsion, are being incorporated into the system using specially-designed hydraulic transformers.

Large-scale adoption of the system probably depends on the successful development of a water-powered drill to replace the present emulsion types, which are more efficient. and in several respects more satisfactory than the widely used pneumatic drills, but present considerable problems of operator discipline. In particular the operator may not stop drilling for a leak (even when he sees it) and he may top the system up with water, omitting the additive. A simple water-powered rockdrill is therefore under investigation by the Chamber of Mines Research Organisation, for use at depths below 1500 metres when surplus hydro power becomes available.

EQUIPMENT

As regards conventional water distribution equipment (pipes, meters, taps and ancillaries) and the whole range of water-using equipment and processes. much if not most is already made in South Africa, traditionally to First World designs. Many if not most categories are being carefully studied, and where the scope exists redesigned for South African conditions.

South Afr designed water meters are being introduced, with a view to measuring lower flow rates than are normally registered in Europe. How successful they will prove is difficult to predict, bearing in mind that there is NO universally satisfactory flowmeter type. The best that a South African-designed meter can probably hope to achieve is greater suitability for local conditions.

In more affluent circles, the large number of swimming pools has given rise to special pumps and motors, as well as to water-powered automatic

cleaning equipment of which the South African-designed Kreepy Krauly has been successful worldwide. It now has a number of rivals operating on slightly different principles, many of which have been exported.

FLOODS

While South Africa, generally speaking, is a country of low rainfall, when it does rain the skies may open to a degree rarely seen in Europe. Storm-water drainage systems are therefore designed to cope not just with rainfall but with sometimes severe flooding.

Flash floods are generally local and unpredictable. The provision made is therefore limited, but the flooding can be widespread and severe, resulting in loss of life, economic disruption and extensive damage.

The declaration of the affected area as a disaster area is a distressingly frequent occurrence, which no emergency service would be adequate to cope with. What assistance is available is readily given by all race groups, on which occasions a common humanity can be perceived.ⁱ

ⁱ The author's wife was killed in Johannesburg. in a car crash caused by a flash flood in January 1988.

CHAP. 7:

"DIAMONDS",V then "GOLD" were the first South African news stories to really catch the world's headlines. More than a century later the country is still the world's largest producer of both. It is also a treasure house of other minerals, with near monopoly positions in several, and a major producer of coal, which is second only to gold as an earner of export revenue, and the country's major energy resource as discussed in Chapter 3. Because of their importance to the country, South Africa's mining and minerals deserve separate, full-scale treatment. Here we merely summarise the position to put the country's industry in perspective.

CEPI

In Rand terms the minerals industry is doing extremely well, with exports of many products at record levels. However a study of export prices by the Minerals Bureau of the Department of Mineral and Energy Affairs shows that this is largely illusory. The bureau's recently devised commodity export price index (CEPI) shows prices for exports have risen 120% in Rand terms since 1983. This should be good news for the economy since mineral and processed mineral commodities account for two-thirds of SA's annual foreign earnings. These are quoted in dollars, is measured (Fig. 7.1).

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against which the Rand-

Nhen the figures are converted to

'real' Rands adjusted for inflation

the were no hi her at the end of

I?E% than at the start of 1983.

The two key

viablility of

issues affecting the

mineral exports are

the Rand/dollar exchange rate and

the inflation rate. In fact South

Africa needs a steady exchange rate

and no more inflation if mineral

exports are not to stagnate, though

they will remain the key factor in

South Africa's economic performance

for perhaps many years to come.

Cunnodities included in CEPI are

anthracite, asbestos, coal, chrome

ore, chromium alloys, copper, diamonds,

gold, iron ore, manganese ore, mangan-

ese alloys, nickel, platinum group

metals. silver and uranium, weighted

on the value of export sales of each.

The weights will be adjusted annually,

using a 5-year moving average, and

the CEPI should become a most useful

tool for overall assessment of South

Africa's mining and mineral industryis

performance (Fig 7.2).

SOLD

AS economists have long pointed out,

South Africa should try to lessen

its dependence on the yellow metal

by more diverse industrial development.

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The reality is that the country has become more dependent on its gold mines' since the fixed gold price was abandoned in 1971. From 1970 to 1987 South Africa's output declined from 1002 tons to 605 tons, despite which its percentage of gross domestic product rose from 5.5 to 9.1%. Gold exports as a percentage of total exports increased from 30 to 37%, while the value of gold output as a percentage of total mining production increased from 55 to 65%.

The gold mining industry employs 480 000 people and accounts for approximately 50% of the non-Communist world's production, despite significantly increased output by other countries. The percentage is down from nearly 60% in 1984 when South Africa's output was 683 tons, but the industry is probably poised for a third great wave of expansion.

THIRD HAVE?

That, at least, is the opinion of Mike Brown, formerly chief economist of the South African Chamber of Mines, who qualified his view by saying that major expansion plans could be hampered by a poor gold price, labour relations problems, delays in development of mining technology and, particularly, an adverse taxation system imposed on the mines. In his view it is imperative that tax treatment of capital expenditure by gold mines remains supportive of new ventures, with which the South African government seems likely to concur in practice.

AS regards the present situation, South Africa's declining gold output is the result of the inevitable diminution of the country's known economic gold reserves after more than a century of mining. Between 1984 and 1987 the average grade of ore mined in the country fell from 6.44 grams per ton milled to 5.28 grams per ton. Many of the existing mines are beyond middle age and known reserves of high grade ore are largely depleted, owing mostly to the Bretton Woods monetary system prevailing after

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World War II. This fixed the official price of gold at \$35 per ounce until 1971. In practice this obliged the mines to concentrate on high-grade ore extraction, and entrenched the South African gold-mining industry as a low-skill, low-wage labour-intensive employer.

With the abandonment of the fixed gold price the economics of mining changed. The challenge was how to operate profitably with a fluctuating gold price and depleted reserves, mostly lying at great depth. The

general approach was higher ore production and milling, but the mines found they had to synchronise as closely as possible the grade of ore produced and milled with the gold price prevailing at the time. '

Mining at greater depth -1 down to 4000 metres - required new technology, much of which had to be developed owing to South Africa's unique deep level, hard-rock mining conditions. The country became a world leader in mining technology, requiring higher skills and training. Skilled workers command higher pay, but the pressure to raise minimum wages, fuelled by the growth of Black trade unionism, had to be accepted.

Two factors prevent the industry becoming substantially less labour-intensive: the limitations of mechanisation in terms of technology, cost and application, and the industry's social responsibility as South Africa's largest employer - which should be taken with a large pinch of salt. Certainly every effort is made to keep marginal mines such as ERPM and Durban Deep open when they are situated in electorally sensitive areas such as Boksburg and Roodepoort. but financial support is provided by the government in the case of ERPM, and no decision had been taken on the financially suspended Durban Deep at the time of going to press. Financially the parent Rand Mines would probably do better to close both ventures, while major new investment is likely to be in trackless mining, which employs significantly less people.

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Technological and have brought about massive increases in the gold mines' compounded by the rise in price of other essentials such as power and water.

working cost per produced rose from R8861 to R17 294, manpower changes

working costs,

Between 1984 and 1987 the kilogran of gold

Until 1987 the effect of these rocketing costs was

Rand receipts, but
gold price
the Rand hardened against the dollar.
The mines received on
81 more Rands for their gold, while
costs per kg rose 25%. Total profits
declined
be retained to keep existing mines
in operation and profits were trimmed
9.4%, tending to shake investor confi-
dence at a time when new investment
is essential.
ameliorated by high
that year the
failed to rise, while
average only
could
14.6%. Less profits

MIND SET

Historically, it should be noted
that the South African financial
community had very much of a mining
camp mentality, expecting economic
windfalls to result from random rises
in the gold price - which in the
last year has not happened. Rather
the price of the metal seems to be
stuck around \$360 per ounce - if
it does not fall further - which
is the worst economic news for South
Africa since the debt standstill.
For the world at large, gold has
lost much of its traditional hedge
attraction since the Opec oil crisis
of the mid seventies. Even at its
present level, it is still ten times
the price at which it was pegged
for 30 years. Much of the subsequent
movement simply represents delayed
adjustment to changes in relative
prices. According to Financial Mail,
there is no reason to believe the
price of gold will rise significant-
ly in real terms, though like any
commodity it will fluctuate upwards
and downwards in response to market
demand. The South African gold mining
industry still has a much longer
life expectancy than anybody predicted
20 years ago, but its life is neverthe-
less that Britain has done as little to
prepare
oil as South Africa has done to prepare
for life after gold.
Africa has .'
more. spending large sums on subsidis-
ing infant industries. which perhaps
will never grow up. Less defensible.
it has indulged in highly inflationary
monetary and ' . .
spent even larger sums on subsidising
the apartheid dream.
A stable
not really change the country's priori-
ties for life after North Sea
In fact South
to do rather
attempted
policies, and
economic gold price does
ties, which SHOULD be to encourage

SOUND economic growth, and to contain inflation. Clearly the country will no longer be able, as it has done for the past 15 years or more, to rely on a golden windfall to bail the economy out.

Economic prescriptions for the short term have to balance long-term requirements with the need to avoid plunging the economy into recession. Prospective continuation of a \$360 gold price reduces the scope for 'soft landing' which the economists are hoping for at best. At worst, it jeopardises up to 300 000 jobs, with social and economic consequences which are incalculable, as well as the balance of payments and the ability to meet foreign debt repayments.

The only way to keep the gold mines profitable is to sustain the gold price in Rand terms: letting the local currency fall in value as far as necessary, while accepting the consequent impact on inflation. To minimise this, monetary policy must be tightened and interest rates allowed to rise. That will result in business failures and perhaps a loss of business confidence, which financially is regarded as the lesser evil.

Short-term the country has little option but to preserve export earnings and safeguard the jobs on the gold mines, as it did throughout the recent election campaign. Longer term a more important requirement is a basic change of mind-set. The country needs

to shed the comfortable, lazy idea that a high gold price is good, a low gold price bad, and get on with working its way out of self-imposed financial difficulties. It may not be just coincidence that economic performance was far better when the gold price was fixed than it has been since deregulation.

CAPITAL NEEDS

Fifteen major gold projects - either new mines or new mine lease areas - could be developed between now and the end of the century, at a cost of R64 billion, allowing for 13.5% inflation. R30 billion of mining capital expenditure is required, mostly for gold mining, followed by platinum (discussed below). Detailed figures provided by Mike Brown and Pat Geoghegan of consultants Davis Borkum Hare are shown in Table 7.1. This is a lot of money, bearing in mind that South Africa has ceased to be a cheap place to mine gold, and little of the funds may be forthcoming from overseas investors. South African investors are, of course, to some extent fixated on their gold shares, which have led at least two of the major waves of prosperity of the last century - that following the original discovery of gold on the Witwatersrand in the 1880s, and the boom of the 1950s and 1960s following the opening up of the Orange Free State gold fields. 50 is the industry really poised for more massive expansion?

The probability is yes, owing to the mind set of the government and JSE investors, who seem likely to agree with Mike Brown that "The expansion of mining operations could play a major role in breaking the current logjam in the South African economy..."

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Professor Danie Kr' head of mineral economics at Witwatersrand University, says the areas presently being explored for new gold mines amount to more than 25 large mining leases, covering the equivalent of the OFS, Klerksdorp and Nest Hits fields combined. Unfortunately much of the ground is deep - below 4000 metres - which means high underground working temperatures, so the effective potential is about 15 new mines each milling 3 million tons of ore annually over an effective 30 year life. Owing to the depth, the mines will be extremely costly to develop, and new or modified technology will be needed.

TECHNOLOGY GAP

There is something of a technology gap, which may take some years to bridge, but the trackless mining methods being tried out at Western Deep Levels and Randfontein are broadly

applicable, as is the use of ice for cooling, hydro in preference to pneumatic power for stope cleaning, rock drilling etc (Chapter 6).

From a technical point of view, one of the major limitations on deep-level mining is the depth to which a single shaft can be sunk. USING existing technology, this is about 2300 metres before the weight of the cable supporting the cage or skip breaches established safety regulations - which permit cable tensions to reach a maximum of one fifteenth of the cable's stated breaking strain. To mine below this depth a second 'sub-vertical' shaft is established with its head near the bottom of the first shaft. Such arrangements are common in SA's deeper gold mines which reach record depths of 4000 metres.

Unlike existing mines, whose reefs have generally outcropped at or near the surface, deposits in some of

Table 7.1:
Protected capital expenditure -
gold, platinum and other mines
1989 - 1993

(Constant 1980/59 terms)

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such as the Potchefstroom (near Potchefstroom) only begin about 3800 metres prospective mining areas underground, below which there is a large high-grade ore body extending down to about 6000 metres. To reach it by sub-vertical shaft would not only increase the cost of development, but delay start of ore mining by 18-24 months and reduce its profit potential.

For this Treason Anglo American has commissioned development of a cableless system which will not use cables or conventional headgear, but will be capable of hoisting loads up a single shaft from the deepest levels, without the traditional rope and pulley method - still employed throughout the world. A spokesman declined to give details, since the project is still in the conceptual design stage, but engineers can envisage several systems which might be effective, based for example on the rack-and-pinion principle. Power can easily be provided, for example by an electric rail. The biggest problem is probably to ensure that the system fails safely under any conceivable operating conditions.

Finding the finance may be a problem because of SA's political/financial situation, including the debt standstill which has largely cut the country off from overseas sources of finance which, traditionally, were available for new mines. The gold mines of

the next generation mayI therefore, have to be financed mainly from domestic capital sources. with probably limited participation by foreign investors.

The money should come frun the major mining finance houses, JSE investors, cash-rich financial institutions who have over-invested in property for the present, gold-linked bonds and, perhaps, reluctant overseas holders of South African Rands effectively trapped in the country by the financial rand mechanism. for whmn the rewards offered by gold mining should be especially attractive. Basic criteria, according td Brown and Georghegan are:

- t A real internal return of 7% p.a.
- t Full implementation of the; Marais' Connittee tax proposals for new gold mining projects, and
- t A gold price equivalent to at least R900 per ounce./

(For current gold price at the time of going to press see page 3.1

In practice the gold price has been depressed with no sign of a major rise despite stock market instability, but the bahaviour of the JSE gold share index shows that gold share investors are expecting the price to rise, or they are incapable of arithmetic, which seems unlikely. Whether existing arithmetic is valid in the case of new mines dependent on emergent technology is in any case questionable.

COAL

This was considered as an energy source, and specifically for electric power generation purposes in Chapters 3 and 4. Here we are specifically concerned with its mining. This is carried out by open-cast methods when the coal is at or near the surface or by underground mining when the coal deposit is at significant depth. Open-cast mining is carried out whenever it is practical, even when, as at New Vaal colliery which is tied to Lethabo power station, the best coal has been mined by underground methods before. New Vaal, when fully developed, will be the largest open-cast coal mine in the world, and the first in southern Africa to penetrate underground workings.

Open-cast coal mining has many advantages when it is practicable, not the least of which is the avoidance of the methane hazard which plagues underground coal mining - and even gold mining in such areas as the Orange Free State where the shaft must penetrate a coal seam. Because

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of this, the plentiful supplies of near-surface coal and the steady improvement of open-cast mining machinery, open cast mining of coal and other minerals is coming strongly to the fore.

The sequence at New Vaal colliery is removal of vegetation and topsoil. and replacing it on top of the overburden spoils; excavation of the soft overburden (sand) and conveying it around the open-cast mine to be placed on top of the hard overburden; mining of the hard overburden to expose the coal seams; mining of the coal seams and hauling the coal to the run-of-mine tip; and rehabilitation of the mined-out area.

Part of the rehabilitated land will be sold to Eskom for dumping ash from the power station. The ash dump will be and planted to grass.

Bucket-wheel excavators, walking draglines and mechanical shovels are used, together with massive dump trucks, conveyors, Spreaders and ancillary equipment.

When the coal deposit is at any depth it is necessary to dig for it, but the methods used in South Africa's underground coal mines today bear little relation to those of former days. The three main methods used now are:

tons/month

1 Bord and pillar, for 75-100 000

2 Pillar extraction, for 30 000

3 Longwall, for 150 000

Longwall is most expensive in capital cost but requires the least maintenance. Where it is applicable, e.g. at New Denmark colliery, it is claimed by the principal equipment vendor (Dowty) to be the most cost-effective method, but other vendors doubtless have other views.

In practice, choice of mining method depends on specific site conditions as well as the age of the pit, since it is neither economical nor practical to convert a working pit from one method to another.

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covered in sand and soil

Bord and pillar is probably still the most popular method, Tending itself to a great deal of mechanisation using continuous miners and shuttle cars (both supplied primarily by Joy Manufacturing) . The disadvantage is the amount of coal left behind in the pit owing to the need for roof support.

Pillar extraction is the next logical step. the roof being supported temporarily while the remaining coal is mined out, before being allowed to

collapse into the mined-out workings. Longwall is the most sophisticated method. A standard 200 metre Tongwail is continuously cut out of the coal face in an area supported by hydraulic props. The props walk forward as the face advances, the roof being attached to collapse behind.

Although coal mining is the country's second largest mining activity, it is an area where South African practice is essentially derivative. Most of the techniques and much of the equipment come from established First World mining countries, especially the USA, UK and Europe. Because of the size of the South African market, however, an increasing proportion of coal mining equipment is made locally.

DIAMONDS, PLATINUM, URANIUM

Diamonds were the first major mineral find of the region, in 1870 near Kimberley. The 'Big Hole' of Kimberley (which was originally a mine) ceased production in 1920, but it was money made on the diamond fields which financed the development of the gold fields of the Witwatersrand.

South Africa is still a major diamond producer, and the South African company De Beers (now an affiliate of Anglo American) has a near monopoly of the world market, controlling mines in South Africa, the neighbouring states of Botswana and Namibia, and other countries worldwide. In southern Africa, most of the diamond mines are open cast, situated downstream of the Kimberley workings near the

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north west Cape and mouth of the river in the neighbouring

states. Diamonds are also mined in the region by dredging offshore along the South African and Namibian coasts.

South Africa has a near monopoly of the world's platinum, which is mined mainly in the Rustenburg area, in the Republic and part of the client state of Botswana. The major producers are Rustenburg Platinum and Impala Platinum, but several additional ventures are to come.

As shown in Table 7.1, the South African platinum industry is expected to invest nearly R5 billion in new mines and other capital expenditure over the next five years, partly due to the fact that the metal is more valuable than gold, and partly to overseas legislation requiring the fitting of platinum-based catalytic converters to automobile exhaust systems, which must cause demand for the metal to increase massively. Open-cast mining methods are generally avoided.

Uranium is mined directly at Rossing, and is found widely in association with gold, allowing it to be extracted as a byproduct of gold refining. This includes the reprocessing of old mine dumps by East Rand Gold and Uranium Corporation (ERGO) which is owned by the Anglo American group. All known production of uranium is exported, since South Africa has no enrichment facility. Intermittent speculation as to whether South Africa possesses nuclear weapons is regarded as speculation only.

BASE METALS

After some years of depressed prices, base metal sales are relatively buoyant to the benefit of numerous SA mines. Iscor (iron ore, and metallurgical-coal from several mines), Palabora (copper, which is also mined at Messina and O'Kiep) and Black Mountain (zinc, lead, copper and silver) are singled out, but the country is a significant producer of nickel, chrome, manganese, vanadium, tin, lead, asbestos and other metals and minerals, mined by open-cast or underground methods. Of the major strategic minerals only bauxite (aluminium ore) is not mined commercially, and even in that case South Africa has strategic reserves which are, perhaps, to be mined soon (a licence to do so has been applied for). Nickel is not mined directly but as a byproduct of platinum mining - in sufficient quantity to support South Africa's stainless steel production and another near monopoly. Individually, in financial terms, South Africa's mining activities in base metals are overshadowed by gold, but the extent of such activity is substantial - quite sufficient to make the country independent of oil but a very few strategic minerals, and to give it strong international leverage in several.

THE MINING INDUSTRY

South African mining today is big business, way beyond the resources of most private investors, as a result of which it is dominated by five massive mining finance corporations which provide finance for individual mines. The five are Anglo American Corporation (Anglo), General Mining Union Corporation (Gencor), Gold Fields of South Africa (GFSa), Johannesburg Consolidated Investments (JCT) and Barlow Rand. Anglo is easily bigger than the other four together, but all five have a broadening spread of interests, making them more in the nature of industrial conglomerates than mining finance houses today. As a result most of them have 'pure' mining financial subsidiaries such as General Mining (Genmin) and Rand Mines. All the major mines, additionally, are public companies in their

own right, allowing investors on the Johannesburg Stock Exchange (JSE) to invest in the particular mine of their choice, whose individual performances vary widely, from really high fliers such as Vaai Reefs to lead balloons.

De Beers has its own diamond research facility, but most research for the (gold) mining industry is pooled

in the Chamber of Mines Research EQUIPMENT .
 Or anisation, which developed the . . .
 technology for deep-level mining Servmg .the industry _ls a broad spread
 (down to 4000 metres already). The ofh bequiment sutpplieters fwho mostly
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 work mdUdeS ventilation, cooling at the bi-annual Electra Mining Exhibi-
 (down to a reject air temperature . .
 o -. tion in Johannesburg, one of the
 Of 27 C wet bulb). trackless mining, three largest mining exhibitions
 h dro ower, continuous scraper winches . .
 ejtlc.pPrivate industry, most notably m the world ("lth L55 Vegas and
 Anglo and Intergraph/Intertech. have Dusseldorf).
 been responsible for the development . .
 Of computer-aided design (CAD) for Owing to the pronunence Of mining,
 mine layout in order to optimise and _the great depth of many mines,
 ore body extraction, as well as for "599"! Rand IS 006 Of the world's
 specification of trackless mining largest wire rope manufacturers. Its
 vehicles and other pioneering equipment JUPlter .plant 15 rfeputed to be the
 for the mines' requirements. SA 1-5 largest integrated wire and rope-making
 the largest market for hard-rock facillity ln the world, while the primary
 trackless mining vehicles in the PTodUCTs Of .the Germston plaht .are
 world. high-carbon ere and strand. Specialised
 equipment, e.g. for longwall coal
 mining, already has more than 50% local
 SAFETY content, and the sole vendor (Dowty)
 The Government Mining Inspector has IS investigating the practicability
 overriding authority in matters of Of full local PmdUCthh-
 safety, being responsible most recently
 for the specification of underground Hhen one looks at mining equipment
 self-rescuers. These have become in general, the impression is of
 mandatory since the underground fire extreme ruggedness, and extensive
 at Kinross mine (1986) in which many use of hydraulics to provide the
 workers lost their lives due to fume muscle. In the trackless mining equip-
 inhalation. ment now being specified by South
 Africa for use in the country's latest
 Polurethane foam, fumes from the hard rock deep level gold mines the
 burning of which caused the fatalities, hydraulics are particularly simple
 has not been banned from underground and rugged.
 use to date. It is still used, as
 are oil-filled transformers and other Imported equipment is often more
 flammable materials, though more sophisticated, frequently making
 expensive alternatives are available. use of servo valves and electro-hydrau-
 lic controllers. It is no accident
 In the case of polyurethane, whether that Joy Manufacturing has recently
 foam or solid material, public senti- moved into electronics in South Africa,
 ment is so strongly against its contin- or that such companies as Boart
 ued use that it seems likely to be are introducing hydraulic rockdrills,
 phased out in practice. Other fire which are more efficient and quieter
 risk practises seem likely to continue than the pneumatic rockdrills which
 on grounds of cost. dominate today.
 the Chamber of Mine?search Organisa- materials handling systems, 'compact
 tion is working the design of milling plant, low maintenance hydraulic'
 a totally water-powered rockdrill, systems, effective rock drilling and
 as well as adapting the emulsion- processing and lower noise level equip-
 powered rockdrills to operate on ment. . ' t
 :aterspezgl'gr ??Liauhliizh ttainsgiigmegf Much equipment is made locally. So
 - are many consumables, for example
 Ei -
 lther approach may prove "able dynamite, which has been made locally
 in new mines where operators can . .
 be trained tin the correct procedures by AEC! .smce the earliest days Of
 gold mining. A great deal more is
 from the outset, prpvided it is apprec' im ort d th '
 iated both by mine management and p e an should be today. This
 equipment manufacturers that miners has occurred for historical reasons,
 prepared to work in the conditions and will to a high degree be rectified
 prevailing 4000 metres underground in future. as the South African mining
 are rough, tough, and treat their industry moves to safeguard its equip-
 equipment accordingly. Even the most ment supplies. For any newcomer looking
 standard mechanical, electrical and to invest I" SOUTH African lndUSTfY.
 other equipment is abused by the local manufacture of mining equipment

mining fraternity to a degree that is an excellent bet.
makes the Kifactor insignificant.

As well as needing to safeguard their
supplies, South Africa's mines have

TOWARDS AUTONOMY another concern: steadily increasing
. . . _ world reluctance . i

With the Size of the SA mining market, serious this :5 tantra Bglgtgudgz
complete autonomy in local manufacture with -
. . an certainty . ln mo

would seem economically achievable, at this stage, it amounts to no more than
but not technically desirable as . ' ' '

. ' . than a bar aimn to l f

in the equipment mentioned 15 state- the price 90% of the product "323332129
off-the-art. In deep level gold mining but wh i

. y . are there are two equally priced

? :ush Afgica itself 15. _the .world sources, one of which is other than
er. h Ut "l C031 mlhlhg lt 15 South African, it seems in practice
"0 much ahead Of the pack, except that the other source is favoured.
in the abrasiveness of the (mostly
.- . Any embargo on key metals from South
poor quality) South African coal. Africa would cost the US around \$9.3
Most mines presently use hoppers to billion according to US Bureau of
convey material from the workplace Mines estimates reported in the
to the shaft or conveyor, but this South African press. Other sources
method is considered unproductive put the figure higher. The strategic
and costly due to the tracks that impact on the stainless steel industry
have to be laid, and maintenance of would be massive since there are
the tracks and hoppers . Trackless no realistic alternative sources
mining utilises load-haul-dumpers right now.
(LHDs) to 'load and haul the ore. Many
different models of LHD are assembled Rather than use this lever directly.
and manufactured locally, some 1500 South Africa's Department Of Mineral
LHDs being in use. The number is growing Affairs I5 recommending that the
by about 400 p.a. country do everything possible to
increase the degree of processing

At present milling operations are in South Africa itself. A major objec-
conducted above ground, but as the NVE Of the FHOHwlng chapter is
shafts sink deeper this is becoming to examine how much progress has
increasingly costly. Several mining been made to date.
houses predict that over the next
decade milling could be moved under- A5 regards American-designed mining
ground owing to the cost of hoisting equipment there has been no hurry
both ore and waste above ground. This tO disinvest, Which appears to have
will increase demand for underground happened only In a small way. Denver
The South African mining industry Most of the_ hydraulic rock drills
is easily the largest in the world are of the ml-water emulsion type,
as regards deep-level hard rock mining which require considerable operator
(for SOIdl- 1" that SPECIHC area discipline. In particular, operators
it leads the world technically. must be trained to stop drilling
when the equipment leaks (which many
South African practice 15 well UP don't, even when they see the leak),
to international norms in open-cast and they may top the system up with
mining, and underground mining. for water out of ignorance or laziness,
coal and a variety of minerals- omitting the additive. For this reason

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processing equipment and Orion slurry pumps, for example, have been sold off by Joy to South Africa's Unihold 'group'. Joy itself seems to be staying put, probably because the South African market is too important for Joy to be able to pull out without a major structural adjustment.

Other US-based vendors such as Harnischfeger seem to be staying too, and one suspects that ways will have to be found to coerce them if the US government really insists on breaking off trade links.

whether it will do so under George Bush, with a new man at the helm. in South Africa, is the big imponderable faced by the mining industry, and every SA industry and overseas suppliers today.

11218 7.2: Comparative gold mining production costs including capital expenditure of the leading producer)uncries (US dollars/ounce).

Fig 7. 3:

goldfield

Potchefstroom

exploration

drilling, December 1988 .

Table 7. 6:

African investors '

Table ..8: Destinations

of coal shipped 'from the

Richards Bay coal terminal.

Table 7. 4

GRANITE PROFITABILITY

Industry averages

Table 7,5

GRANITE PROFITABILITY

60th." : on F03 hula

Annual average metal prices on the world market, Included because of their influence on South thinking. Base metal prices have been buoyant recently, but the gold price depressed.

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CHAPTER 8:

SOUTH AFRICA, in general ;terms, is making too little use of its minerals, a high proportion of which are exported in unprocessed or semi-processed form. This is 'true of. the precious metals gold and platinum, uraniumL much of the coal and iron ore, and other minerals and metals dealt with in this chapter. Despite this there is sufficient processing, at least to a primary level, to provide a sound basis for massive future industrial development, which when it occurs will generally be aimed at increasing the degree of processing.

According to figures from Paul Hatty of Barlow Rand, the same ton of raw material currently exported at R178 can be transformed into goods worth R25 000. generating billions of Rands in forex and creating new jobs. The snag, of course, is that billions are required to process the materials

in the first place, but South Africa's low energy and labour costs, added to its mineral wealth, make it a sound place to undertake such processing. As a result, several major new process plants are in the offing.

This chapter is concerned with primary processing. It is considered for the major categories iron and steel, non-ferrous metals. other engineering materials, wood, pulp and paper, packaging, chemicals and carbon. In all there is significant local production, exports, and imports of other, mainly more specialised lines. Building materials are dealt with in Chapter 17.

IRON AND STEEL

This sector is dominated by Iscor, the South African Iron and Steel Corporation, and major private producers. South Africa is self-sufficient, at least as regards standard grades of steel, with a large surplus for export. Special steels are mainly imported, not because of South Africa's technical inability to produce them but; because they are required by the local market

ENGINEERING AND OTHER MATERIALS

in sub-economic quantities, and South Africa would find difficulty in exporting sufficient to justify local production. However, this traditional wisdom is changing.

Steelmaking is a well-understood process which will not be described except where South African practice differs from the norm. It should be noted, however, that it is extremely energy-intensive, so benefits greatly from the economies of scale. The three Iscor plants, and those of the other producers mentioned are massive, as they must be to compete successfully in world terms.

Iskor

The originally state-owned Iscor is due for privatisation about the time this report is published. At the time of writing it is unclear what proportion of the shares will be listed, or what the offer price will be. On the basis of its published results for the financial year to 30 June 1989 it is probable that the entire undertaking could be sold. It is reckoned to be worth R3-4 billion and its financial advisors have been chary of trying to raise this sum from the public in one go, probably needlessly in the light of its sparkling financial performance (see Appendix). Since the Iscor listing is the spearhead of the government's present privatisation policy, the success of the listing is considered important for the future sale of Eskom and other bodies.

Because of the imminent listing, the press has been prolific in its reporting but it is necessary to dig for nuggets of real information. The International Iron and Steel Institute ranks Iscor

as the 15th largest steel producer
in the free world, while its profitabil-
ity ranking is as high as sixth. but
this is very recent and, one suspects,
achieved primarily by ruthless pruning.
The far from sparkling 1987 performance
resulted in restriction of capital

expenditure and redundancies, about which lscor kept as quiet as possible. Significant capital expenditure occurred but was strictly limited to projects aimed at enhancing efficiency. The most notable major expenditure is on a world-first coal reduction (Corex) iron manufacturing plant at Pretoria, where lscor has its headquarters and largest plant.

Developed by Korf of who were installing it with Voest Alpine, is intended to Nest Germany in consortium the Corex plant replace traditional blast furnaces, allowing the use of local bituminous coal, instead of coking coal which is in short supply. There should also be less pollution. but there were serious technical teeth-ing troubles well into last year. That is. not unusual in the start-up of maJor plant, especially with a new process, but the problem was major. Has it been entirely sorted out yet? It is not even mentioned in the 1989 financial year-end statement, which merely makes the general statement that "lscor intends improving the efficiency of its mainstream business in the proddction of iron and steel through on-going investment, sustained at the level of the 1988/89 financial year. No major expansion of primary steel production capacity is envisaged for the next five years since lscor has sufficient installed production base to meet the projected needs of its South African customers "... for the next five years... The current financial year has started well... lscor's ability to maintain throughput by accepting a greater number of export orders at satisfactory profit margins has enabled the directors to confidently predict further real growth... "

Updated information on prospects was due to be given with the prospectus for public listing on 1st October 1989, but on its track record problem areas will be swept out of sight at a time when the steel industry is topping out.

lscor operates ten mines, four steel mills, employs 58 000 and produces about 7 million tons of steel per year. It supplies 70-75% of South

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African

drawn and forged st , and some products which are company

on primary production.

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requir ts for rolled, steel

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While it is the manufacture of steel products itself, it assists secondary producers adding value for export, to the tune of R77,1 million in 1988.

It is a major exporter of iron ore mined at Sishen, and transported to the coast by the purpose-built Sishen-Saldanha railway line, originally built and operated by Iscor but now transferred (rightly) to South African Transport Services (SATS). It operates the longest and heaviest trains in the world.

It is a major producer of coking coal, for example at Grootgeluk colliery, the discard from which is used by Matimba power station (Chapter 4).

A financially minor, far more specialised venture in which Iscor is involved as a partner with Dorbyl is a R120 million steel tube mill now being installed by Tubemakers of South Africa (TOSA), which replaces a previous World War II veteran.

Tosa to replace 850 million worth of imported seamless steel tubing per annum, more than doubling the present capacity of 22 000 tons of rather low grade tubing. The new mill will have initial capacity of 50 000 tons p.a. with provision for doubling. TOSA is a specialised case indicative of Iscor moves into smaller market sectors. Iscor itself satisfies South Africa's general steel needs and exports - at differential prices! Steel is sold more cheaply to overseas buyers than to South African customers, which generates adverse publicity for Iscor on a fairly regular basis. Exports recover fixed costs; and give a margin of profit sufficient only to keep the plant running while main profits are generated from the core home market, to the fury of local steel users.

One wonders how long Iscor will be able to trade in this fashion without falling foul of overseas countries' anti-dumping rules.

It will enable

Highveld

Smaller and somewhat more specialised is Highveld Steel and Vanadium, which offers rolled products, coil, strip, round bar, vanadium and ferro alloys. Highveld, whose main plant is at Nitbank is the largest privately-owned steel maker in Africa and the world's largest producer of vanadium. The company is majority-owned by Anglo American, which imposes its conservative accounting policies. No breakdown of turnover or profit contribution is given by type of activity, but the company is generally informative in a non-quantifiable way. It is also highly profitable in the first six months of 1989, recording earnings per share up 290% - more than the whole of 1988

which was itself described as an out-standing year.

After some years of boom and bust in steel and other commodity markets, the financial performance is probably a fluke and management is hedging its bets. Chairman Leslie Boyd is cautiously optimistic, but the interim dividend of 50 c comprises a normal dividend of 30 c and an extraordinary dividend of 20 c "arising from exceptional export prices" (so don't expect mesmeawm).

Demand for: all the group's products was firm throughout the year, so plants operated at capacity. South African consumption of steel levelled off, which was offset by growth in exports. The proportion of exports is not stated. Consumption of export products was expected to remain firm throughout the second half, though dollar prices for vanadium and ferrosilicon are weakening. Like other major exporters, Highveld suffers lower profitability when the 1 exchange rate improves, . interference with its export markets due to sanctions and periodic interruption of operations due to industrial action, though this is not mentioned in the interim report. Vanadium production has just been cut 20% owing to weakening demand.

A total of 5397 - more than 90% of those eligible - participated in the Anglo American Group Employee Shareholder Scheme.

Middelburg

South Africa's only stainless steel producer is Middelburg Steel & Alloys, a member of the Barlow Rand group. No figures are given for production because our information is out of date. but the company produces stainless steel and ferrochrome, the former mainly for the local market and the latter primarily for export. The small proportion not exported is absorbed by Middelburg's own stainless steel production. Its Southern Cross Stainless Steel Division is the only producer on the continent, but that name seems to be giving way to Middelburg in the company's publicity today. Its output of about 100 000 tons p.a. is presently being increased to about 170 000 tons. Middelburg makes stainless steel and corrosion-resistant steel sheet and plate. The plant is one of the most modern in the world, including a new hot rolling mill, cold mill, slab caster and recent extensions to the melt shop. The company makes South Africa strategically self-sufficient in stainless steel. Some production is exported, and many stainless steel products are imported, but South Africa's use of stainless steel is proportionately less than that of more developed First World countries. Major expansion of the Middelburg

plant in the early eighties gave rise to a new low-cost, corrosion resistant steel known as 3CR12 which has attracted world-wide interest. Initially it has, in South Africa, made a very considerable market impression, thereby doubling the consumption of ferrochrome and exceeding the market for austenitic steel plate.

3C812 is a 12% chromium steel, not designed to replace stainless steels but to fill the price and technology gap between stainless steels and rust-prone carbon steels. This it has succeeded in doing locally, at least in the short term.

If its initial local success is repeated in the world market. it will double the world's consumption of chrome. Significantly, South Africa has 80%

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of the world's known chrome reserves.
0? which Barlow Rand owns 40%. .

Sanancor

The South African Manganese Corporation is the country's only producer of manganese - of which there is world over-supply. It is also a major producer of ferrochrome, of which there is a world shortage. After a poor 1987, which reflected the market for manganese Sanancor got its sums right in 1988, taking off financially in the wake of booming world demand for stainless steel, of which its ferrochrome is a major constituent. Performance should be up so far in 1989.

Sanancor is therefore boosting ferrochrome production and, perhaps more important, is investigating with Highveld the possibility of establishing a joint venture for the production of 250-500 000 tons of stainless steel billets annually for a captive Taiwanese market. Final cost. Attributing for inflation and working capital, is estimated at R1.5-2 billion. Taiwanese capital may be involved directly.

The billets considered are semi-finished and produced in the form of bar, which must be processed further to finished products. By producing only 'semis' which would be processed further overseas the prospective partners avoid the additional massive capital investment required for a steel finishing works and in Samancor's case avoid going into head-on competition with the stainless steel producers which are its present customers for ferrochrome. The project is still under investigation by Highveld and Samancor, which previously looked at the possibility of going it alone. After more than a year, the project was considered too big for Samancor and its parent company Gencor. A decision on the joint project, and on the possible involvement of overseas finance, is expected before the end of the year - when, one suspects the prospective partners will have a better view of the SA government's proposed reform plans. These do not influence the project directly, since

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The project is being mooted

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Middelburg is also
production (page 93),
output is
Middelburg's MD John
has said he does! not see
the- proposed Highveld/Samancor venture
as a competitive threat. i
The two key ingredients of, stainless
steel are ferrochrome and nickel,
which ensure the metal's 'resistance
to rust and corrosion. Samancor is
the world's largest producer of ferro-
chrome, while nickel is produced in
South Africa as a by-product of platinum
mining.
Samancor recently consolidated other
chrome interests of its parent company
by taking over Gencor's 51% shareholding
in Tubatse Ferrochrome and 49% holding
in Cromare. The world shortage of
ferrochrome seems about to end, however,
with new capacity coming on stream
before the year end. There should
be no significant fall in world ferro-
chrome prices for a while as stainless
steel manufacturers replenish stocks,
but the steady increase in prices
- by 50% since mid 1987, 'is probably
past history.
Union Steel
This is a much smaller, financially
troubled producer controlled by Iscor,
although it is a public company in
its own right. In the financial year
to 30th September 1988, profits moved
ahead sharply, but the problem remains
that the direct reduction plant -
designed to produce sponge iron as
an alternative to scrap steel feedstock,
continues to be plagued by technical
difficulties, which were causing losses
at that plant of more
last year. Management
spend as necessary to try to
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better world steel prices and deteriorating domestic market, Usco resumed exporting steel billets.

On the non-ferrous front Usco's sales of aluminium cable to Eskom have fallen owing to freezing of projects, but sales of copper cable are improving. Stainless steel wire sales are static. Capital expenditure of R22.8 million were in the pipeline at the beginning of the year, beyond which the company had no major expansion plans. Nor should it implement more, until its present plant is properly operational.

Distribution and Protection

While the major steel manufacturers hog the limelight, much of the marketing to industry is done by steel merchants and stockists. Many of them are situated around the Roodekop area south of Johannesburg, where Mac Steel, Gulf Steel, Horrid Steel, Bruce Fairlie Steels and Namascor Steel Service Centre are located.

Also to be found there is the new coating shop of R J Southey, which company has specialised in steel protection for the past 50 years. Southey hopes, from the choice of location, to encourage steel users and fabricators to order parts delivered to their premises pre-treated and primed, or otherwise protected.

On the South African Highveld, steel corrosion at ground level is normally light. At the coast and in the mines it is severe. In any case all steels other than stainless need to be protected against rust in some way, whether by painting, galvanising or some other method such as bitumen wrapping and lining, or spray-applied urethane lining of pipes. Blast cleaning is generally necessary for surface preparation.

Galvanising (zinc coating) is particularly well-established, with one company, Monowid Galvanisers dominating the market. At the time of our last visit to Monowid's Germiston plant a great deal of work was passing through at a time when the economy is theoretically depressed. Much of it comprises finished and semi-finished steel products destined for export.

Painting is another important method of protection from corrosion, which is widely practised in South Africa. Paints are locally made by Plascon and others.

The whole subject of corrosion prevention has been given a considerable boost by Mosse Bay, although the level of protection required on an rig is of a

off-shore oil and gas

industrial

different order to normal

and domestic requirements.

The more standardised protective methods

are well-established in South Africa

and fairly rigidly applied - with

little technical understanding but

sufficient conscientiousness to protect

the steel for a normal working life.

Problems, when they arise, normally

do so in critical situations, owing

to operators' lack of understanding

of the need for etching, blasting

(or whatever surface preparation method

is adopted) so that corners are cut,

often inadvertently.

NON-FERROUS METALS

Aluminium is the second most widely

used metal (after steel). with sane

unique engineering properties as regards

lightness and resistance to corrosion.

South Africa's use is less than it

might be, but 98% of the country's

needs for primary aluminium are catered

for locally by Alusaf. Indeed, virtually

the only aluminium which is nowadays

imported consists of highly specialised

alloys required in very low quantities,

and fabricated and semi-fabricated

products of overseas design. The justifi-

cation for importing rather than

manufacturing such products locally

is purely an economic one.

The locally-produced metal enjoys

10% ad valorem tariff protection.

South Africa's aluminium fabricators

and semi-fabricators are as competent

as those of most countries. The largest

semi-fabricator, Hulett Aluminium,

is a minor shareholder, but the major

partners are Alusuisse, the IOC and

the new controlling shareholder, Gencor, which has recently bought a 30.7% stake from IDC for R270 million. The Alusaf plant is working at capacity, producing about 170 000 tons p.a. worth about R800 million last year, giving taxed profit of R120 million. Around 35% is exported, which however is declining owing to the increasing home market, which has been more-or-less buoyant since the mid eighties. Potroom A, the original processing hall, comprises 240 separate pots, or reduction cells laid out in a straight line to a length of 1.4 km, making it the longest potroom in the world. All the cells are of the modern high-current, pre-baked anode version of the Hall-Heroult type. Potrooms B and C are of the older Soederberg type, which however feature more advanced cathode design. These cells and associated equipment were acquired from an existing smelter in Japan which had become uneconomic to operate in that country owing to dramatically increased electricity costs as a result of the seventies energy crisis. The reduction of aluminium is an electricity intensive process, giving South Africa an edge with its low electricity costs. Moreover South African aluminium is of high quality, so in overseas demand. The Alusaf plant is Eskom's largest Natal customer, with an offtake amounting to that of a medium-sized city. Bauxite (aluminium ore) is present in strategic quantities in South Africa and a licence has been applied for mining, though it is not mined at the present time. The raw material for the Alusaf plant comprises imported alumina, cryolite and carbon, landed directly at Richards Bay or railed up from Durban. Technical data on the Alusaf plant, and other plants mentioned are generally available. Since the additions of Potrooms B and C in the early eighties, which allowed Alusaf to win the State Award for Export Achievement in 1984 through a doubling of the plant's capacity, no major expansion has taken place. Minor extensions and refinements are still occurring, aimed at optimising

the efficiency and plant, and processing so far as this can be done without competing with its customers. economy of the increasing the degree of Thus Alustang, the subsidiary supplying electrical conductor, recently installed Conform processing machinery for the continuous forming of solid-sector electrical conductor from 25 to 300 mm² cross section for the manufacture of electric power cable. The Conform process is 12-15 times faster than the previous method of manufacture,

but its commissioning was beset by teething troubles.

Aluminium originating from Alusaf accounts for virtually all the electrical conductor used by Eskom for overhead power lines.

Copper

Of the other non-ferrous metals, copper is the most important, and the most widely used for electrical purposes. It is mined in South Africa at Patabora and Messina, in sufficient quantities for South Africa's needs and exports. The primary metal is processed by both the named companies.

As with other locally-mined metals, local prices are set by the export market - principally the price prevailing on the London Metal Exchange, which has recently been remarkably buoyant. As a result the two companies named are doing very well financially, with Patabora heading for another record year and capacity production of 140 000 tons of copper cathode annually, as a result of commissioning a new Con-Top smelter which commenced operation in October 1988. It is now forecast that copper prices should remain buoyant for the rest of the year, but perhaps decline in 1990. Copper is classed as a mature metal, but it has the best electrical and thermal conductivity. It can be replaced by aluminium in many applications, but in practice aluminium prices have risen faster than copper prices so the metal is making a strong resurgence. In fact the majority of base metal prices are extremely buoyant. A year

1989

ago the markets were nervous owing to the increasing sanctions on South Africa and the country's ability, at least in theory, to turn the tap off world supplies of so many metals. In fact, withholding of supplies from the world market is not so much occurring in direct retaliation for sanctions (which neither the companies nor SA government could afford) as due to South Africa increasing its total processing, which it is doing anyway. According to Des Ninship, MD of Hulett Aluminium, "South Africa produced 3% of the West's copper, 1.6% of its zinc, and 11.2% of its aluminium in 1988. This translated into R3.5 billion contribution to South Africa's GNP last year.

"The case for non-ferrous metal industry capex is a strong one, based on opportunities in the local and export market. South Africa has a viable non-ferrous metal industry, one which is thinking ahead and investing... The industry accounts for the employment of 50 000 people, and allowing for a multiplying factor of three for the tertiary industry...

"The building and construction industry is currently the largest user of non-ferrous metals - 20% aluminium, 35.5% copper and 55% zinc. The next largest user is the electrical industry...

"Scrap non-ferrous metals are a rapidly appreciating resource... currently in South Africa 30% of primary use aluminium is reclaimed while copper recycles 40-50%... in line with world figures for the scrap metal industry." The South African non-ferrous metals industry will have to spend R1.5 billion to stay competitive and abreast of technology, he states. As a separate issue, there is agitation for banning the export of ferrous and non-ferrous scrap metal, the uncontrolled export of which should certainly be stopped.)

Tin

While most base metal prices are buoyant tin has failed to recover since the collapse of the futures market on

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the London Metal Exchange some years ago. The slump in tin prices has serious consequences for South Africa's three producers: Union Tin, which was forced to stop mining, Zambians, which was forced into loss for the financial year to March 1988, and Rooiberg, which had to cut its production by a third to maintain profitability. All three are significant exporters, as well as serving the needs of South Africa's producers of tinplate and solder, of which there are significant imports. Tinplate today suffers severe competition from substitutes, especially aluminium and plastics. The electrical solder market is large, and should grow larger with the continuing growth of electronics. except for the fact that it is undermined by miniaturisation of electronic equipment.

OTHER ENGINEERING MATERIALS

While metals account for the majority of engineering materials, they are being supplemented increasingly by plastics, of which plastics, ceramics and glass are specifically considered. Plastics

This material, or rather group of materials, has a very wide range of applications, including packaging, low-cost plastic parts which are generally moulded, higher quality die-cast components, extrusions and true engineering components. A special category is glass-reinforced plastics (GRP). South African industry's current plastics production of 494 000 tons is set to nearly double to 874 000 tons by 1992 according to Safripol managing director Glen Carter, reported in Engineering Week. The capabilities of standard thermoplastic polymer producers fall short of demand, but the major players in the industry, AECI, Sarsnas and Sasol plan to expand their production facilities

to this degree. According to Roger
Cockram. president of the Plastics
Federation of South Africa said the
local industry will be able to produce
enough poTymers - with the exception
of polystyrene - this decade Ewhich

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it is thought should read next decade, since he was speaking in February 1989: unless plans are very well advanced attributed this to 'debottlenecking of ethylene and increased polypropylene capacity."

South Africa is virtually self-sufficient in acrylics, alkyds/aminos, epoxies and urea, melamines. phenolics, PVA and SBR. Major local markets are packaging (38%), engineering (10%). electronics (8%) and building and construction (8%). Carter said total industry turnover stood at R5600 million in 1988, with R3250 million investment. Some 36 000 people are employed. With the industry expected to grow around 5% p.a., "significant additional quantities of ethylene. butadiene. styrene. chlorine and aromatics" would be needed. LDPE, PS, HDPE and PP are still imported due to capacity and monomer constraints. Short-term opportunities were then available for breaking the bottleneck in olefine supplies. With increased PVC, HDPE, LLDPE and polystyrene capacity, South Africa would need a new P2 billion petrochemical facility. Such an investment would bring significant polymer and converted product export opportunities. According to Ampaglas general manager Colin Coetze speaking on the same occasion, the South African market for the next decade shows thin-walled polypropylene sheet as a major development area, with future production using such materials as ABS. polystyrene and polycarbonate, and acrylic.

Engineering plastics

In the area of engineering plastics (Which the author knows and understands better), the South African market is claimed by others to be expanding at 10-15% p.a., while that for non-ferrous metals - which engineering plastics generally replace - is at best holding its own. One of the major players is Vescoplastics, founded and still run by Alain Leger, one of two significant SA producers. Vescoplastics' output consists of machinable plastics including rod and sheet semi-finished materials, heavy-wall injection mouldings (of which Vescoplastics

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was a pioneer), standard and custom products including a wide range of bushes and machine components. The major interest is in machinable plastic materials such as nylon and Vesconite in rod and plate form, and low-friction components such as bearings and slides - wherever two materials rub together. The largest South African producer is Polypenco - in technical partnership with Polymer Corp (USA) although the South African company is owned by its management, headed by MD Andre Smit, who bought it from GEC. Polypenco produces nylon from the basic raw

material, moulds and extrudes stock shapes and specials to customers' requirements, and machines components in a dedicated plastics machine shop, through which about half the company's output passes. The nylon casting plant was designed and built by Polypenco in South Africa. Though small by world standards it is believed to be one of the most sophisticated anywhere.

HMHPE

Another significant player is Solidur, an affiliate of the German company PennekampiHeusker. Solidur is headed by Roger Thomas, who has a major share. It produces a range of high and ultra-high molecular weight 'polyethylene (UHMWPE) derived directly from the foreign parent which is widely used, for example, in materials handling when non-stick properties are required. In fact the material is one of the most versatile of all plastics.

Most other

suppliers of engineering plastics are importers of overseas ranges.

South Africa's use of engineering plastics is still in its infancy (and not very advanced anywhere). As the market becomes more educated, plastics are losing their 'cheap' image and being recognised as the most appropriate material in many circumstances. "The local non-ferrous metals market absorbs about 400 tons of brass and bronze per month, of which I believe that 60% could be replaced with engineering plastics" says Smit.

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IEIII

Unlike metals, which require expensive tooling or individual machining, casting of plastics is relatively cheap. It is possible to do it economically on a one-off basis, with a minimum of subsequent machining. At the same time the price of engineering plastics falls sharply with increasing demand as greater volumes increase plant efficiency - unlike metals, where higher demand often increases cost, due to the fixed nature of the processing plant.

As a result the companies mentioned are becoming involved daily in new plastics applications, some of which have not yet occurred abroad. Kister brackets and star wheel blanks used on bottling lines are being cast locally by Polypenco, typically at half the cost of previously imported components. Other interesting products include scrolls for handling machines, blast curtains for mining, mica-filled PTFE bearings, and slippers - the prime universal joint components of steel rolling mills.

Extrusion

In the extrusion area plastic pipes are coming strongly to the fore, with

several significant suppliers. The Reefline underground mining system from Paxit Pipekor, and polypropylene and high-density polyethylene pipe system from Afcelt are typical. A well-established material is polyurethane, widely used for lining piping systems. It is particularly corrosion-proof, and suitable even for the conveyance of acids. South African systems are offered, for example, by Urethane Mohlded Products.

Following the underground fire at Kinross mine, there is strong feeling against the continued use of polyurethane foam insulation underground, despite which it continues to be used) on financial grounds. Technically there are alternatives such as phenolic foam which does not give off toxic fumes (which caused most of the Kinross fatalities). Phenolics are, however, more expensive.

A material related to plastics. at least in its synthetic form. is rubber. A wide range of rubber mouldings. including standard and custom-made products, is available from Mining and Industrial Rubber.

Ceramics

These are extremely hard, wear-resistant materials whose applications. like engineering plastics. are still in their infancy. They are manufactured by relatively few South African companies of whom Hoh 9 is singled out, as the producer of a unique slurry pump for mining, with ceramic impeller and housing, which offers several times longer life than such pumps made of more conventional materials. The impeller is not a single casting, but an assembly in which the ceramic components are bonded elastomerically. Launched at the last-but-one Electra Mining exhibition. the pump is now marketed by Salweir, but it is the material itself that interests us here.

Apart from that first-ever application, ceramics are extensively used for lining wear surfaces, e.g. of the pulverised coal ducts feeding the burners of the boilers at Lethabo power station, owing to the particularly abrasive nature of the very-low-grade coal used there. Ceramics are also used for armourplate lining by Armscor and its suppliers.

These applications are sufficient to indicate that South Africa's usage is up to world norms. and in some areas the country is a pioneer. In others it follows international norms. The country is essentially a spectator of the international effort towards the introduction of ceramics for vehicle engines.

A major producer of electrical ceramics is Cullinan Refractories, which manufactures most of the engines for Eskom

powerlines. The company also offers Ceramospray and Ceramocote alumina-silicate ceramic spray systems, widely used for protective coating in maintenance and repair work.

Glass

South Africa's use of this material is both extensive and sophisticated, and well up to international norms. Plate glass is used not only as a window material, but also for the full cladding of modern buildings - particularly those erected for Anglo American Property Services (Amaprop). The cladding material is imported. Almost all the window glass is made locally. Plate glass is produced primarily in flat sheets, but also in a variety of more complex shapes. e.g. for vehicle windscreens, by such companies as PG. Glass containers are made by the three majors in the packaging industry, of whom Consol specialises in glass. The other two majors mentioned are Metal Box and Nampak.

After a very good financial year in 1988, Consol added a new glass furnace which has just come on stream, at a cost of about R60 million. specialised glass, e.g. for light bulbs, is made by the companies producing such products (Chapter 5). Probably the most specialised glass producer in the country is the glass fibre drawn for telecommunication cable at African Telephone Cables plant in Brits. This, unfortunately, is reckoned to be relatively primitive single-mode optical fibre. More advanced optical fibre cable making use of imported glass fibre is manufactured by major competitor Asea Cable.

GRP

Glass-reinforced plastics (GRP). generally known as fibreglass (despite copyright infringement) is widely used in industrial and consumer products of an enormous variety, ranging in size and complexity up to transport containers, parabolic reflectors and ocean-going yachts.

A severe shake-out of that industry occurred in South Africa in the years 1984-86, but the market is again buoyant with growth in excess of 12% believed to be occurring. New applications arise almost on a daily basis.

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of pines.

fibre,

Non-woven glass supplied for example by Vivian Regina, is used for surfaces requiring maximum smoothness. By and large, however, the technology and its applications are believed to differ little from practice overseas. Glass flake linings for corrosive environments are presently imported.

HOOD

South Africa has no natural forests which can produce timber on a commercial scale. but there are areas where soil and climate are suited to the cultivation of fast-growing exotic hard and softwoods.

An increasing proportion of such areas

are deliberately planted to forests, which are renewed and replanted whenever they are felled. Today 1.2 million hectares of South Africa are so forested mainly with pine, eucalyptus (gum) and wattle. The bark of the Tatter is used to make tannin, and the wood of the fonner for pulping and mining timber poTes.

Pine and eucalyptus are the most extensively planted. About 600 000 hectares of the cultivated forests consist which produce 6.4 million m³ of wood; 560 ha of eucalyptus produce 5.4 million In³ Pine (softwood) is mostly cultivated for the production of pulp and paper, poTes and sawn timber. EucaTyptus (hardwood). _is planted for pulp and paper, mining timber and poTes. A small amount is al50 used for the production of laminated beams and furniture.

Other uses of wood, which it is convenient to mention at this point, are structural applications other than building, fencing, pit props (for shoring up the roofs of mine tunneTs) railway sTeepers, fuel - particularly in the Third Hoer; and in the First Hoer for starting coal fires,. and as a prime fuel for the ubiquitous braaivleis (barbeque). The other main use is pulp and paper, discussed below.

applications
Collectively these
make

wood the most versatiTe of all materials
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though it is Tess w!ely used industrially than steel.

PULP AND PAPER

In 1985 South Africa moved, in a single year, from being a large net importer to a substantial exporter of pulp and paper, due to the almost simultaneous start-up of two massive mills: that of Sappi at Ngodwana and Honidi at Richards Bay. The country continues to import paper, if not on the same scale as it did before, in any case in quite significant quantities. It should. perhaps continue to import the better grades of coated paper. As regards the more mundane paper, there should be no incentive to import, as it can be made competitiveTy in South Africa.

There is a specific reason for this. Namely the strong southern African sunshine causes wood to grow severaT times faster than it does in the cooT temperate zone of the northern hemisphere (int the warm .temperate zone of the north most of the wood has Tong since been cut down). Against this, the sTower-growing timber of Finland or' Canada is straighter, and generally of better quality, whether for timber or pqu and paper production. In the mass market of the woer Informa-

tion Society catered for by Sappi and Mondi, South Africa has a natural advantage, offset only by the country's greater distance from major world markets. 1

Sappi

South African Pulp and Paper Industries is the second largest focussed industrial company in the region (after Sasol) and one of the top 25 pulp and paper producers in the world. It has a number of activities, including the sale of roundwood, processed wood (mining timber, timber and particle board), bleached and unbleached pulp, and chemicals which are broken out separately in the very detailed annual report. By far the largest activity is the sale of paper, board and tissue, which are produced at a number of mills. That at Ngodwana, near Nelspruit

is the largest and one of the most modern in the world. a. , k .

Sparkling financial performance from 1987-89 is debatably continuing, with a 49% rise in net income for the half year to 31st August 1989 on turnover up 34% to R1.37 billion. Newsprint prices are weakening due to excess world capacity, however, and dollar prices of other Sappi products show signs of peaking. Turnover for the full year to 28th February last was R2468.6 million, a massive increase on the previous figure due to the consolidation of Courtaulds' interests in Saiccor and Usutu pulp mills. Formal approval for the takeover of Usutu Pulp in Swaziland is still awaited, meanwhile Sappi is managing the company into the

world's pulp

The acquisition put Sappi big league among the and paper producers, in addition to which ownership of the Swazi mill gives preferential access to the European market. As part of the deal Sappi becomes linked to the international marketing consortium Specialty Pulp Trading, which continues to market Saiccor's and Usutu's products, and may assume a pivotal role in the marketing of Sappi's other products. Worldwide, the group has felt little impact from sanctions, though exports have increased from 25 to 40% of turnover. Assets are now in the region of R4 billion.

The Saiccor mill

11% of

at Umkomaas supplies

the woollen dissolving pulp

(used in the manufacture of synthetic fibre for fabric, not paper), and the Usutu mill is 14% of the world's unbleached softwood pulp.

The good financial performance of 1987 and 88 was achieved under quite

adverse conditions, an explosion in
a locked chemical store at the new
Ngodwana mill occurring at the centre
of the site - fortunately at the dead
of night so there were no fatalities.
The explosion
that windows
2 km away.
damaged at
was of such severity
were blown out nearly
Nearly every building was
least externally, needing
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replacement of 100 000 m2 of aluminium cladding. In addition the control centre 'fer the No 2 fibre line was .4estwuyed - and rebuilt in 55 days in a major co-operative effort by Sappi's technical suppliers. Consequent debottlenecking of the mill was proceeding throughout 1988, by the end of which it was again in full production and investing in further major plant, for example a second turbo-generator which makes the mill independent of Eskom power.

Sappi's SA paper prices match imported prices - unjustifiably since its exports are subjected to duties ranging from 6 to 22% in every country with its own paper industry, despite which it is highly competitive financially.

generally perhaps not

Hondi

The other major player in the industry is a subsidiary of Anglo American Industrial Corporation and overdue for public listing in the writer's view. In the absence of JSE participation the information available is more patchy, though management is quite forthcoming as regards specifics.

Mondi Paper of Merebank, the world's 93rd largest producer. The company's Richards Bay mill - the largest built at any one time, boosted the company into the world's top 50, with potential sales in excess of R1000 million p.a. Unlike Sappi's Ngodwana, which was an upgrade of a previous mill, Mondi Richards Bay was constructed on a greenfield site with Finnish technical assistance. It concentrates on production of chemical pulp - mainly air-dried bleached Durban, was

kraft pulp (470 000 tons p.a.) and linerboard (200 000 tons). Before construction Mondi imported 150 000 tons of pulp annually. Nith Richards Bay in full production it has an export surplus of 150 000 tons, and half the linerboard is exported as well.

Richards Bay was erected at a cost of R600 million. Merebank previously gave the company a turnover of R325

Now Mondi has the mills

million in 1982.

intention of expanding both

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and renovating as ne.ary at a capital cost of R400 million, of which R170 million will be spent at Merebank, R50 million at Richards Bay and the remaining R180 million on a variety of smaller renewals and enhancements.

The programme foliows a 1988 R170 million enhancement of the No 6 board machine at Springs. Annual production of the PM1 paper machine at Merebank

will be increased by 45% to 127 000 tons and the quality of the supercalendered paper will be improved, making it suitable for offset and gravure printing processes. 1

Another significant company is Nampak, at whose Belville (Cape Town) premises a fourth paper machine (PM4) was commissioned about the same time the major Sappi and Mondi mills came on stream. It produces tissue from waste paper, mostly for export. Although supplied by Sulzer, the machine was locally, designed and installed by Nampak. Nampak, with a turnover approaching R3 billion, is largely specialised in packaging and paper products. It owns the South African Metal Box company which was previously listed in its own right, but which has been acquired in stages from its British parent in recent years. The controlling shareholder in Nampak is CG Smith, which in turn is controlled by Barlow Rand. The company, and the paper and packaging industry in general, should be a major beneficiary of the burgeoning of the informal sector of the economy, which is more-or-less unaffected by government stop-go economic policies, and a major engine for economic growth. The sector is therefore representative of a comparatively small group of companies which should be early beneficiaries of rising black spending power. For the company the major problems are materials shortages and slim profit margins, but the burgeoning informal sector, despite the government's best economic efforts, means that its financial performance should be maintained. Chemical pulping is a wasteful process which in South Africa produces 650 000 tons of lignin and a similar amount of hemicellulose wastes p.a. These iilllllilllllill

wastes are either burned, and the spent pulping chemicals reclaimed, or they are dumped into the sea. which is not likely to be allowed in the longer term. The CSIR is undertaking research into the possible uses of these wastes as productive raw material resources, for the manufacture of adhesives, foundry core binders, flocculation aids and paper chemicals, and the country is very interested in the research of such leading paper producing countries as Finland. All these projects are based on their companies' confidence that domestic and export markets for pulp and paper will continue to grow for some years. as they must at the present phase of the Information Society. Theoretical moves towards the paperless office have been undermined in practice by the photocopier, the fax machine, the laser printer, indeed many printing processes, and the human desire for a more permanent record than electronic

media can provide. For whatever reason, world consumption of paper continues to grow. South Africa's paper and board consumption is around 40 kg per capita per annum - easily the highest in Africa, but way behind the figures for Britain (130 kg) and USA (270 kg). If local consumption rose even to the modest level of Australia, local production would have to be trebled to meet the demand. Substantial future increase in consumption is considered inevitable with the rising literacy and living standards of the local population.

Afforestation

New afforestation projects covering 110 000 hectares are planned by Sappi and Mondi - which will not be enough to prevent SA's timber resources from being depleted by the year 2007 according to the Forest Owners' Association (FOA), which estimates a cumulative shortfall of 18 million m of softwood and 32.5 million m of hardwood by 2010 (with which figures Sappi's MD disagrees).

Sappi has 240 000 hectares under forest in South Africa. It is heavily involved in the forest industry of Swaziland and is investigating with Mozambique the possibility of planting 50 000 hectares of new forests in that country, the cost of which would be more than R50 million. Mondi has 220 000 hectares under trees and is involved with sister companies De Beers and Anglo American in a R110 million joint venture for the development of 60 000 hectares in the north-east Cape. In fact afforestation is proceeding at the rate of 23 000 hectares p.a. According to FDA the rate should be 40 000 hectares p.a. for the next five years and 16 000 thereafter. It remains to be seen when South Africa will run out of forestable space!

CHEMICALS

A large number of companies produce specialised chemicals, mostly under overseas licensing agreements, although there are many original South African developments. The major South African producers are AECI, Sentrachmn and

Fig 8.1.- Cutaway view of automated mining equipment showing surfaces suitable for lining with UHMWPE

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Saschan, with Afrox and Fedgas offering speciality gases.

AECI

The former African Explosives and Cehmical Industries, formed to make dynamite TocaTty for the Witwatersrand 90ld mines, is now a far more broadly based producer of chemical products. Anglo American Industrial has 40% of the equity, the British lCl 38% and Old Mutuai 5%. Profitabiility depends overwhelmingly on maintaining fuTl factory loadings. Production is geared to supplying the SA market, and exports to mop up excess capacity. Nhen locaT demand exceeds domestic capacityI AECI makes up the baTance with imports. When the group diversifies into new products its target market is local,, and it generally needs protection from imports. These characteristics are evident in the R920 million Sua Pan soda ash venture in northern Bots-wana, due to come on stream in 1991, which needs protection in the formative stages from traditional US suppliers. The same is true of the hydrogen peroxide plant which AECI is building in a joint venture with CG Smith at Umbogintwini. AECI's financial strength is in cuunodity chemicals like soda ash, explosives, fertiliser and PVC. which are Tinked with the country's GDP growth, international demand for SA minerals and local industrial ration-alisation.

Last year's explosive saTes repeated their previous year's growth. farmers resisted fertiliser price increases, paint demand remains strong and the Umbogintwini plant's capacity has been raised, while Kynoch acquisition of Fedmis' Cape operations permits fertiliser industry rationalisation. This year the CoalpTex plant should have been debottlenecked, allowing the resumption of chlorine production for the manufacture of caustic soda and other chlorine derivatives. A recurring problem is that AECI has persistent difficulty in raising foreign capital for joint ventures. CapitaT spending will be about R300 million this year. with the synfuels project on Tine when Sua Pan is completed.

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World oppositior.o the erosion of the world's ozone layer by chl0rofluorocarbon (CFC) gas has created a business opportunity for C G Smith subsidiary, Natal Cane By-Products, which was recentTy reported ready to construct 3 R12 million plant at its Merebank (Durban) factory to manufacture dimethyi ether (DME), an ozone-friendly aTterna-tive to CFC.

CARBON

This material is largely imported, but Tocale processed for a variety of uses including electrical and mechanical applications. Carbon is an excel-

lent electrical and thermal conductor which is also self-lubricating. It is extensively used in electrical machinery for making contact with commutators and sliprings (carbon brushes), as well as for making electrical contact more generally.

The largest electrical application in South Africa is provided by the anodes of the Alcoa reduction cells, which are fabricated and pre-baked on site. Smelter electrical and mechanical components are made by Ringsdorf and Morganite - the South African subsidiary of Morgan Crucible (UK). Since its acquisition of Carbon and Graphite from the SA Landrock group in 1986, Morganite's Tutu Park premises house the largest carbon machining facility in the southern hemisphere.

As a result Morganite is emerging as a strong force in mechanical carbon products, including components for pumps, bearings, bushes etc. The material is also used for crucibles, bursting disks and heat exchanger blocks.

Economically, the most important use of carbon in South Africa is that of activated carbon for gold recovery in the carbon-in-pulp process, now replacing all other methods for the extraction of gold from ore, including the extraction of further gold from previously processed mine dumps. Activated carbon is obtained from coconut shells, which are charred and oxidised. A ton of activated carbon, obtained from 49 000 coconut shells, is capable of adsorbing up to 10 000

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grams of gold. South Africa needs about 220 million coconuts a year for this. The South African company Carbon Developments has sold two processing plants to coconut-rich Mozambique and Sri Lanka for R10 million each. The Sri Lankans paid for their plant while British money has paid for the Maputo plant.

So far only coconut shells have been found suitable for the gold extraction application, which is far more efficient than the previous method involving filtration.

Activated carbon was first used for gas masks in Noer War 1. Other uses

today include pollution control and solvent recovery. Although it looks like ordinary charcoal, activated carbon is highly porous, giving it a vast surface area - more than 1000 m² per gram. The process used by Carbon Developments involves the passing of electricity through the carbon, whose resistance causes it to get hot. The carbon need not be moved around, yet all parts of the carbon are heated evenly, which is not the case with externally-applied heat. In addition the process is flexible, allowing the activated carbon to be tailor-made for different applications.

RESEARCH AND DEVELOPMENT

Work on specific materials is carried out by their manufacturers. More formal R&D programmes are carried out by the CSIR, which has a National Institute for Materials Research, and by most universities. Wits University has a formal programme for the study of composite materials - an interesting group whose South African application has not yet progressed beyond 'the research phase.

PROMOTION AND SELECTION

With so many materials to choose from, the user is often faced with difficult choices, which the South African industrial user far too often makes on the basis of doing what was done before. Where the application is leading edge, it makes sense for the material choice to be conservative, but such an approach is not necessarily correct. The principal factors which should govern engineering material selection are promoted by the Federation of Engineering and Constructional Materials Associations (FECMA), which stresses both technical and financial considerations.

A related body of slightly broader scope is the Joint Engineering Materials Council (JEMC) which organised a materials week in June 1989. A list of member associations is given in Table 8.x. Most of them are trade associations formed by the member companies of particular industries, which are often dominated by their largest members. Most follow a specific policy of not recommending particular suppliers, but it is difficult for the Stainless Steel Development Association to avoid mention of Middeburg, or for the Hot Dip Galvanisers Association not to mention Monoweld.

All such associations are useful sources of technical data on the characteristics of particular materials which they promote on an individual basis, and of companies to contact for potential users unfamiliar with the specific field.

Similar umbrella bodies exist in building materials and other sectors.

Fig 9.1:

SA ELECTRONICS MARKET

Total market value R8 647 million

RLECOMMUNICATION

13%

COMPONENTS

5%

CONTROL

3%

SICUITTV

3%

AUDIO 5 VIDEO

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CHAPTER 9:

,0? TH? YECHNOLOGIES which influence present-day industry and society, electronics is the most pervasive and in many ways the most important. Specifically, it is the driving technology of the emergent Information Society. It is indispensable for computing, communications, industrial measurement and control and armaments. all of which are dealt with in separate chapters. It is also central to a broadening range of leisure pursuits. About the time this report appears, electronics becomes the world's largest industry, but it is not its inherent size, but its impact on other sectors of life which accounts for its importance. Whatever the shape of industry and society in the 21st Century, electronics will play a crucial role, in South Africa as elsewhere. The seminal importance of the electronics industry has long been recognised by the country's planners, who took steps back in the mid-seventies to establish the country's place in what was seen as the technology of the future. South African Posts and Telecommunications (SAPT), and the then Postmaster General, Louis Rive played perhaps the key role, insisting on the country pioneering the use of digital electronic telephone exchanges, local manufacture of these exchanges and, so far as possible, of their components, for which South African Micro Electronic Systems (SAMES) was specifically established. In South Africa, electronics technology is imported or at best implanted after being pioneered by the major First World countries, but present technology is nowhere very old. It is still rapidly evolving technically, but seems to be moving towards commercial maturity, leading worldwide to developments such as the Siemens/GEC takeover of Plessey, with equivalent rationalisation in South Africa perhaps to come. Before considering the South African electronics industry in detail, technical trends in the industry worldwide must be reviewed.t

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ELECTRONICS

tThis report is not concerned with technical issues as such, but as regards electronics it is necessary that the author state his view, which is that electronics is in transition from its formative or high growth phase to commercial maturity. In fact it is being driven to maturity, financially. by the sheer size of the industry. which it is not quite ready. technically, to adopt. Some trends are well established. like the move towards greater circuit

integration, fibre optic cabling and, on the printed circuit board, to surface mount devices (SMDs). which is tending to transform the industry from labour to capital-intensive. and servicing to a matter of PCB replacement only.

In the past. for the investor, electronics has paid back quickly. which accounts at least in part' for its meteoric rise. As regards equipment it' has been possible to develop a good idea in a back room with little more than. a soldering iron and oscilloscope, assemble the result in a garage. then scale! up as labour or capital intensively. as one wished. Electronics manufacture might employ large numbers of people or highly automated machinery provided the automated process was Flexible. If it was not, then the company and its products were leapfrogged by the next technical. innovation. which competitors introduced as a matter of course.

This technical one-upmanship combined with component innovation are extreme - so much so that the leading-edge electronic components retain their lead position on average for an estimated three months and equipment for no more than a year. The average piece of equipment was in production for no more than three years before the design had to be replaced. and detailed icircuit improvements had to be made before then. As the industry moves towards maturity the product life cycle

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seems to be shortening. to the extent that it is never really possible to freeze a design for production; rather production must be implemented somehow (and the product had better meet specification!) despite a philosophy of ever-evolving design. Recent moves towards software-based systems mean that theoreticallx lifespans should lengthen, but any electronics manufacturer who counts on it is most unwise.

The technical leapfrogging of the leading-edge companies and the failure to adapt fast enough of the also-rans leads to ongoing industry rationalisation on a scale that few outsiders appreciate. Despite the firming up of some trends. allowing marketing men to indulge in Mark II thinking. it is very questionable whether the electronics industry has grow beyond major techical innovations. The obvious contenders are gallium arsenide electro-optic semiconductors and wafer-scale integrated circuits.

theoretically capable of revolutionising (optical) communications and (further) dramatically reducing the cost of computing power, but they are perhaps not revolutionary enough. The most significant changes to come can probably not be foreseen. except for the extent of corporate devastation they will cause.

For the non-electronics reader, it may be relevant to state that an IC design with 10 000 connections of which 9999 are correct is a failure. Nothing short of perfection is acceptable in the chip design area since mistakes cannot be rectified after fabrication.

The ICDC student or customer is encouraged to design and test in software everything that will be made in hardware. and to design his circuit and develop a test pattern such that all possible faults are detectable. If the fabricated device does not work when it comes to be tested, the fault is most likely in the connections or external wiring.

For systems engineers and others who employ ICs as users, the design of ICs is not yet normal practice. overseas or in South Africa. though it is becoming an essential industrial skill. For electronics design engineers the capability is becoming critical. At the least. the external circuit designer must know what is possible at chip level. as the still increasing scale of circuit integration means that more of the designer's system is absorbed. to a steadily increasing extent, by the IC.

Despite this (worldwide) trend. printed circuit board (PCB) design is still a very real function but one which. like IC design. is increasingly being performed by computer. A simple but powerful set of tools for this purpose is the PCAD system. designed to run on the IBM PC and its compatibles, which allows low-cost entry into computer-aided PCB design. Significantly. PCAD is marketed by ICDC. and has a clear majority of South African PCB design installations.

There are. of course. more sophisticated systems. but PCAD is becoming the de facto standard.

ICDC also supports programmable logic devices, which is coming very close to the (non-electronics) industrial end user. It will be some time before the non-electronics engineer feels the need to design his own IC or PCB but he is already programming the simpler varieties of logic controller and the more adventurous are programming their own PCs. How long will it be before

they start to program microprocessors? Not too long in South Africa, given the financial and strategic incentives and the already acute shortage of skilled manpower.

THE INDUSTRY

The electronics industry is variously stated to be worth R7 billion or R10 billion p.a.. the difference depending on whether it includes information technology. Fig 9.1.

South African electronics and information technology industries are expected to top R10 billion this year according to BMI, a leading market research firm. The total market was reported to be worth R8.43 billion last year and is expected to continue growing at the traditional 20-25% p.a. Telecommunications products and services currently account for around 18%, components 9%, and electronic systems (control, security kit and specialised products) 13%. Other items, including test and measurement, medical electronics, transportation and audio and video equipment add another 18%. The rest of the market is increasingly dominated by information technology products and systems such as electronic data processing equipment (27%) and office equipment (5%).

The BMI breakdown is less logical than the traditional divisions into telecommunications, computing, consumer electronics and measurement and control, with components feeding the other four, but no categories are really satisfactory for this most dynamic of all industries, and the BMI breakdown conveniently reflects South African realities.

According to Dr Bill Venter, executive chairman of Altech in that company's recent annual report, three main forces are currently shaping the electronics market: centralisation, decentralisation and networking. More and more companies are centralising information but decentralising applications. To enable and control this they rely on public and private communications networks (to which Altech is, of course, a most important contributor). This is a simplistic view (as Dr Venter would himself acknowledge, yet as a generalisation it has validity. In particular it emphasises the cardinal importance of computing and communications which we address separately in the following chapters.

Market growth in selective areas of electronics was good during the past year. Altech's Venter was especially pleased with progress in electronic components and systems, and with the

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fact that certain facets of their telecommunications activities showed enormous potential despite heavy Post Office cutbacks.

For the present in South Africa the technology is presently imported, but much of the hardware is local. The technical capability of the country is equivalent to that of a minor First World country, although in specific respects the capability is higher. So far as one is obliged to make an overall assessment, the electronics industry is remarkably competent, but not self-sufficient

to any meaningful degree. Neither are the industries of any major First World country, in this most international of all technologies.

COMPONENTS

while much electronic equipment is already made locally and more can be produced, a clear majority of the components are imported. For the foreseeable future this will continue to be the case owing to their very wide variety, the relatively small quantities in which South Africa requires them and the fact that the leading-edge components normally originate from the world centres of the technology such as Silicon Valley or Mount Fuji.

As regards many of the more established component types, South Africa is self-sufficient strategically, and competitive in world markets to a degree.

ECMA

there are 17 members of the (South African) Electronic Component Manufacturers Association (ECMA), headed by Ray Gould of STC (Altech group), which is easily the largest local component producer. Most of the ECMA members are exporting, in many cases a majority of their output - often not too visibly since the electronics industry virtually invented the OEM concept, and putting the customer's name on the product is normal practice in South Africa as overseas.

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There is also a frequent convenient confusion of names. STC (South Africa) - has no remaining connection with STC (UK) but the names remain the same, dating from the time when both belonged to ITT in the mid seventies. In more recent cases the disinvesting former parent company has generally insisted that the local successor company changes its name, even when (as in the majority of cases) trade links continue. No one overseas asks whether components with the Siemens, Philips or Plessey logo are of South African origin, though this might be the case.

ECMA, while relatively small, produces an estimated 37% of South Africa's component needs.

The component manufacturers produce printed circuit boards, thick film hybrids, connectors, diodes, transistors, ICs, varistors, resistors, capacitors, relays, transformers, cultured quartz, quartz crystals and filters, temperature compensated crystal filter oscillators, telephone capsules, telephone cords, fibre optic cable and, debatably, cathode ray tubes.

With the increasing emphasis on

ICs, the markets for some discrete components are dying, but most are in demand, here and overseas. One notable category in trouble is printed circuit boards, not due to their natural decline, but to the cutback in SAPT orders. As a result the PCB activities of MSN (Altech group) have been sold off to Tek, and Alumet has been sold by Control Instruments group to Renak (Plessey). They will be integrated with those companies' East London and Cape Town facilities.

The proposed R450 million plant for the manufacture of TV tubes looks likely to be established in George - referred to in political circles as the PNB area, after its one-time MP, PW Botha. The

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plant will reportedly be one of seven in the world. set up by a consortium of Far East and European interests and imported complete from Taiwan. It will be able to produce 2 million tubes p.a. as well as 3 million electron guns and convergence yokes - far too many for the domestic market, a result of which is that exports will be sought from the outset. A great spin-off for South Africa is that monochrome TV sets could reduce in price to as little as R150 - a great communications benefit in the hypothetical post-apartheid society.

SAHES

This is South Africa's only commercial integrated circuit manufacturer, set up at Koedoespoort (Pretoria) in premises formerly occupied by Siemens, specifically to manufacture ICs for the SAPT telecommunications and other industries.

Originally established by Siemens, with financial backing from the Industrial Development Corporation, SAMES is now owned by a consortium of the country's major electronic equipment manufacturers with the Altech group as managing shareholder. It is easily the largest IC plant in the southern hemisphere.

The SAMES plant is wholly staffed by South Africans, under whose management it was extended at a cost of R22 million to run the latest process technologies. The equipment installed was necessarily imported, but plant design and engineering were entirely local.

In the words of Geof Hainebach, founding chief executive of SAMES, "Our original intention was to make not only a wide variety of ICs, but to do so by an almost equally wide range of process technologies. This proved impractical to implement.

"Instead we concentrated our efforts
on the dominant metal oxide semiconduc-
tor (MOS) technologies, of which
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we utilise four at present, with
or'ie main variant of each. These include
three metal gate technologies: P-
channel MOS, N-channel MOS and comple-
mentary MOS (CMOS). 3-micron CMOS
is now the workhorse technology.
with double metal and double poly
options...t"

At the risk of boring the non-electron-
ics reader further, it may be noted
that the SAMES plant is converting
entirely to 100 mm diameter wafers
with 3 micron capability, which will
be shrunk progressively to 2.5 then
2.0 micron capability for performance
reasons, i.e. to increase the maximum
switching speed of SAMES chips to
40MHz. SAMES is particularly pushing.
its 3800 family of semi-custom gate
array chips, with gate counts ranging
from 700 to 3800. The company has
also introduced a standard cell family
for application-specific ICs (ASICs),
allowing increased chip complexity
(up to 6800 gates) and the inclusion
of analogue functions.

The company is now independent of
overseas principals and competes
as it wishes in overseas markets .
Since 1985 it has exported up to'
60% of its output by volume, though
the percentage by value is less than
50%.

As regards the South African market.
every semiconductor used in locally-
manufactured telephones is now made
t The technical differences between
these process technologies need
not concern the non-electronics
reader. who should merely note
that SAMES has made. and is still
making, great strides in process
technology, which it now implements
itself. The practical differences
in the technologies are mainly
in ease of implementation. speed
of operation, packing density and
power consumption. It is the function
of ICDC to know which technology
is most appropriate for a particular
application, while SAMES' function
is to implement the technology
selected.

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by SAMES, which since 1984-85 has
saved the country money in terms
of foreign exchange. This yardstick
was used by the management, more
or less justifiably, to 'disguise
the fact that the facility is not
yet making profits, but the government
decision to bail the company out
to the extent of R19 million (which
had been agreed previously) caused
an outcry from the engineering industry
at large, while the decision to support
the electronics industry to the extent
of a further R40 million caused an
even bigger fuss.

The whole question of electronics

subsidies is considered in the conclusion to this chapter.

For plastic-encapsulated ICs produced ex-wafer by SAMES, materials account for only about 7% of the cost of the end product so the plant gives very high added value. Nafer fabrication is technically the most critical area but not the most expensive.

Assembly of the finished device is 20-60% of the selling price and testing 10-80% according to chip complexity.

In the established MOS technologies in which SAMESA competes, the plant is already self-sufficient. The adding of other technologies and shrinking to sub-micron capabilities are merely a matter of time.

SEC and ICDC

SCC is a SAMES offshoot developed from its in-house test department, which undertakes testing of devices for SAMES and IC customers at large. Initially most of its testing is carried out for SAMES, without whose needs the facility would not have been established. Over the next few years it is projected that independent testing will grow from around 30% to perhaps 80% of the total, as the facility and the benefits of independent testing become more widely known.

Integrated Circuit Design Centre (ICDC) is a formerly autonomous government owned body which has recently been integrated with SAMES. Its function today is the promotion of IC design, which it formerly carried out together with training. Both functions, today, fall under SAMES directly, but they are carried out from the same premises. and it is convenient to consider then under the ICDC umbrella.

According to Gordon Skorup, founding CEO of ICDC, "Logic and physical design are quite separate procedures from manufacture. Both are complex and can only be carried out today with the aid of a computer and the powerful programs that reside there... For South Africa it is 'desirable that IC design expertise be spread as widely as possible. Although the CAD system needed for design must be powerful (we use a VAX 11/780), design may be initiated using a personal computer and appropriate 'software. It is our function to make design facilities available to everyone and to train the industry's designers in their use.

"This approach is rapidly spreading ICDC's expertise throughout the electronics industry, despite the high cost (R5000) for the very 'intensive one-week IC design course: - which however is deductible from the cost of the first application that the customer does under ICDC supervision."

ICDC developed a semi-custom technique which forced the trainee designer to follow rigorous guidelines embodying good engineering practice which results in easily testable designs. Notable ASIC designs to emerge under ICDC auspices were the chip set for the M-net decoder, a pump motor controller IC and several applications in the area of deep-level mining, including a detonator chip not yet formally announced.

ICDC produces a dedicated electronics newsletter, ChilEs. According to Neil Frost, current and former marketing man whose brainchild it was, ICDC (i.e. SAMES) has increased its capacity to design high-volume, high-complexity chips, in addition to the low-volume, low-complexity chips which it concentrated on previously. In fact it wants to handle the full spectrum of ASIC design, in no way limited to those which SAMES can produce in house. "Obviously we will favour ourselves as regards reduction, but if we do not have the capability we will go overseas to manufacture the chip".

In 1987 it was estimated by Macintosh Consultants that the world complexity of ASICs was an average of 4000 gates. which would increase over five years to 10 000 gates. In South Africa the average is probably still under 1000 gates but is growing rapidly, as is the number of ASIC starts. To the non-electronics reader, this may appear to be exotic territory, of no interest beyond electronics design circles. On the contrary, it is regarded as the mainstream of electronics design in the nineties. when ASICs will be the most common approach; 90% of ASIC starts will be for applications that did not exist before.

In this overview of South Africa's electronics industry we have concentrated so far on SAMES and its affiliates because IC design and manufacture are central to the whole electronics design and manufacturing situation. However they do not exist in isolation./

Semikron

This is the country's only manufacturer of power semiconductors. It offers a wide range of power diodes, thyristors, gate turn-off devices (GTOs) and other device types, standard Semipack modules, rectifying stacks and assemblies to customers' requirements. The company is SA market leader as a result of manufacturing for more than a decade in premises at Koedoespoort located very close to SAMES. Local diffusion of devices has recently commenced.

The company is the only member

of the German-based Semikron group which manufactures almost the complete range of standard Semikron power devices from 1A to 2000A. Locally manufactured products account for more than 90% of turnover.

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r Heatsinks are all made locally, but some of the more technical components such as the ceramic housings of 'hockey puck' devices are imported for economic reasons. Stud devices still account for a majority of sales but they are being replaced increasingly by hockey puck devices and later, less heavily encapsulated types, some of which are South African developments.

Owing to the high powers handled, heat dissipation is a fundamental problem. A great deal of development work is therefore taking place in the cooling area. in South Africa and overseas.

Standing committee

The local manufacture of electronics, including both equipment and components, is strongly encouraged by a Standing Committee on Electronics headed by Carel van der Merwe of the Industrial Development Corporation. As regards components, the thinking is that a strong components industry is a prerequisite of a strong equipment industry and South Africa is not at the leading edge. The committee has been quite successful in marshalling the buying power of the major government departments and semi-government bodies such as SAPT, SA Transport Services (SATS), Armscor etc to give preference to locally made electronic products. Up to 10% financial preference is now given to locally assembled products and up to 25% for local designs, apart from any tariff protection which the local manufacturer may seek from Customs.

It has been rather less successful in identifying niche markets to be served by equipment built to government specification, because the electronics industry develops too rapidly for bureaucrats to make an adequate response. Plans for a government-specified computer terminal were aborted by the market moving on in the interim to PCs.

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Despite this the government is pressing on with plans to subsidise the electronics industry to the extent of R40 million, on top of a previously agreed R19 million subsidy for SAMES. How the R40 million will be spent is not yet clear but it should, in some form, go to the components sector.

It should be noted that through oversight or difficulty of implementation, the beneficiaries of government preference are equipment (rather than component) manufacturers, and it is a major moan of the components industry that there is no

incentive for local equipment manufacturers to buy South African components. Most of them do so in practice - with the overt or implicit proviso that the local components are competitive with imports!

Most of them are competitive. Indeed they are being exported successfully, but the component manufacturers feel that local preference, since it exists, should be extended to the component area.

ECMA is addressing the problem collectively, and it is expected that the anomaly will be ironed out. In a slightly different area ECMA is campaigning for increased export incentives from the present allowances of about 10% of FOB value to 50%, which would allow local component manufacturers to compete really effectively in the world market, in a way that many overseas competitors are doing. Current exports of components are considerable but possibly transient, being due in large measure to the weakness of the Rand.

In the broader industrial area, lack of knowledge concerning the availability of locally-made components coupled with unscrupulous dealers is costing the country dearly. At least so says Dr Danie van Vuuren, MD of Loadcell Services. "Imported electronic goods often cost five or six times as much

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as the local equivalent. This means that the supplier's commission will be several times greater if he sells the imported product, which he does, although he is fully aware that local products are available... It is not a question of quality or customer preference. In many fields the South African products are superior to the imported ..." How prevalent the practice is can only be guessed at, but it certainly happens to a significant degree with those components sold as accessories to larger systems,

and generally with foreign-designed equipment which is locally assembled, because it 'is simply less trouble to stick with the overseas-specified component than incorporate the local substitute.

EQUIPMENT 1

A large number of companies design and manufacture (assemble) electronic equipment, including the Altech group, Telephone Manufacturers of South Africa (TMSA)' and Siemens (main telephone exchanges), T51 and ICL (computers), Control Logic (industrial control equipment). Barlows, Grinel and Plessey (armaments), Philips, Tedalex and Tek (consumer electronics).

Major manufacturers such as Plessey continue to make major capital investments (R15 million allocated this year, up from R12 million in 1988, excluding the purchase of Alumet and in-house finance for PABX rentals). The great proportion of the investment is in manufacturing and R&D - in which context. it may be noted that Plessey South Africa. isy largely independent of the British company, and locally financed, so unlikely to be affected by the merger in the UK. though the British group may disinvest. In communications and military systems South Africa already makes most of its own electronic equipment although designs, in the case of telecom, mainly come from overseas. Recent developments include a closed circuit television camera made in South Africa (using charge-coupled devices), and the announcement of locally-made industrial laser systems (whose 'electronics' designation is perhaps debatable).

In those two areas the country is debatably self-sufficient. It is potentially so in others, most notably industrial process control equipment (the bulk of which is presently imported).

Many more categories of consumer electronic equipment could also be made in South Africa. All TV sets sold are made locally to stringent SABS specifications, from mainly imported components. For the future it is reported that the country is to manufacture TV tubes locally, in a massive, and expensive plant to be relocated complete from Taiwan. There is increasing activity in computers, but the extent of present local manufacture is low.

In large mainframe computers, production equipment of most types, sophisticated electronic test equipment and leading-edge products in general the country continues to rely on imports. Virtually any electronic equipment which is required in

reasonable quantities can be assembled if not yet designed locally. The questions are whether it is economically desirable or strategically necessary to do so? In such areas as process control, for which there is a large local market, the country should in a few years be making many more locally designed products and systems which are world-competitive. In consumer electronics and ultra-sophisticated equipment required in small quantities the country will be unable to go it alone, because it has neither the market to support it nor the technical manpower to develop it.

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Whatever the cost, it will be cheaper and less wasteful of resources to continue importing storage oscilloscopes, large printed circuit board test systems, and even top hi-fi systems with their wide variety of frills.

In 1988 the IDC announced a series of Electronics Design Awards, the winners of which are listed in Table 9.1.

Two recent talking points are the lack of a strategic plan for technology parks, which have proved excellent forcing grounds for electronic development overseas, and the increasing number of Blacks and women entering the electronics industry. (The numbers ARE increasing but the proportions are still extremely low.)

Altech

Any assessment of the South African electronics industry would be incomplete without specific treatment of Altech, the largest locally-owned electronics group. which together with Powertech and Fintech comprises the Altron or Ventron group, headed by Bill Venter. debatably South Africa's most successful entrepreneur.

Formed as recently as the mid seventies by the acquisition of STC South Africa from the disinvesting ITT, Altech and its operating companies secured a ten-year supply agreement from SAPT for main telephone exchange equipment, manufacturing the CIT Alcatel electronic exchange (as the SA 128E) in opposition to the Siemens EHSD system manufactured by that company and TMSA.

Altech also obtained exclusive contracts for the manufacture of Post Office microwave equipment, and acquired, or acquired interests in, many other South African electronic and electrical groups including SAMES, BBT (formerly Asea), Aberdare and smaller. specialised concerns such as MSN. Messina Electronics and Intergraph/Intertech.

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Altech's local content programme embraces a very broad product range, and no financial period passes without it adding significantly to its facilities at Boksburg and other factories.

results for Altech and

Powertech were excellent for the most recent period, though undermined by major problems at Fintech.

Financial

SOME FINDINGS

South Africa's electronics blanners of the seventies laid the foundations for a thriving industry which can implement systems and equipment, compete successfully in older types

of components, and sanctions so far have stimulated local manufacture, design and development. In the short term only, sanctions are not seriously threatening providing the country can obtain what it needs openly, or by the back door, but that statement exposes the contradictions of official thinking.

For South Africa's planners, a strong electronics industry is important because of its present and probable long-term importance. They have been supported for short-term reasons by officials of the laager mentality because of the country's growing political and economic isolation, and THE PRACTICAL DIFFICULTY OF IMPOSING EFFECTIVE SANCTIONS ON ITEMS AS SMALL AND DIVERSE AS ELECTRONIC components. It is certainly true, as has been said to the author, that sufficient unmounted chips to supply South Africa's needs for most types of Its for many months can be imported in a single sanctions-buster's briefcase. Even at the packaged level, it takes up little room, and the established categories are available multi-nationally from many sources of supply, but that way of thinking encourages isolation. By the same token, are SMDs appropriate technology for South Africa? Can the country service the boards? As recently as the

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mid-eighties those questions were valid. Today it is clear that South Africa, like the electronics world in general, is following the world trend towards SMD, which is tending to transform the industry from labour to capital-intensive, servicing to a matter of PCB replacement only, AND THE ELECTRONICS INDUSTRY TO AN INTERNATIONAL WHOLE. It is far more important that the country is able to source its ASIC designs internationally than it is to be able to make all components locally, which is some out-of-date planner's impossible dream. '

Longer term, assuming a political settlement of sufficient substance to return the country to international respectability, the presently thriving state of its electronics industry and the progress it has made in the last decade lead me to, believe that it MAY carry the country to the leading edge by the turn of the century. In electronics terms however, that is many generations of equipment away. It was industry rationalisation, as much as the country's political polecat status, which accounted for much of the earlier pulling out and cutting back by US-based electronics companies in South Africa (Motorola SA sold to Altech, SA General Electric a management buy-out, Taylor Instrument and Fluke reduced from subsidiaries to agency status, Apple Computers stopped supplying).

For US consumption it sounded better to blame it on the country's politics rather than increasing competition in a tight market, but it was notable that, prior to the formal imposition of sanctions, the leading-edge companies Honeywell and Hewlett-Packard were INCREASING rather than cutting back, as were the European-based leaders Siemens and Philips. Both Honeywell and HP have withdrawn subsequently, but reluctantly, HP as recently as 1989, leaving an almost-new corporate headquarters and other assets to a successor company (High Performance Systems) which Hewlett-Packard continues to supply. The European-based companies mentioned are capitalising on the Americans' withdrawal. So, increasingly, are the Taiwanese.

Today, in this technology, no country or company can afford isolation, and self-sufficiency, even strategically, is a planner's pipedream. The technology changes too rapidly, too radically and too unpredictably for even the USA, Japan or Europe to do without imports, licensing and second-source agreements. South Africa certainly cannot afford to be isolated from the electronics mainstream.

In this assessment of South Africa's electronics industry, the local capability has perhaps been overstated. It is significantly less than that of the First World electronics leaders, but far higher than Third World norms, and the South African government is well aware of its strategic importance. If the sanctions noose tightens, or even if the present level of sanctions continue, possible will be done by the South

African government to increase the capability of the local electronics industry, which is far greater than the rest of the world gives it credit for. That, however, would be a negative scenario. Far more progress will be made in practice if the government gives the political and economic climate for the industry to find its own way. and its own place in the international context. with the moves towards greater integration, SMDs and corporate rationalisation, this will involve some sacrifice of national autonomy, which in this industry is no more than illusory anyway. There remains a significant case for financial support of electronic components manufacture, as a necessary everything

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sary corollary to a strong equipment
building industry, but which compon-
. ents should be supported? The author
would hesitate to answer, although
his professional training and exper-
tise are in this area.

If the government wishes to support
electronics to the extent of R40
million or any other figure, it
is probably best that the money
be allocated to start-up ventures
on an individual project basis,
such as the proposed television
tube factory (if that is really
a wise move?). The last thing the
country needs is a broadly subsidised
(and therefore uncompetitive) elec-
tronics industry established in
defiance of economic or technical
logic for the purpose of promoting
non-existent independence in further-
ance of some planner's dream.

The success of a high-tech industry
such as electronics. is dependent
in large measure on the skills,
expertise and leadership of people
in industry, universities, technikons
and research organisations. Adequate
support of these organisations
by both the private and public
sector is considered of fundamental
importance. Strong technological
links worldwide are essential,
and must be maintained if South
Africa is to continue to transfer
up-to-date technology from other
countries. Accordingly it is vital
that South African engineers attend
symposia. visit exhibitions and
large and small electronics companies
overseas. An uninterrupted two-
way flow of information and products
between South Africa and other
countries must occur.

On the import front, it is not
uncommon for ten or more trade
missions to visit South Africa
in a year. To increase exports,
South Africa needs to send its
trade missions to target countries.
Components are particularly suitable
for export as they can be regarded
as commodities which, unlike elec-
tronic equipment, do not require
the establishment overseas of exten-
sive backup and maintenance services.

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A key factor in the equation is the
still acute shortage of skilled people.
University graduates have met only
half the demand since the early seven-
ties and the current levels of the
'brain drain' are a major cause for
concern. The roles of the technicians
and technologists are as important
as those of professional engineers,
and the output of SA's technikons
would have to be quadrupled to meet
the demands of the local industry
in the decade ahead. The shortage

of a high level of imports. We have

the quality of engineers to design and develop products for world markets". Plessey SA was regarded as a prime company within the group, which has just been taken over in its home country by GEC. The local company, which has grown at a compound rate of more than 20% p.a. is unlikely to be affected except possibly by parent company disinvestment. GEC South Africa is controlled locally by Barlow Rand and Plessey South Africa is 26% owned by Sankorp, which probably puts them in opposite camps. If that happens, a change of name seems likely.

The problem company of the industry is perhaps SAMES, which recently announced a further reduction to 2 micron capability, from the 3 micron line width which was previously the norm. That, however, seems to be the limit with its present plant. Leading-edge semiconductor plants abroad are reaching low sub-micron linewidths, to achieve which SAMES must spend a great deal more money, which is unlikely to be forthcoming from its industrial shareholders in the present political climate

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nor is it necessarily desirable for the industry to pursue that course. What is more important is that it has the capability to design more advanced chips, and to have them made as necessary by overseas plants. In other words, the pressure is pushed back on the government to achieve international acceptability, which in computers, communications, measurement and control and electronics generally is regarded as technically vital - far more so than another R40 million handout.

Electronics manufacturers are urged to address import replacement in the face of increasing sanctions and disinvestment by moving further into the high risk area of local development. The negative impact of sanctions must stimulate local industry to increase its level of control over local manufacture by economically maximising local added value. The maximising of short-term growth must be replaced by a long-term strategic planning approach emphasising local design and manufacture. According to Venter the achievable limit of 50-60% local content across all electronics sectors would require RE70 million additional capital expenditure, increasing at 10% for the next five years along with the industry. The exact figure may be questioned, but Venter, if anyone, will have his sums right.

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Table 9.1.- Membership of the South African Electronic Component Manufacturers' Association (ECMA). i

Abcordare Cables Africa	le
African Capacitors	(Pty) le
Alumel Circuits Technologies	(Pty) Ltd
ATC	(Pty) Ltd (Fibre Optic Division)
Dimbaza Capacitors	(Pty) le
Integrated Circuits Design Centre	(ICDC) 1
Industrial and Electronic Components	(PW) Ltd
MSN Products	(Pty) Ltd
PIesscy SA	le
Renal:	(Pty) le
SA Microelectronic Systems	(Pty) le
(SAMES)	
Scrcnvision	(Pty) Ltd
Semikron	(Pty) Ltd
Siemens	Ltd
STC Components	(Pty) Ltd
Suprcscraft	(Pty) Ltd
Tek Industrials	(Pty) Ltd
Telephone Manufacturers	(SA) Ltd
Television and Electrical Holdings	Ltd
South African CAD Usage	Fig 9.5
by Rand Value	

CHAPTER 10:

TELECOMMUNICATIONS is arguably South Africa's most important high-tech industry. To quote the Altech annual report, it is the key to increased efficiency in both the manufacturing and service sectors and is currently

undergoing some of the most revolutionary changes in its history.

The lines of demarcation in communications are becoming increasingly blurred. The public network is now offering services that were formerly available only in private telephone systems. At the same time, private subscriber networks are becoming more complex. They are being used by organisations to link geographically dispersed units in the same way as the public network. Stationary terminals are also becoming mobile as a result of advanced radio technology. This same technology is making it possible today to expand telephone systems in areas which are inaccessible by cable. The rate of expansion of networks for mobile telephony will accelerate, and the distinctions which now exist between stationary and mobile communications will disappear. The telephone itself will not be connected to a fixed outtet but, as a light, portable unit, will be usable virtually anywhere.

When telecom networks are supplemented by central databases, subscribers will be able to gain access in a cost-effective way to new services in intelligent networks. These services may involve anything from debiting accounts to control and credit operations or even voting by phone.

This vision of the communications utopia is perhaps not much different from other countries, but the emphasis is greater. The local content of telecommunications equipment is encouraging at 68%. The export potential of this sector has only been recognised in the last few years, but is regarded as substantial by many observers including the author.

COMMUNICATIONS

In the communications sector, exports have in the past mainly been limited to telephone equipment. In this category there is considerable potential to export a far broader range of equipment to South Africa's regional neighbours, including digital electronic exchanges, microwave and fibre optic systems, so far as South Africa can free itself from overseas licensing constraints.

SAPT

Public networks are the responsibility of the SA Department of Posts and Telecommunications, modelled on the old UK Post Office. For several years now, as its push to convert the trunk network to digital operation has peaked, the department has been under increasing pressure to cut capital expenditure. Total capex for their 1988 financial year was budgeted at R1620 but the actual was R1539 million, representing a 5% cut. The budget for the year just past was R1595 and the actual would have been close to that figure.

Spending on telecom plant is around 85% of the total. Last year it dropped from R1471 million to R1312 million, which cuts are regarded as severe when inflation is taken into account. As a result the major suppliers are necessarily turning more to non-Post Office-related business. Communications in South Africa mostly mean long-distance electronic communications, by the Department of Posts and Telecommunications and increasingly private bodies as the area moves towards deregulation and privatisation of the present monopoly services under government control. Following a study by Dr H J de Villiers concerning the strategy, policy, control structure and organisation of posts and telecommunications it is clear that the area is to be privatised into two separate businesses along the lines of the British Post Office and British Telecom.

' To this end PrT is being restructured on businesslike lines. similar to those being pioneered by Eskom, to which end the former deputy postmaster generals have been renamed general managers and their number increased from four to five. who are assisted by eight deputy general managers. About the time this report appears, an umbrella body will have been created and an Eskom-style management board; by April 1990 the two divisions (postal services and cannunications) should be operating as separate companies. Privatisation is expected to folTow "within a few years".

For 1987-88, the last financial year for which the Post Office annuai report was available, revenue increased by R201 million (4.7%) to R4465 million, while operating expenditure and approp-riations were reduced by R195 million (4.6%). CapitaT expenditure was cut back R81 million (5%). For these and other reasons there was a record operat-ing surplus of R774.9 miliion, all0wing R452.3 million to be contributed to the partial financing of capital expen-diture. Next year's forecast is R690 million - a hardiy exciting 13% up; In telecommunications, significant progress was made with the digitisation of the network, especially with the introduction of the first inter-primary digital microwave and optical fibre links. The telephone system was extended ,by 225 985 Tines to a total of 4461 907 line units. The capacity of the automatic exchange system was extended by a record number of 331 839 lines and the waiting list for telephones was reduced by 25 868 (15.4%) to 141 670. According to the Postmaster Generai (whose title may change to executive Post Office has for some time been in the process of priwat-isation and deregulation on a llimited director, the scale, but no firm timetabTe is yet given. 923 automatic exchanges were in operation on 31st March 1988. There were 167 digital exchange switch-ing units, and remote-controlled concen-trators were operationaT at 226 Sites, total capacity of these subscriber Tines, lines and 181 359 trunk lines. Further automation deoehdS bringing the units to 1031 415 731 927 junction on funds being available.

The number of inland and international call units at automatic exchanges increased by 11.2% or 1.7 billion units to 16.8 billion. A market test of cardphones was launched in March 1988, of which 100 units were to be installed on a trial basis.

The number of mobile units connected to the then new motorphone service increased by 199% to 1418.

Transmission

The transmission network, measured in terms of trunk circuit kilometres, increased 19.6% to 43 566 240, with a 35.6% increase in digital channels and 16.7% in analogue channels. The digital microwave network, which forms an integral part of the transmission network, expanded by a massive 267%. It now represents 21% of the total microwave capability.

Five additional optical fibre and digital coaxial systems were commissioned:

Ioama7 198H88

850 nm multimode 38 14

1300 nm multimode 9 6

1300 nm single mode 20 45

1300 nm single mode. 5 3

digital coaxial systems 10 -

The first interprimary 140 Mbit/sec optical fibre systems were installed.

Two of these are on the route between Johannesburg and Durban, increasing the capacity of the route by almost 4000 channels. The route covers a distance of 714 km and the systems employ 22 regenerators each.

A 2-8 Mbit/sec system was developed to meet the growing demand for incorporation into uses

of optical fibre systems the Toca network. The system either a light-emitting diode for distances up to 7 km, (LED)

Mbit/sec optical fibre systems five different manufacturers evaluated under local

These provide 7680 channels, still operating over of the 140 Mbit/sec systems. or a laser

diode for distances up to 60 km. 565 were conditions.

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strands. That is four times the capacity

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The digitisation of the telecom network has progressed further with the ordering and delivery of the first digital video codec system. This converts an analogue television signal into a 140 Mbit/sec digital signal for transmission over conventional digital transmission systems. A full evaluation of the system was carried out and a new performance objective was developed. The evaluation of video

codecs operating at 34 Mbits/sec is continuing.

Interprimary microwave routes between Johannesburg and Pretoria, Durban, Kimberley, Cape Town, Bloemfontein and Port Elizabeth, as well as the link between Bloemfontein and Kimberley, were completed during the year. Other centres incorporated into the digital microwave network were Nylstroom, Pietersburg, Louis Trichardt, Tzaneen, Edna, Christiana, Ermelo, East London and Queenstown. The digital microwave link between Johannesburg and the satellite earth station at Hartebeesthoek was completed.

A television distribution network for M-Net was provided in Cape Town, Port Elizabeth, Durban and Bloemfontein. Major disruptions to the transmission network occurred in Natal, Orange Free State and northern Cape regions as a result of flooding, but service to isolated towns was restored in record time.

Future needs

A study commenced to determine methods for optimally increasing the transmission network, which involves the evaluation of alternative routing, network surveillance and management options.

It is expected to take two years, after which a decision will be made concerning the timescale for its implementation. Capital investment required to increase network availability is high, so adequate time is being spent on determining exact requirements.

This is considered especially necessary in view of the uniqueness of the South African transmission network in terms of size and geographical layout.

DATA TRANSMISSION

The number of data transmission service connections increased 7.4% to 77 079. The number of Post Office modems leased by clients decreased by about 3%, due to the liberalisation policy whereby customers may connect approved private modems.

Service was extended to Bloemfontein and Port Elizabeth from the centres where it was already operating (Pretoria, the Witwatersrand, Durban, Cape Town and Pietermaritzburg).

7414 Diginet connections were in operation at the end of the year (182% increase).

The Saponet packet switching service network using Siemens EDX-P was fully integrated and all users linked. To meet demand the network was expanded by additional nodes installed at Johannesburg, Pretoria and Cape Town. Further nodes were being installed at Durban and Johannesburg, as well as seven smaller nodes at other centres.

Medium wavelength communications continued to decrease, as users migrated to the packet switching and

Diginet services. Two additional 144 kbits/sec multiplexer networks were put into operation between East London and Port Elizabeth, and between Durban and Cape Town.

The increase in Saponet packet switching services over the past five years is shown in the table below. Management of the circuit and packet-switching networks has been entirely transferred to Cape Town, where a 24-hour user service centre has been established.

Telex service connections declined by 5.8%, and inland telex calls fell by 11.2%, attributed like the previous year's fall to the increasing popularity of other text transmission services.

Increase of Saponet packet-switching services over the past five years (31 March of the respective years):

1984	1985	1986	1987	1988
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108	254	585	1160	2111
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5	618	9	855	20	337	40	730	62	264
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X 25links...,...m..

Logic channels...

x328	links	38	191	307	362	891
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Network users'

international numbers ., 115 258 499 311 I 136

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Teletex service connections increased 24.3% to 2671, despite which call units decreased by 19.5%.

The number of telegrams handled fell 9%.

BeTteT

The Post Office BeTteT (PreStet type) system had 6615 registered users.

including 154 information providers, 77 sub-information providers and 20 service providers who had external computers connected to Beltel via gateways. The system has a capacity for 15 000 users. Access can be gained by a TocaT call from most main centres and from smaller centres by dialling the nearest BeTteT node.

By March 1988, 117 licences for communal radio repeater station systems, comprising 7141 stations had been issued to members of the private sector.

The demand for Licences or certificates for private radio communication services increased about 8% - see table below.

A toll-free telephone service has been operating on a trial basis since November 1985.

A major X.400 ISDN research project is being undertaken by the SA Post Office Telecommunications Institute (PoteTin).

It is an integrated service which can edit, send, store and retrieve multi-media electronic mail (including speech, text and photos) in a secure and user-friendly way. Tenders for the supply of a country-wide system have been called for.

International telephone calls showed an increase of 17.7% to 20.9 million, 95% of which were dialled direct.

The demand for licences or certificates for private radio communication services increased by approximately 8%.

Type 01 station licence 1986/87 1987/88

Amateur radio station, 4 801 4 995

airmail radiocommunication 423 254 458 392

name (10813101 5 licence

(aeronautical and marine) 30 417 32 186

Ship station 3 268 3 398

Aircraft station, 2 912 3064

' Includes Cx-luzeneband. communal radio repeater stations. communal and radio bui-glalaralavrn outstations.

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The increased utilisation of fax and data equipment on the network contributed significantly to the growth in the number of calls.

An additional 703 telephone circuits were provided to other countries at the end of the year. The 4819 circuits then in use comprised 1035 satellite circuits, 321 submarine cable circuits, one radio and 3462 landline connections. 2060 international incoming and outgoing television transmissions with a total duration of 49642 minutes were handled via the Hartbeesthoek satellite earth station (up 16%). In addition to South Africa's own traffic were 732 bookings for Bophuthatswana.

Automatic telex service was extended to another 20 countries, with direct dialling to 138 of the 196 destinations

available. Subscribers made 12.9 million international call minutes - a decrease of 7.8%, attributed to the growth of fax and packet-switched data service. TeTetex service was available to 12 countries. The total of 17 779 call minutes registered represented an increase of 6.8%.

19 823 telex c3115 with a duration of 74 795 minutes were handTed by the Durban and Cape Town coast radio stations to and from ships at sea, 17.6% up. 10 844 telegrams to and from ships were also handled.

The number of international teTegrams decreased 9% to 871 890 - a continuation of the worldwide downward trend in favour of more recent services.

Packet-switched data service was avail-able to 20 countries, the 2584 160 minutes registered being an increase of nearly 30%. The number of private leased voice, data ane teTepri-nter circuits to other countries increased 33 to 480.

POSTAL SERVICES

The number of postal items handTed increased 2.4% to just over 2 blillion after a small decrease the previous

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Fig 10.2.- Telex and Teletex services
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Fig 10.4:

1983/84 1964185 1985186 198587

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year. Although the postal services were disrupted by strikes, stay-aways and flood disasters, delays were relatively slight in the circumstances. Financially the postal service operates at a loss, the deficit rising to R111 million (2.2% worse, which however was 155 down than the previous year at 14.9%). Obsolete cuiling/facing/canceling machines at Cape Town and Johannesburg were replaced at a cost of R3.3 miiiion. Letter-sorting equipment at those offices reached its design lifespan and tenders were called for replacement equipment. The large-scale cancellation and/or curtailment of uneconomic train and road motor transport services by SATS (Chapter 15) forced Posts to use its own transport increasingly. The department now conveys mail over severai routes by road. 10.2 m kg of 'surface mail' was conveyed by air over certain routes without additionai postage being charged owing to special rates negotiated with SAA.

121 900 post boxes were established at special collection points (where there is no post office) and a further two collection points were estabiished. Including those at post offices a total of 740 748 private post boxes were in use at the financiai year end.

Priority mail service is availabie at 23 post offices. The international priority mail service was extended to Zimbabwe and is now availabie to 18 countries. 1.2 million articles were accepted for priority mail, including 2400 forwarded to countries abroad. Some 44 000 priority items were received frun abroad.

VEHICLES

To handle1 the above services, the Post Office operates its own fieet of 19 638 vehicles (up by 1156). Of these 17 319 were for telecom and 2319 for postal use. Motor cycies, mainly used for mail delivery. numbered 509. Vehicie maintenance and operating costs amounted to RS0.6 miHionl up only 0.1%, mainiy due to reduction in price iof the 37.7 million litres of fuei used. 242.6 million kiometres were covered. A further 14 vehicies

were modified for use in dangerous areas.

To support these activities the Post Office employed 95 531 staff, which it makes extensive provision for training. It also operates investment and money transfer services, special philatelic services and a museum, as well the functional departments of finance, works and estates, buying and supplies.

THE SUPPLIERS

Siemens and Aitech are the two primary SAPT telecom suppliers, together with Telephone Manufacturers of South Africa (TMSA) which is jointly owned by Piessey and SEC. Siemens manufactures its EHSD electronic digital exchange system and Teitech (Altech group) the CIT Alcatel system under licence as SA 128E. TMSA makes ENSD under licence as well as most telephone instruments. Aitech is the main supplier of microwave and fibre optic transmission equipment. The suppliers share SAPT business in the data transmission area.

Private Automatic Branch Exchanges (PABX) used to be available only from a ring of approved suppliers: Siemens, STC, Piessey, SEC and SA Philips, but the market has now been opened to any supplier prepared to comply with local content rules (nine at the last count), of which Teikor is probably the most significant addition. Philips and Alcom (ex Motorola) are leading two-way radio manufacturers but there are others such as OO Electronics.

Altech

With the peaking of the SAPT telecom business, and the non-renewal of the previous ten-year exclusive supply agreements, the major suppliers Altech and Siemens are being forced to compete increasingly in the private market, with considerable success.

In this regard Aitech not only kept pace in fiscal 1989 but in many ways set it. Having anticipated SAPT's reduction in expenditure with its major suppliers, the company vigorously pursued new markets and secured a number of contracts outside its tradie

tionai areas of activity. Its programme of providing telecommunications systems to TBVC states continues to develop at a healthy pace, while execution of a major contract with South African Transport Services (SATS) for a multi-channel digital microwave network remained firmly on schedule. Added to this the company received, against strong international competition, a major order for supply of a locally-designed and manufactured optical time system as well as private sector contracts for digital radio equipment. Sales of UHF radio equipment also continued to grow. The installation at Jan Smuts Airport (Johannesburg) of a UHF Granger system using local Altech-designed interfaces is also significant.

New applications for pulse code modulation (PCM) equipment are rapidly developing in the private sector and in the local business customer network. To cater for this, Altech has successfully developed its flexible primary multiplex (FPMX) which holds the key to future digital access to public and private networks. This equipment has been designed to satisfy requirements for mixed voice, data and video services distributed both on customer's premises and within the network. It is regarded as an interim step towards ISDN, as well as being ISDN-compatible. FPMX has been successfully tendered, with a number of significant current orders.

Altech's established production of 140 Mbit/sec digital microwave radio systems, which carry 1920 voice or data channels, has been extended to to medium-capacity 34 and 18 Mbit/sec systems. These satisfy needs for a multitude of secondary routes in rural areas, as well as main arterial links for private and military networks. The manufacture of microwave antennas continues at full capacity and a record 250 units were shipped from Altech's Hatfield facility during fiscal 89. Manufacture of an extremely high frequency (18 GHz) short-haul microwave system is designed to fill the need

for quick-installation private networks, as well as feeder circuits to office blocks, computer centres and urban local exchanges.

During fiscal 89 Altech worked closely with SAPT on evaluation of various 565 Mbit/sec fibre optic systems, from which the Siemens system was selected for local manufacture by Altech as fibre optic contractor. This will enable up to 7680 channels to be carried between major cities, with a unique facility for dropping channels to small towns and communities along the route. A locally-designed and developed 2-8 Mbit/sec low-capacity

cost-effective system was well received, and this is to be extended to 34 Mbit/sec during the current year, for the local market and for export (Altech anticipate strong international demand). For many years, A'ltech's 508-18 carrier systems have been exploiting the open wire farm Tine network to provide high-quaiity exciusive service to 18 subscribers on a single pair of wires. Research is now weTT underway to extend this capabiility to as many as 36 subscribers. To cater for develop- ing areas with Jittie or no infrastruc- ture or Tines, Altech is negotiating with a number of suppliers of digital rurai radio systems to provide a Tow- maintenance service abie to operate under extreme conditions.

There was a notable demand for Diginet in fiscal 89, for which ATtech is the sole supptier. The company is also achieving volume production of a iocaiTy-deveioed new universal terminating unit (NTU) which enables SAPT to meet demands for a variety of user speeds with a singie unit. A variation of this product. is the universai baseband modem (UBM) which has been sold for operation on private networks.

for speeds1 of 64-1920

kbits/sec was introduced during the year. Trials were also successfuily completed for a Tong-iine_NTU designed to take Diginet into rural areas where onTy analogue voice channels are now avaiiabie.

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Diginet circuits are gted through the transmission network by automatic cross-connect equipment now being manufactured by the group. An upgrade to the autanatic cross-connect and remote control software was instaiied in August 1988 which has enabled SAPT to acceTerate the provision of circuits and fault reporting.

Additional work on the two-wire (NTU) is proceeding. This utiilises ISDN technology and paves the way for the provision of future equipment of this type.

During the year Aitech supplied equip- ment for more than 5000 tenninations, expanding the installed base by 67%. The company's technoiogy development (TD) efforts were aiso directed towards text and packet-switching services (Beltei and Saponet). In that regard they have developed a range of highly competitive data modens for diaT-up

access to 300, 1200 and 2400 baud services, including full software control, automatic configuration and error correction. Again, they are expected to sell well locally and abroad.

Part of Aitech's production is geared for original equipment manufacture (OEM) under contract to customers requiring equipment or sub-assemblies in this technology in which they may not be proficient.

Siemens.

Since the introduction of Siemens EHSD digital switching technology to South Africa, 183 projects have been handed over to SAPT, having a total capacity of 725 000 ports. The system fully meets customer requirements with lower than specified downtime. Numerous software enhancements have been introduced. Version C8 software has been successfully implemented in all exchanges and fully complies with SAPT specifications. The latest generation software package has been accepted and the entire network will be upgraded to this level. At the time of Siemens 1988 business report, 29 exchanges incorporated the latest update.

Business from the 'independent national states' improved markedly, in response to funds being made available by the Southern African Development Bank. Business in Namibia also progressed well and that country's first operation, maintenance and subscriber service centre (OMC/SSC) was commissioned. South Africa's first Centrex PABX was introduced at the SAPT headquarters in Pretoria. The company participated extensively in the pilot programme for ISDN which was handed over to SAPT. During the 1988 ISDN conference, ISDN was demonstrated live over the public switching telephone network. A new locally-developed Tocal call metering system was introduced from April 1989.

SAPT has ordered extensions to existing mobile telephone exchanges and subscriber capacities will be increased to about 15 000 subscribers.

The decision by SAPT to introduce further extensions to the packet switching network is an indication of satisfaction. A large order was received for a network control centre for installation in Cape Town coupled to three nodes in Cape Town, Johannesburg and Pretoria. The new ENSP system will be delivered for these projects. ENSP is much more powerful than the present EDX-P as regards speed and throughput, but both systems can work compatibly in one network.

Two EDX-P nodes were installed in Johannesburg and Durban as interim solutions to demands from the business sector for data transmission.

The performance of the EDX-P data network was further improved. EDX-S (telex, teletex) exchanges were commissioned in Bioemfontein and Port Elizabeth while an EDS system was installed in Benoni.

Local product development programmes include further upgrading of teletex

T42qp/40 terminal. The company has made preparations for a low-cost locally manufactured terminal, concerning the introduction of which the market continues to speculate.

The coaxial cable installation for the first stage of the coal line deviation project for SATS has been completed and the second stage is on schedule.

Siemens' private networks and PABX group produced 30% better sales than target, underlining market awareness of Siemens quality in an increasingly traded market. During the reporting period, SAPT deregulated the supply of cable reticulation and telephone instruments for PABX application, thereby increasing business volume. A large number of small PABX systems were sold.

The company introduced its locally-developed Venus PABX, but the most important breakthrough was reckoned to be the introduction of Netlink software packages for large EMSGOT PABXs. It allows up to five systems to be linked together to operate as a dedicated system. Local engineering efforts made international headlines with the Netlink network application installed at Anglo American Gold Mines in the Orange Free State, when the first fully digital voice network was commissioned using SAPT microwave links.

A new locally-developed and manufactured communications interface allowing all PCs to communicate via the various text/data networks has been named PC Matchmaker.

LAYOFFS

Both Altech and Siemens are successfully compensating for lost Post Office telecom business with private sector orders, including exports. Both main factories are well-equipped, as is TMSA though we have not visited the TMSA factory in Springs recently.

In practice the impact of the cutbacks has forced both Siemens and Altech (and probably TMSA) to lay off staff, many of whom had developed skills

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dedicated to the products and services supplied to SAPT.

Highly sophisticated coin-operated telephones are manufactured locally by Telkor, a member of the Reunert (Barlow Rand) group. Its activities embrace telecommunications, railway products and signalling, electronic systems, components, instrumentation and PABX. Telkor's manufacturing division at Maraisburg (Roodepoort), recently produced its 20 000th payphone for delivery to SAPT.

FUTURE TRENDS

Looking ahead, the main method of trunk transmission will be single mode optical fibre, with 1550 nanometre lasers, and dispersion-shifted fibres

for submarine and very-long-haul applications. This has inherent technical advantages, which far exceed those of traditional copper cable. They are enhanced in South Africa by the prevalence of lightning strikes from which fibre optic systems are inherently free, as they are from RF interference and unauthorised access. Authorised access can be and is obtained at the exchange and locally by the Bureau of State Security and P0 people.

Main exchanges will be electronic digital, probably Siemens EHS or Teltech's SA 128E (made under licence from CIT Alcatel). Both have been assembled locally for the last decade, but the exclusive supply agreements have not been renewed, probably because the Post Office wishes to try alternatives. The Siemens system in particular is one of the top four in the world, however, and the writer sees little reason for the Post Office to change. SAPT has decided to standardise on Siemens Telecommunicazioni 565 Mbit/sec optical fibre transmission.

Supplementing the fibre-optic network will be a microwave radio network operating at all the established frequencies, but with reduced radiated bandwidth which will be achieved by 64 QAM modulation.

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An important development,
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of switching and flexible access multiplexing now taking off in Europe.

Also of probable importance will be integrated services digital networks (ISDN) despite several slow starts worldwide. It is expected to enter the business arena via the new breed of PABXs, which will precede availability in the public network.

terms has been the

most acquisitive group in the local electronics industry, but its recent acquisition of autopage is a departure from traditional areas, underlining the growing importance of radio paging as a communications activity.

Altech in general

Cordless telephones (CTs) are not yet legal in South Africa, but the CT2 now being tested by British Telecom is also being evaluated in South Africa. If accepted by Britain and the EEC it is likely to be good enough for SA. At present they are still classed as radio transmission equipment and no licences have been issued, although some illegal units are undoubtedly

edly in use.

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CHAPTER 11:

SOUTH AFRICA's computer trade is in a state of rationalisation after producing excellent, apparently exceptional financial results last year. The embryonic manufacturing industry is probably in better shape, but is not yet a substantial force, nor would it likely exist but for sanctions and disinvestment. According to BMI, a market research firm which publishes the annual survey, the South African computer "industry" grew 47% in 1988 to R4.26 billion, but this was an exceptional figure which resulted from forward buying, 'both because of the declining Rand and fears of increased sanctions.

FIRST iDRLD?

The South African computing market is First World in its sophistication although the hardware is predominantly imported. The market - it is unrealistic to speak of an industry in the writer's view, is quite large in relation to the size of the economy. Indeed, South Africa's use of computers is extensive owing to the enliemic shortage of skilled manpower.

According to Tilman Ludin, retiring MD of Siltek, electronic data processing hardware currently accounts for 25% of the total electronics and information technology market, which is expected to rise to 30% this year. There is, of course, serious import-dependence in this sector, with EDP hardware accounting for 42% of all electronic imports. Total electronic imports now account for nearly 20% of South Africa's gold earnings, despite the considerable and growing capability of the local industry.

In the circumstances it is hardly surprising that the market was thrown into total disarray by the 1986 US imposition of sanctions, accompanied or followed by the corporate withdrawal of every US-based mainframe vendor. Most of their hardware continues to be available - for now.

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COMPUTING .

STATISTICS

Hardware sales were up 55% at R2590 million, software services up 50% to R900 million, hardware maintenance up 17% to R440 million and second hand sales rose to R135 million. Consumable supplies were not lresearched specifically, but BMI estimates they were up 25% at R75 million, and bureau sales were up a third at R120 million. According to Brian Neilson, divisional manager at BMI, growth rates for 1989 and 90 will be lower but are still expected to beat the inflation rate. Hardware sales are expected to grow

26% this year and 23% next year. Software and professional services should perform more strongly, with revenues expected to rise 45% to R1303 million this year and 39% in 1990. "This high sustained growth rate is due largely to greater use of out-house services and packaged services relative to in-house. customised programing.

This trend will stabilise in the medium term when a new equilibrium is reached"

Personal computer sales are reported to have passed the R1000 million mark. Sales of 80286 and 80386-based systems showed high growth rates. Sales for the entire PC market are expected to grow 46% in 1989. 1

Sales of Unix-based systems showed 200% growth off a low base, while the minicomputer market as a whole grew 45% to R214 million. Mainframe sales were up 44% after a 12% decline in 1987, but "In the longer term negative real growth is expected in this maturing market", according to Neilson. Banks, insurance companies and related financial services buy the most computers (34%), followed by the public sector and manufacturing sectors.

Sales from dealers accounted for 32% of hardware sales, or R830 million, up from R477 million in 1987, which reflects the move to PC-type products.

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The market for second-hand computers grew 23% to R135 million, and could grow much faster if the second-hand minicomputer market picks up speed, as more than half the respondents said they had no objection to buying second-hand kit. -

Sales of locally-manufactured computers showed little growth. but there was little available. Nearly a quarter of respondents said they would consider buying a locally-made mainframe if quality and technical skills issues can be satisfied. With the increasing concern over forex, and increasing difficulty of obtaining some imported hardware, the government is certainly encouraging local manufacture.

More important in market terms at this stage is the growing trend towards networking and interconnectivity.

This suggests that exchange of information by electronic means is becoming more common, and companies are expected to start integrating voice- and data service, which will lead to greater sales of network hardware and software. Not having received the press release, this review of the BMI findings is taken second-hand from Dataweek, but incorporates additional comment of our own. The story appeared in substantially the same form in Computer SA, Computerweek, and with additional

interpretation in the Computer Mail supplement to Financial Mail. He would additionally cement that the South African market's use of computers is sophisticated, and extensive for the size of the economy, probably owing to the endemic skills shortage. Not all computing power is well-utilised but the number, sophistication and extent of computer networks and other major applications is comparable to that in many more developed countries. Provisional findings of a previous Unix survey by EM! put the market at R200 million p.a., which seems conservative given the level of interest or marketing hype. Of the companies then involved with Unix 7% were dedicated to the operating system, 11% have some Unix applications, 32% had no applications yet and 50% of users were unaware of Unix - which should perhaps read uneducated. In any event there is a great need of user education. considering probable future penetration of the system, which is being strongly promoted in SA partly because of the sanctions threat. and the perceived portability, flexibility and user-independence of the system, which is possibly becoming an industry standard after more than 20 years. The next two years will see many new users according to Neilson. At the time 18% of industry used Unix. 16% planned to do so within two years, 30% within five years. If Unix gains widespread acceptance, however, the penetration will of course increase, with 24% planning to implement within two years. At that stage SA was lagging behind the rest of the world in Unix sales, partly because there are less small Unix systems available, and partly because of the local success of the Pick operating system in the SA small systems market.

A second Unix Expo was held in Johannesburg at the World Trade Centre - a larger venue than the hotel used last year.

ALL CHANGE

Three years ago the US computer majors controlled South Africa's computer trade. In April 1989 the last US firm quit, leaving the trade in the hands of local companies and a few European majors such as Nixdorf, which are also under increasing pressure to leave.

European computer suppliers seem less likely to run into anti-South African procurement policies in their home countries but the US market is important to them, as a result of which they are also tending to withdraw. Any scramble to acquire their subsidiaries will be less open than the battle for their US counterparts, since several already have local tie-ups.

More important than the withdrawal

of US vendors is the perceived isolation

of the country, which is perhaps more acute in computing than any other area, coupled with the highly marketable nature of computing skills. This has caused an exodus of top technical talent from the sector, so that the present trade (or industry) and market are staffed mainly by second rankers, who are neither capable of maintaining existing systems to their earlier levels of proficiency, nor innovating as extensively or successfully as in the past. As a result, despite the buoyant figures, the computer trade and market are in a state of severe rationalisation which is expected to intensify, at least until there is political accommodation. There is simply insufficient talent left to run the systems presently in place. The situation is so unstable that it is frankly highly questionable how far it is worth exploring the ramifications of the present situation, but the importance of computing for South Africa, and the whole modern world economy, dictates that the subject is taken seriously.

THE COMPANIES

According to the (South African) Sunday Times in August, the consolidation of the computer industry in the grip of four of the nation's largest industrial groups moved closer with Hurray & Roberts' decision to 'pull the plug' on its majority-owned GBS Holdings (the main Hang distributor), leaving the field clear for Barlows and their market leader TSI, Sanlam and Sankorp's Unidata and major stake in ICL, Altron's Punchline, and Anglovaal-Grinaker's merged Siltek and M&PD operations. He questioned the term 'industry' and the strength of the 'grip' of the four large groups. Former SiTtek MD Tilman Ludin who has bowed out to concentrate on his game ranch said further rationalisation is inevitable. "The industry is maturing. The big players will grow at the expense of the small companies. But that said, there will always be a place for the small man with a particular skill or the right technology". Putting it less politely, the country's computing business is in one big mess.

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The largest and probably most successful group is TSI - Technology Systems International - with turnover of R1087 million to 30th September 1988 (the later interim was not obtained). Its principal operating companies are ISM - the local IBM distributor, and Persetel - the Hitachi distributor, which will continue to trade at arms length, owing to the rivalry between the two major principals. IBM has easily the largest installed hardware base in South Africa as worldwide, despite the company's formal

withdrawal in 1986. Its hardware continues to be available from Information Systems Management (ISM), the successor company, appropriately headed by the former 18M South Africa's management, which appears to have managed the transition from subsidiary to distributor fairly successfully.

Second place contention

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. sales when combined
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The purchase price of R132 million was made up of- an absolute figure of R82 million and a further R50 million held in trust, and linked over a 5-year period with Unisys' ability to provide continuing access to technology, training, customer support etc. The arrangement is mentioned specifically because it is the sort of safeguard likely to be insisted on in future by other financially strong South African companies taking over foreign-owned subsidiaries. Financial performance was not mentioned, at least publicly, and the first subsequent financial results of the combined group were exactly as forecast. This has notably not been the case with recent acquisitions of smaller locally-owned distributors. i

The financial muscle

is provided by the Sanlam insurance group, which earlier injected R30 million into Mercedes Information Technologies (MIT), the holding company for the then Mercedes Datakor, in return for a 26% stake in a renamed holding company, now Sanlam Investment Corp (Sankorp).

Datakor moved into the computer industry big time by the acquisition of Unisys in August 1988.- the effective parent company of Unidata, which announced attributable earnings to the end of March up 136%, on turnover up 245% to R363 million as a result of the Unidata acquisition. Its distributor subsidiary Joffe Associates, grew from R40 million to R100 million, with maintained profitability. It is headed by Joan Joffe, a prominent industry figure, as is Nic Frangos who heads up Datakor.

At the smaller end of the market the most active in local manufacture is ICL, which in South Africa is a subsidiary of Malbak. Its South African-designed Series range extends from the semi-portable Elf to 80386-based Unix machines, assembled at its Aeroton facility.

NCR, which will be renamed, has been acquired by Fintech.

NCR is expected by its new parent to turn over more than R200 million this year, which gives Fintech some claim to be No 2 in the industry, though not if Xerox copiers are removed from the equation.

Punchline has also gone through a radical restructuring this year after turning a R7 million profit into a shock loss. In the resultant tidying-up operation its FutureWave graphics and desk-top publishing subsidiary has been hived off into a new joint venture with the unlisted Strider group. Fintech, the effective parent company of Punchline, has disinvested from Sequel Computers, which is expected to apply for JSE relisting after a name change.

Management and most of the staff of Punchline subsidiary Futurewave resigned following attempts to buy the company from Punchline, headed by MD Hilton Trevis. Two new computer graphics companies were to be established by Trevis and his team, provisionally entitled Nextwave and DreamHave. The latter was to be headed by Bruce Jones, former head of news graphics at the SABC.

The March 1989 takeover of Hewlett-Packard SA (renamed High Performance Systems) by Siltek followed that group's 1987 acquisition of Amdahl SA and Tran Systems from Amdahl Corp, and CMC and Medis from McDonnell Douglas. The HP range, like the other ranges mentioned, continues to be supplied under Siltek, which has recently acquired

another arm in PC-compatible distributor M&PD. Whether Grinaker and Siltek can keep adequate control of all that remains to be seen. If they can, and there are no unpleasant financial shocks, the group should overtake Datakor as No 2 in the market.

Control Data and Amdahi,
pow 'puilled together under Grinaker's
, Siitek group as Corporate Data Controi.
which now heads up
to Cortech, a subsidiary of Unidev.
CDS, with a turnover of R43 miiiion
is going through severe restructuring.
Problems cane to light after a manage-
ment buyout in April supported by
Finansbank, which was left with a
large shareholding so instailed its
own men as managing and financial
directors.

As we went to press 685, which turned
over R60 miiiion last year, was fighting
for existence by way of a possible
management buyout and/or repurchase
by Martin Hammerschmidt, who took
the company publiic but left at the
end of last year. When M&R pulied
the plug, 685 staff were left unpaid,
which is not M&R's usual style. It
seems probabie there was misrepresenta-
tion or, at the least, gross ineffic-
iency. The chances of successful rescue
were considered no more than even,
with Hang itseif in a loss situation
in the States, but backing was "confid-
ently expected" from both Hang and
Mitac. An estimated R10-15 miiion
was needed to keep the company afloat.

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SANCTIONS

Though the US companies mentioned s
have withdrawn corporately from the
market, their hardware continues to
be avaiiabile at this time. With reducing
security of supply, however, as US
customers, iegislators, shareholders
or management become increasingly
tough in their attitude towards South
African trade. Because of this there
is an increasing tendency for South
African users to iook for aiternative
sources of suppiy, and to purchase
non-US hardware where possible, whether
British. European or Japanese, and
for the local vendors to make increasing
noises about iocal manufacture (which
with few exceptions are regarded as
little more than hot air).

Fig 11.1 and 11.2: Structure of the
South African computing industry so '
far as the Comeuter Mail supplement
to Financial Mail could piece it toge-
Siemens, a European market leader. met in "89' The Charts "'5 already-
confinees its iocal computing sales
mainly to specialised industrial markets
outdated In several significant respects
but the situation is so fluid that
they are not thought worth updating
properly at this stage.

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such as CAD/CAM and process control.
Another German-based computer company,
Nixdorf, whose own products are mainly
smali and medium-sized office computers,
is new marketing Hitachi IBM-compatible
mainframes as upgrades for its 8890

user base.

ICL is also prominent, but large main-
frame competition to the US majors
is mainly provided by the Japanese,
IBM.

Fig 11.3.- CAD plant

design by Brian Gourlie.

then of EMS, c 1984/85

(original in colour).

which partly accounts for Japan moving
up into the position of South Africa's
No 1 trading partner.

This is seen as essentially a short-
term expedient. If the US leans on
its trading partners in the Far East
and Europe to the extent that all
of them stop supplying large computers,
then South Africa will be in trouble,
since it has neither the technical

Capability to demon or produce Targe computers;- nor the market to support ' their economic Tocal production. That is the conventionai wisdom, but is it true? The major groups into which the South African computer indus-try is rationalising certainly have the financiai muscle to compete actively in arge computers, and T51 at Teast seems to be moving in that direction, with ICL hot on its heeis. Such a development is considered quite probable within the context of a prolonged economic siege - even probable if open sources of supply are cut off.

LOCAL MANUFACTURE

Tim Schumann, formeriy MD of Skok Systems, the leading iocaliyy-based CAD suppiier, has left the company for Technology Systems Manufacturing, which as the name impiies is the manu-facturing arm of Technology Systans International, the Barlow Rand computing group, whose operating arm is Interna-tional Systans Management (ISM), the IBM distributor since Big Blue pulled out corporately in 1986. TSM is cTaimed to have invested more than R35 miiiion in Tocai manufacture. the first fruit of which is an IBM-compatib'le mainframe, designated MF100 announced in June. It is based on System 370 architecture and ciaims more than 50% local content - which is probabiy as much as any local manufacturer has achieved. It consists of three central processing units (CPUs) arranged in a parallel, fault-toierant cluster, running at about 3 million instructions per second (Mips). It can handle up to 17 megabytes of memory and 16 input/output (I/O) channels. It is aimed at the Tower end of the mainframe market and does not require a speciai environment. It is aimed at the first-time user, and is initially a iow-cost machine, which can be supplied with public-domain software. It should be noted that TSM makes no claim to self-suffic-ency, nor is it reaiiyy in prospect. Standard System/370 peripherais may be attached to the system including the latest direct access storage devices and magnetic tape subsystems. Some imported peripherals must be, since

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South Africa does not make keyboards, disk drives, tape drives or displays. The TSI group has been investing in manufacture for more than six years. Other products inciude the 0X mid-range systems, TOAM educational terminai and IBM 3270-compatible terminals, but the Tocai content in aii cases is low. The company declines to name the sources of its components.

ICL South Africa markets its own iocaliyy deveioped PC and Unix compatibies which are more-oreiess iocaliyy manufac-tured. The proviso is necessary because the local content amounts to iocal

assemblies (from predominantly imported components) of selected printed circuit boards, and screwdriver-assemblies of the system using local and imported boards and other components and assemblies imported in kit form from the Far East, and complete system checks. The local content is low but increasing, amounting to a genuine attempt at local manufacture over time. Quite sophisticated electronic test equipment has been installed in the ICL factory at Aeroton, where the system and some of the sub-assemblies are 'engineered' to local designs.

Strong demand for its P05 recently led ICL to double the production capacity of its Aeroton plant, which was reported in April to have a capacity of 4000 units per month, mostly of the lower end Eif range.

The value of EDP exports for 1988 showed a marked increase off a very low base, a significant proportion of which derived from export of locally-manufactured PCs. Most companies claiming local design or content are simply trying to cash in on the country's understandable desire for self-sufficiency in this highly strategic area in which South Africa is lagging. Even were the motherboard and all subsidiary boards to be locally assembled (and many are not) the system would not be manufactured to self-sufficiency. The only true South African content is the case and some

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of the printed circuit boards, and the checking out of the overall system, which is sufficient 'ly 'South African designed' to give ICL the largest share of the local PC market.

There are several 'South African designed or branded PC compatibles, and some genuine South African designed and manufactured hand-held computers for such applications as shop-floor data collection. One example is Oscar - winner of the bronze award in the IDC's 1988 electronics design competition. There are also South African

upgrades for overseas-designed systems such as a slot-in 'transputer' card developed at the new Steilensbosch technopark which - with specially compiled software, "can make a PC up to 30 times more powerful than a standard AT". While the transputer card costs several thousand Rand, 11'.- is said to offer an unbeatable price/performance ratio. In certain applications it is said to allow an IBM-compatible PC to perform on a par with mainframe equipment costing R1 million.

The card is being manufactured by ESD, a member of the Barlow Rand/Reutech group and marketed by Reutech subsidiary Saco Systems, who will use the card in certain of their access control and security systems. Strong demand was thought likely, from computer industry OEMs and upgrading users. Technology Systems Distribution signed an agreement with Seikosha of Japan announced in January which permits the local company to assemble computer printers. Local assembly of two mid-range models has commenced at the group's Midrand facility.

A Taiwanese was recently reported to be investing R7 million in a computer assembly plant at Richards Bay. Prowtec Computers SA, headed by Yun Yuh Kuo was reported to be setting up for 1500 units per month, of which 33% would be exported, though not under Prowtec's Procom label. Rodney Brett is MD of the group's SA operation, which also includes an adjacent clothing factory. Factors which were reported to have influenced the group's decision to set up at Richards Bay were already trusted connections (the plant was opened by SA's Defence Minister), decentralisation and export incentives, the potential of the domestic market and exchange rates, as well as the "onerous" quota system imposed by the US on exports from Taiwan. "The secret is to export from a country which has no quota imposed on its output, generally Third World or African countries" explained Brett. Prowtec has an offshore manufacturing plant in Mauritius, and other undisclosed marketing routes.

PULLED BACK

While local companies set up assembly lines to make PCs from imported components, Olivetti Africa has chosen to cut back. The move was reported in January and was regarded as unexpected in view of the company's long history of assembling business machines in SA. It is thought to reflect Olivetti's cutting back and/or restructuring in computers worldwide. At the time the cutback was announced, Olivetti claimed to hold about 15% of the local PC market. are moving to

Whatever the exact percentage, it held a significant slice, as a result of which it began assembling four years ago, and it had achieved about 40% Tocai content. Its strategy was based on the expectation that the government would put out a specification for locally manufactured PCs, which however has not happened. According to the Tocai MD, it is cheaper to import PCs from its fully-automated manufacturing plant in Europe. It is also faster, and allows the group to maintain better control of quality - an important consideration in any circumstances, but perhaps particularly so in Olivetti's case, as a vendor of premium products.

Nedbank, which claims to run the most cost-effective computer systems in SA banking, has recently changed from Unidata to Olivetti terminals, of which it expects to install at least R50 million over five years.

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SOFTWARE

While South Africa is importing almost all its own computer hardware at this time, the country is doing much better in the area of software, which has to be more or less tailored to local needs and regulations. Not only is it developing a great deal of software for its own needs, but much of the more transportable software is being exported, ranging from more or less amateur offerings such as Labels and Pink Software's TurboCAD, to highly professional systems such as those of AT&T in the engineering field. Probably a majority of local offerings are at PC, micro and minicomputer levels.

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Productivity Software is reported to be undergoing restructuring to consolidate the Computer Associates distributorship.

South African software is exported fairly widely, for example Syspro's Impact software for the Unix manufacturing environment. It was entirely developed in SA but is now available in the US and a growing list of other countries.

APPLICATIONS

South Africa's computing applications are, perhaps surprisingly, as advanced as those of most First World economies of equivalent size, and more advanced than many. In banking, for example, its automatic teller machine (ATM) networks are national, and they mostly work, despite far-from-perfect telephone communications. Apart from dispensing cash they provide immediate information as to the status of accounts, including temporary statements. with on-line updating of accounts and other goodies. One of the most impressive is Standard Bank's phone-in feature which allows money to be transferred to third parties so obviating the need for cheques, perhaps entirely in the long run(?). Within the banking system and branches there is extensive use of office automation (OA) networks, which are becoming increasingly established throughout the financial sector.

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In general it is observed that South Africa's computer networks are as sophisticated and extensive as those found elsewhere, and they have been leading edge. Whether they will maintain that prominence, or whether the existing systems will even be maintained to an adequate standard with the increasing manpower shortage is very doubtful.

INDUSTRIAL COMPUTING

What constitutes industrial computing? There is no clear definition, so it varies with the interests of the vendor. Most computing applications are financial, and the financial sector is

highly computerised, in South Africa as elsewhere. 50 are the accounting functions of the leading industrial companies. Their computing activities, however, are today being given an increasing industrial bias by the addition of stock and inventory control, production planning, manufacturing resource planning (MRP) etc. Most South African industrial companies of substance are at least starting to implement such schemes, in which they are perhaps Tagging First World norms.

Industrial computing, computer-aided design and drafting (CADD), computer-aided design and manufacturing (CAD/CAM) and computer-aided engineering (CAE), computer-integrated manufacturing (CIM), process control computing etc are passing through a period of very rapid growth in South Africa, as in the world at large, greatly stimulated though not started by the advent of the microprocessor and PC.

HiTe the PC started Tife as Tittle more than a toy for the hobbyist, the IBM PC, its upgrades and imitators today have become entirely professional, at least for the purchaser prepared to pay a premium price. In the industrial area they differ from mini and mainframe computers mainly in their ability to put computing power on the desk of the individual engineer or manager more cost-effectively than in the past, rather than restricting it to the elite who justified dedicated terminals to the single, centralised computing facility round which the organisation tended to revolve. The PC, of course, is frequently used in a terminal mode, which may be necessary to access database information, or technically to enhance the power of computing available to individuals. The fact that it can operate independently is highly significant, however, reinforcing a trend towards corporate decentralisation.

Certain technical applications of computing involving the generation of complex shapes or the simultaneous performance of large numbers of calculations necessitate a great deal of computing power, in South Africa as elsewhere. Where this is a requirement, it is mandatory to access the mainframe, but the number of such applications is few in South Africa. Much more prevalent is the need to access the central database.

Central computing has its place in industry. It is greatly enhanced in usefulness by networking, but in engineering, general industry and commerce in South Africa that is not where the greatest computing load is situated, nor where the greatest technical advances are being made. They are taking place today on the desk of the individ-

ual engineer or manager, whether his function is design and drafting (CAD, CADD), translation of the drawing into manufacturing instructions (CAM), measurement, control or simulation of manufacture or process, predictive maintenance, control of maintenance scheduling, integration of any or all of these functions (CIM), or limited to traditional industrial management. Virtually all the established hardware comes with specialised industrial and technical software, an increasing proportion of which is locally produced. In the last five years there has been a veritable flood of new CAD offerings, mostly resident on the IBM PC, its compatibles, 'clones' or upgrades. From the offerings of vendors such as Pink Software (TurboCAD) which is little more than a 20 add-on to home PC systems, to dedicated workstations accessing the largest computers, computer-aided design and drafting are, or are

norm.

rapidly becoming, the

In South Africa the top of that market is still very largely the province of Intergraph, despite its corporate withdrawal and the renaming of the successor company (now Intertech). More or less elaborate Intergraph systems are installed by almost every major industrial user in the private or semi-government sector. Whether they are being fully utilised is another matter.

Lower down the scale - at the bottom of where the market was before the advent of the PC, Skok Systems is still prominent. It is dominant in the local architectural field, as well as having a solid industrial base. Originally designed to run on HP desktop computers and nowadays on IBM PC compatibles, Skok's locally-developed 20 systems have been extremely popular but are now suffering severe competition, while the company has changed hands for a second time. Between these two, probably the most prominent vendor is CAD/CAH Systems, formed by Ron Elvin, then of BarlowCAD, from whom they acquired the Computer-vision (CV) agency. They have since added other lines.

A large number of vendors are fighting for the balance of the market, among whom CADart Systems (AutoCAD), ProCAD (ICL), Vector Graphics (Graftek and Caddie) and PNI Computers (Autotrol) are prominent but merely representative. Allyson Lawless Systems (Aichad etc) is most prominent in civil engineering. PC impact

It is the availability of the PC, and its ability to handle CAD-type programs, which has led to this proliferation of offerings, not all of which are sufficiently powerful for serious

purposes. The PC itself has insufficient memory to accommodate very sophisticated programs, which has led to progressive upgrading to totally professional stand-alone workstations, which may or may not be linked to others or to a mainframe.

Intertech today offers desktop stand-alone systems which are entirely professional. It was, apparently, the ability to manufacture these locally, rather than the local dominance of Intergraph's large systems which led Fintech to purchase the company on Intergraph's withdrawal. Technical support from Intergraph is ongoing and not all one way. Intergraph and Intertech products are heavily involved with mine mapping in South Africa, which Intergraph should be promoting in the world mining market.

On the engineering front, South Africa is lagging in certain areas such as the depth of CAD/CAM penetration. However this is perhaps as much a function of the small size of the market, necessitating less automation, than of inability to implement sophisticated systems, or any psychological holding back.

Automation drive

On the contrary, the First World industrial economy suffers so severely from skills shortages that it is automating so far as it is able. The large private industries such as the mines feel some corporate responsibility for employment,, but this is not characteristic of industry in general. On the contrary, the severe industrial unrest of 1987 and the ability of workers to call major strikes for essentially political reasons is leading to a disquieting trend towards automation at the expense of employment. In this the computer is playing a prominent role.

On the technical level, South African industry is as computer-conscious as that of most countries and has developed many applications, of which the following are merely representative: t Harnischfeger, manufacturer of mechanical shovels and other machinery for open-cast mining etc, is using finite element analysis for design of individually mine-matched dippers. They are reported to give up to 20% higher fill factors, more efficient truck loading in fewer passes and lower maintenance costs.

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i Control Logic has developed a Conet local area network for in-plant process control. It supports up to 126 nodes at distances up to 10 km. The token bus network is being used for mineshaft monitoring, in-plant data acquisition and other duties

" AECI Process Computing

developed the Cygnus and microCygnus ranges of process control computing hardware and software which has been widely installed in South Africa.

It is now looking for exports.

1(APC) has

1" Hestplex Computer Systems have developed their own Measurecomo PC-based

instrument system which is one of the most advanced available. Up to 14 instruments from Nestpiex or other manufacturers can be integrated using a single system provided they can communicate via the general-purpose interface bus (GPIB). One of the first customers was ICL South Africa.

it Allyson Lawless has recently introduced Version 2.0 of AllyCAD, which runs twice as fast as before. The company has also linked up technically with Syspro's locally-developed production, distribution and accounting control system.

t Dolly's Hire Spark, specialist injection moulding tool and die maker, has become the first South African company to link a numerically-controlled (NC) machine directly to a CADkey computer-aided design and drafting system. locally supplied by Intamarket.

t ICL South Africa has launched a local manufacturing system; CLASSICL, to run on its Unix range, and a series of engineering workstations marketed by subsidiary ProCAD.

i Hitep has introduced a computerised reliability-centred maintenance (RCM) system based on an Expert Systems shell.

Other locally-developed computerised maintenance management systems are available for example from P.E Corporate Services. The country is particularly advanced in their application because of its political isolation and geographical distance from foreign sources of supply.

While CAD is being used for an increasing range of manufacturing tasks, it seems to work best in South Africa (and probably worldwide) in more-or-less standard product manufacturing situations such as electric motors or circuitbreakers. Circuitbreaker Industries (formerly Heinemann/Fuchs) has recently installed a Graftek system which is fully employed.

Most of the major engineering consulting firms have installed Intergraph equipment but are not yet using it to their full, perhaps because there is still no integrated 3D plant modelling system available off the shelf from any supplier. Vendors may deny that, but in practice users must expect to customise standard software to their specific needs.

The standard example seems to be this 30 plant model, designed on Intergraph by Brian Gourlie as long ago as 1985 when he was EMS Engineering's operations manager. It was still being proffered by EMS 'proof' of their sophisticated CAD usage four years after Gourlie had left.

Since EMS Offshore is the main contractor for Moss gas its competence is of some national importance. One wonders which government minister was conned,

or does the firm restrict such attempts to the technical press? In fact its competence is believed to be no worse than that of South African industry in general, but it is demonstrably no better. It would be wrong to single out the incident, except for its characteristic nature, and the importance of the Moss gas project.

TOUARDS SELF-SUFFICIENCY

South Africa is presently working hard towards increased computer self-sufficiency, in which it is helped by the worldwide trend towards smaller systems. Whether that will be sufficient to give it self-sufficiency in the strategic sense is very doubtful; but the attempt is certainly being made.

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As regards local content, Tilman Ludin, retiring MD of Siltek has a slightly different view. If it was to be improved by 10% in the computer industry to a possible 46% of market value, then local production would have to increase by R220 million this year. "If one considers other sectors as well. in an attempt to increase local value in an industry worth R12 billion in 1990 and growing at an annual rate of 20%, then every 1% of local value increase requires R30 million in investment capital. The achievable limit of perhaps 60% local content across all electronic sectors will require an additional capital investment of at least R270 million p.a., increasing at 20% p.a. for the next five years. Added to this, the capital required to maintain present facilities brings total demand up to R350 million for the next five years."

Ludin contended that the time is long past when one can afford to gather groups of interested parties, arrange workshops and attempt to reach consensus among industry leaders. "Those who are bold enough now to commit themselves to a plan of action will be the long-term winners," he said.

Tenuous links

At least 50 US cities have some form of ordinance prohibiting business with companies which have a direct presence in SA.

Most US computer companies have continued to supply equipment to SA through their former subsidiaries which now act as distributors. High-profile vendors such as DEC, Apple Computer, Lotus and Sun Microsystems have never had subsidiaries, and do not supply directly, though their products are generally available via third parties. Digital Equipment Corp (DEC) is the most prominent minicomputer specialist worldwide. Its VAX and PDP computers have been purchased abroad directly by many South African customers. They are also available locally from at

least three South African distributors,
but DEC has never been represented

in South Africa officially. Apple pulled out from direct representation despite which its hardware continues to have a following, particularly among desktop publishing (DTP) users. Its absence of direct representation today is debatably holding the SA DTP market back.

Of the European-base computer companies, ICL is now wholly South African, 46.5% owned by Malbak, 48% of Siemens is held by Sankorp (Sanlam) - the financial muscle behind Unidata/Datakor, as well as Gencor and the IDC, and Sankorp has 26% of Plessey SA. Olivetti, Nixdorf and Philips are unattached to local financial groups at this stage.

Larger systems

ICL is looking at possible manufacture of larger computers on a continuing basis. So is Siemens. As discussed more fully in Chapter 10, Siemens' ENSD digital electronic telephone exchanges are being manufactured for the South African Post Office at Haltloo (Pretoria) which includes the central computer of the ENSD system, which is comparable in size and complexity to a medium-sized general computer which we could manufacture here though it would not be commercially worthwhile? The quote is from Dr D Botsch, then 30int MD of Siemens Ltd.

Instead, in the DP area, concentrating at that time on local manufacture of the MTSZ100 terminal, which was locally designed to a specification by the South African Standing

Committee on Electronics. though "He will be seeking overseas as well as local markets" said Botsch.

Exactly what the position is with terminals being increasingly superseded by PCs is unclear, though a strong indicator may be seen in the fact that Siemens has a large local shareholder which is now a financial backer of the local computer industry. With the falling away of the exclusive Post Office supply agreement it seems probable that the excellent Haltloo factory will be redeployed increasingly for computer manufacture directly, whether or not ownership is transferred.

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corporate

South Africa dare not write off companies who have disinvested from South Africa in this sector so dominated by big US names. Either more hardware will be withdrawn, putting real pressure or at least great inconvenience on the SA economy, or the producers will reabsorb their South African distributors when sanctions are consigned to history, unless by that time the distributors have alternative local sources of supply. With developments now taking place, it is considered

ntirel robable that South Kfrica
 e
 will Hevelog at least one worla-class
 comguter range! which wi i e y
 be rea y or marketing a out the time
 that sanctions are taken off. If it
 is to be of more than academic interest
 however, it must have access to the
 world market, not rel on. the rotec-
 tion 0? tarit? walls which are no
 true rotection, rather the ensure
 that the developement will sta% uncoer-
 titive. South Africa's e ectronics
 industry is well capable of achieving
 technical maturity, and contributing
 significantly to the world technology,
 though not of self-sufficiency in
 any meaningful sense.

It remains obvious that the EDP sector
 has the largest impact on foreign
 exchange and is the most vulnerable
 to possible curbs on imports.

Fig 11.4

Vertex Electrical Engineers

Salary Survey

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Scum: Verlu Annual Salary Survey

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CHAPTER 12:

SOUTH AFRICA's First World sector,
 at least, is fairly well-served by
 modern, fairly efficient transportation
 embracing the normal internal road,
 rail and air services. The road and
 rail networks extend into adjoining
 territories which, however, are less
 developed in that regard. It may be
 noted at this point that many of the
 country's . regional neighbours are
 dependent on South African road and
 rail transport for the import and
 export of their goods, without which
 the economies of several states in
 the regionl would collapse. It is to
 South Africa's credit that it allows
 this, up to and including the free
 movement of South African rolling
 stock on neighbouring states' internal
 railway systems, whatever anti-apartheid
 stance that country publicly takes.
 South African Airways, and most of
 the major European airlines operate
 regular overseas flights, but the
 US has banned direct flights to and
 from the Republic. Heavier goods are
 transported to and from South African
 ports, principally by container, while
 bulk carriers export coal, iron ore
 and many metals and minerals. Most
 of the oil consumed is imported by
 tanker as crude oil. The last Union
 Castle mailship carrying passengers
 overseas sailed from Cape Town in
 the early seventies. There are, today,
 a few passenger berths on cargo and
 bulk carrying vessels, but commercial
 overseas passenger services are restric-
 ted to air services today.

. MOTOR INDUSTRY

South Africa, like many other countries, identified the motor industry as an engine for economic growth. and encouraged its establishment in South Africa in the 1960s. Very high duties, now amounting to 110%, were placed on imported passenger cars, to escape which they had to comply with local content rules.

TRANSPORT

In 1961, when government first stepped in, local content amounted to 14% by weight of 'SA-produced' cars. By February 1989, when the government changed the ground rules, it had risen in stages to a minimum of 66% by weight. Because the measurement was by weight, the motor companies concentrated on manufacture of bodies, engine blocks and other heavy components, importing the more technically-demanding sub-assemblies and components which are now subject to 50% duty in the case of seatbelts, gearboxes, shock absorbers and windscreen wipers. This encourages some local manufacture, but insufficient to satisfy the authorities, who are now demanding 75% local content by value. Manufacturers must achieve 55% by value in the first year, rising in stages to 75% by 1997.

The motor industry has high media exposure, and its combined profits last year amounted to around R500 million. Partly as a result, and partly because of the strategic importance of the industry, several of the manufacturers and their major suppliers have been hit by damaging strikes aimed at forcing up wages. In June, when the subject was thoroughly aired, basic starting wages ranged from R4.50 to R5.40, with similar differences for other grades. Cosatu-affiliated National Union of Metalworkers (NUMSA), which represents 20 000 of the industry's workforce of around 37 000, wanted a minimum starting rate of R6.58 from July, which the industry said categorically that it could not afford at a time when it must invest heavily to comply with local content programme. There was also some question whether bargaining should be for the whole industry or (as the manufacturers wished) at plant level, as a result of which the plants were hit by individual strikes. At the end of the day, a national minimum wage level was accepted but certain plants agreed to pay more. so the industry has a

twocotier future negotiating structure.
 embracing national minimum wages and
 xindiyyidyal piant bargaining.
 The Phase 6 local content programme
 coming into force allows the manufac-
 turers to balance foreign exchange
 spending against exports and completed
 vehicle production values. Thus BMH.
 which exports vehicles in some quantity.
 is allowed to import more componentry
 and still comply with local content
 rules. The arrangement seems complicated
 but in fact mereiy recognises the
 international nature of the world's
 motor industry, where South Africa
 can achieve a degree of autonomy but
 not self-sufficiency in any meaningful
 strategic sense. Production stoppages,
 according to Financial Mail, have
 exposed a major ?Iaw in the system.
 Industry officials estimate that some
 manufacturers have lost up to R2 million
 per day because, during stoppages,
 they continue to pay duty on imported
 components and technoiogy. for which
 they were unable to buiid the vehicies
 to earn the rebates. They reckon that
 each day's Tost production reduces
 a company's local content level by
 0.5% in tenms of the formula, or 4.5%
 for nine days' stoppage in some cases.
 In theory the penalties incurred should
 of course be recoverable later but
 that is not cIear under the present
 rules, which were implemented first,
 regardless of possible tidying up
 needed Tater. Another ananally is the
 question of inciusion/exciusion of
 after-saTes parts and accessories
 (originally to be included, now excluded
 due to difficulty of impiementation
 and, debatably. the inflation effect).
 A more serious cause of inflation
 is probably the rise in price of the
 vehicles as such (Fig 12.2).
 The National Association of Automobile
 Manufacturers (NAAMSA) says the industry
 cannot economicaiiy achieve more.
 The National Association of Automotive
 Cunponent and Allied Manufacturers
 (NAACAM) say they can achieve more,
 perhaps 80%. It is of course possible
 to acieve 100% if containing cost is no
 object, but the price tag is too high.

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"Besides the fact Q: the size of
 our market is too small to allow the
 required economies of scaie, there
 are tremendous benefits in being a
 follower rather than a Teader", said
 Nico Vermeulen, director of NAAMSA.
 "You don't carry the samel risks, but
 you have access to the Tatett technolo-
 gical innovations. Reaiisticaliy,
 the SA industry will always ireiy on
 overseas automotive technology and
 design, and imports of speciaTised
 vehicles which attract Tower duty.
 Thus singTe-seater racing dars attract
 only 30% duty today, hearses 20%,
 and fTame-proof mining vehicles are

free of duty. 50 are tractor gearboxes, which SA is not yet capable of making. The South African motor industry peaked in 1984. with sales of more than 300 000 vehicles. This was expected to grow further, but following the Rubicon speech the reverse happened. The projected figure for 1989 is around 210 000, which is expected to drop a Tittie Tower in 1990, before perhaps picking up in 1991. Meanwhile the cost of new cars continues to rise, and the industry continues to rationalise. The present line-up of manufacturers comprises Samcor, Delta, Nissan, Toyota, Volkswagen, BMH and Mercedes Benz. Samcor produces Mazda and nFord cars, and Mitsubishi commerciaT (no Mitsubishi cars at present), whiie Delta is the successor to General Motors. The Japanese and German manufacturers mentioned produce itheir own brands. in addition to which Mercedes Benz South Africa assemblesi the Honda Ballade range, which has acquired a noted up-market image by aSsociation. A South African designed and built car with GRP body is the 4-cylinder_1800 Beira, manufactured in Benoni at a target rate of 40 per month. Another company in the Beira Industries group is turning out 60 caravans per month, as well as leisurecraft and other GRP items. LocaT content is claimed to be about 90%, with the engine and other unavaiiable components imported. The initiai sports model is shortiy to be supplemented by a vehiclesv

M

. market, convertible and a 5%. The vacuum-formed body is reported to be hailproof - a decided advantage on the South African highveld, where overseas body designs are frequently haiT-damaged. Not onTy passenger cars, but commercial vehicle sales are rocky, though less depressed in general. Monthly figures are produced by NAAMSA showing sales of cars, Tight commercials, medium cmnnercials and heavy commercials separately, as well as a breakdown of sales by manufacturer. Toyota is the Targest producer today, and Japanese cars in general control the volume while the luxury market is served primarily by the German firms. In medium commercial vehicles there is far more standardisation than in cars, since all manufacturers are obliged to use the locaTTy-made Atlantis diesei engines and AS transmissions. The Tatest ADE additions are the 360 and 440V series, but the company makes a wide range, which bis accepted as 100% local content for compliance with the Phase 6 programme. ADE recently commissioned a R24 million computerised fiexible manufacturing ceiT - the first in Africa - to manufac-

ture the new engine ranges.

Local car engine and gearbox manufacture are Tess advanced, amounting in most cases to no more than machining of the engine block. Tyres of most categories are locally made, by BTR Dunlop, FSI-controlled Gentyre, Fedvoiks-controlled Firestone, and Goodyear - recently acquired by ConsoT. The R2 billion tyre market is fairly evenly shared by the cartel.

The strikes in the motor industry in the first two weeks of August were estimated to have cost the industry R350 million. Not only the manufacturers but the component people were affected, including Goodyear which fired 1200 workers. The tyre company had stopped work four weeks earlier than the vehicle manufacturers owing to a dispute in connection with the US parent's disinvestment from SA. Dorbyl, which supplies 30-35% of the industry's components avoided a strike at that time. With the move towards increased component content sparked off by the change-over to value-based Total content programmes, the motor components industry seems set for relatively good times - possibly boom times if it can control labour unrest. A typical supplier is Metair, which manufactures and distributes shock absorbers, springs and stabilisers as well as other components. The company is financially conservative, but produced good results in 1988 which were 18% up at the half year to 30th June. "At Least" maintained improvement due in second half. Motor vehicle distributors were largely maintaining profitability by tight financial control.

The first locally-made emergency braking was recently demonstrated by TwinTech, based on the Australian design of Bob Kershaw, modified for local conditions. About the same time there was widespread concern over the sale of possibly inferior brake components, due to a spate of accidents involving runaway vehicles.

With the rapid increase in costs, remanufacture has become normal practice in the heavy transport sector, from which it is filtering down to smaller vehicles. Some major companies, in particular Propower Diesel (NEI Africa Group) are specialising in remanufacture - by implication a more complete process than reconditioning.

ROADS

The Department of Transport is responsible for maintaining and the trunk road network, which it SHOULD finance by way of a levy on fuel. In practice the levy is diverted towards financing the Mossel Bay project and the AECI synfuels project to follow, while trunk road repairs and extensions are being financed to a high degree by the establishment of toll roads,

which are drawing increasing criticism.
Two companies, Toicon and Toiway,
seem to be set up to operate private
toll roads even before the legislation
has been approved. In fact it is running
into so much opposition that it seems
very possible it will not be approved,
145
extending

in which case the country can look forward to state-run toll roads. it appears to be a case of one or the other.

Since 1975 the Department of Finance has been steadily reducing the funds allocated for road construction and maintenance, for which this year's figure is R2.2 billion, down 3% in Rand terms and 18% allowing for inflation. As a result the question may well be asked when the road network will fall into disrepair from neglect? The sum allocated will be divided between the Provinces and SA Road Board and used to finance some 400 projects throughout the country. Fig XX shows the amounts handed by private contractors which have varied widely. The 1988 figure includes private toll road work of about R75 million. Concrete surfacing is currently being provided on heavily-used roads such as the Ben Schoeman highway between Johannesburg and Pretoria. The cost is comparable to that of black-topped roads, but choice is based on other considerations such as technical performance and relative freedom from maintenance. A service life in excess of 25 years is forecast, with increased road safety.

SATS

Most of the state-run transport activities fall under South African Transport Services (SATS), which operates the railways, harbours, airways, the oil pipeline from Durban to the interior, and road transport services which are restricted to abnormal load vehicles operated in competition with private-carriers. South African Road Transport Services also operate long-distance coaches, while South African Railways operate parcel and container delivery services. In these days of containerisation it should be noted that Johannesburg is technically the principal 'port' of entry. The following comments are based on the SATS annual report for the financial year to 31st March 1988, which was the latest available. The year started with the first strike in SATS history, which was also the

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largest ever in the public sector, flood disasters in Natal, the Orange Free State and some other areas and the loss of the Boeing 747 Herengberg off Mauritius, but the scenario was not all negative. The organisation was restructured into five business concerns: Railways, Harbours, Airways, Pipelines and Road Transport, and a fairly large number of business units: workshops, telecommunications, technical advisory services, industrial services, construction, stores, transmed (the largest medical aid scheme in the country), catering, data processing,-

pensions. travel department. training college, housing and Labour relations. This is stated to be the first step. towards privatisation and deregulation. SATS, according to latest information, is due to be privatised in April 1990, at which time many of its services are expected to receive severe private sector competition.

A surplus of R74 million was earned on the massive turnover of R9.26 billion, down from R184 million on the previous year's turnover of R8.45 billion. The improvement in turnover was attributed mainly to increased fares, up 9.7% on average, which however was lower than the official inflation rate of 13.1%. Labour costs remained constant despite a salary increase of 12.5%, due to reduction in the number of employees to 193 from 203 thousand the year before, achieved without redundancies. Railways, including commuter services, and road transport were running at a loss, harbours, airways and pipelines were profitable.

Railways

Because of the losses, mainline passenger services were substantially reduced, but those remaining were generally improved. Commuter services were running at big losses - which are characteristic of most such services worldwide. In order to obviate the negative effects of internal cross-subsidisation, it is considered essential that SATS receive full compensation for losses suffered on commuter services. This view has been accepted by government.

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Commuter journeys decreased by 5% in the financial year, aggravated by the strike, but passenger journeys are in long-term decline. Railways makes most of its money from transport of containers and bulk commodities, especially coal and iron which are primarily moved to the coast for export via the purpose-built Richards Bay coal line and Sishen-Saldanha (iron ore) line, which carry the longest and heaviest trains in the world (Chapters 3 and 6).

SATS typically runs six or seven 2.5 km long coal trains to Richards Bay daily, recently ran an iron ore train of 7.281 km comprising 660 flat-topped ore trucks - the longest and heaviest train in the world.

Owing to South Africa's cheap coal, steam trains have never been phased out entirely, but their operation is no longer commercial. Most engines

are diesel or electric - the latter traditionally operating at 3 kV DC and more recently at 25 kV AC. The latest class 14E locomotives operate on either system. The 50 Cycle Group of Europe, represented in South Africa by Siemens, is half way through a R24 million contract to build three prototype Class 14E locomotives for SATS. They are a new generation of 4-axle locos designed for fast freight trains, able to pull at sustained speeds of 120 km per hour (20 km faster than the maximum speed of the prestige passenger service Blue Train). SATS already uses locos capable of 120 km/hour, but not of sustaining that speed. If they come up to expectations another 30-50 will probably be ordered at a cost of about R4 million each. (It should be noted that very high speeds such as are achieved on some First World rail systems are impractical with South Africa's relatively narrow gauge.) SATS is looking for tenders for a dual electric/diesel electric loco of innovative design, and it has just placed its largest ever order for 50 Class 10E electric locos with GEC Traction in its largest ever R175 million order. The 10Es will be delivered from September 1990 to November 1992.

SM

South African Airways, which has an effective internal monopoly, flies regular internal services between all the major and to many minor centres, internal traffic increasing 17.6% in the period, when for the second year running internal air fares were not increased (though they have risen sharply subsequently). International traffic increased 9.8%. South Africa is a member of the International Air Transport Association (IATA), and shares external routes with the national carriers of destination countries, notably in Europe and the southern African region. During the year under review the service to Australia was suspended and the previous year that to the US as a result of unilateral withdrawal of facilities by those countries. Service to the UK and Europe continues unabated, hindered only by the refusal of some countries to the north to allow landing or overflying rights to the national carrier, which is obliged to fly round the bulge of Africa, landing on northbound flights at Lomé. Despite this inconvenience, SAA's European and London flights are as full as those of its competitors, though internal security checks are noticeably tougher. At London Airport (Heathrow), SAA passengers' travel documents are scrutinised by the airline and baggage is subjected to additional security

checks - not unjustifiably as regards passenger and aircraft safety, but the feeling was clearly conveyed to this passenger on his most recent 'trip prior to the election that he was entering a country under siege by extension at Heathrow, which feeling was by no means lessened by the attitude of immigration officials at the rather dated facilities of Jan Smuts airport (Johannesburg) .

Jan Smuts Airport, which was a show-piece in the days before the Jumbo, now looks both outdated and tatty, but is reported to be due for a major face lift.1

SAA operates 9 Boeing 747 variants on external services. 5 Airbus A300 and 16 Boeing 737s on regular internal services.

Harbours, Road Transport, Pipelines
Apart from the dedicated coal terminal at Richards Bay, the largest ports are Durban, Cape Town, Port Elizabeth and Cape Town in that order. The number of vessels calling at South African ports decreased by 6.5% in the financial year, which reflects the increasing proportion of business handled by dedicated container ships rather than a decrease in trade which however was static, attributed to sanctions pressure.

SA Road Transport is the only SATS business which does not operate mainly as a monopoly, though it monopolises certain types of business such as very large abnormal load vehicles. Its passenger business decreased 5.3%, while transport of goods and livestock increased, but Road Transport is loss-making and reducing today, being generally unable to compete with the dynamic private sector.

Despite external pressures, the volume of transport (up 17.5%).

Pipelines
its best year as regards
of product tendered for
13%) and gross revenue

Very little detail is published for strategic reasons. but a large increase in especially crude oil to the refineries occurred, indicating that demand for fuel exceeded expectations.

Next period

Though the annual report was not yet published, SATS financial results for 1988-89 were available, resulting in a profit of R147 million instead of the budgeted loss of R115 million on turnover of R11 billion. The asset base is a massive R56 billion replacement cost. Unlike 1988, goods tonnage carried by railways increased 8% and harbour volumes by 51, while SAA suffered a 15% decrease in cargo. 12% salary increase were offset by continuing reduction of staff to 179 000 in June 1989.

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Light rail

No city in South Africa yet has a modern light rail system, but Port Elizabeth seems set up to become the first. However the system envisaged is likely to travel on existing SATS tracks running parallel with Main Street. Regular proposals are made for underground transport in Johannesburg (which in the writer's view is badly in need of better public transport). In practice, they never come

to anything.

PCA

The Public Carriers Association has commissioned the CSIR to conduct a comprehensive investigation into the road transport sector.

PCA, whose members haul goods, the South African Bus Operators' Association (SABOA) which represents prime sector bus operators, the National Association of Private Transport Operators (NAPTO) whose members haul their own goods, and SAVRALA, which represents the truck hire industry are considering merging into a single body.. According to PCA, truck operators' costs soared R2 billion in 1988. In fact costs are rising so rapidly that rail '15 becoming an increasingly attractive alternative despite increasing tariffs. Table XXX gives a breakdown of heavy vehicle operating costs in 1988.

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ITEC

The major shop window for the transport industry is the alternate yearly International Transport Exhibition (ITEC), organised by Specialised Exhibitions, which was recently held in August 1989.

ITEC was well organised and presented as were the parallel conferences at the ITEC venue - the National Exhibition Centre (Nasrec) for the Institute of Transport of Southern Africa, the Southern African Bus Operators' Association and the Public Carriers' Association. By contrast the Annual Transportation Convention (ATC) organised at the same time by the Department of Transport in Pretoria came in for :lllIEIIIIIEITIIII

severe criticism for ' relevance and conflicting interests. What it did was to highlight the poor communication between government and commercial operators.

Transportation, in South Africa as elsewhere, is undergoing fundamental and structural changes which will decide its shape in the 21st Century. It is confronting deregulation, reorganisation, privatisation, restructuring - and an onslaught by a government short of money which has targeted the industry as a suitable source. ATC tackled little or none of this. In more than 175 papers spread over five days it tried to address the theme: "An appraisal of the southern African transportation system", with indifferent success, in a series of papers mostly of interest to academics, researchers and engineers. An isolated paper on combi-taxis attracted standing room only because of its much more practical subject - the black taxi, which has mushroomed in under ten years to the point where SABTA has become the country's largest private consumer of fuel, motor oil and motor

accessories. As a transport company
 it is 20 times larger than its state-
 subsidised equivalent, directly provid-
 ing work for an estimated 300 000
 people and transporting 2 billion
 passengers per year. And supporting
 a mushrooming informal business sector.
 In terms of cash, SABTA does not yet
 have much money. though it is supported
 by a R470 000 grant from the Anglo
 American Chairman's fund.
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 African Black Taxi Association (SABTA),
 and the Association of Street Traders
 are now of considerable economic impor-
 tance. SABTA, particularly, is the
 major purchaser of minibuses-type vehicles
 which are generally preferred as methods
 of transport to traditional buses,
 operated by Putco and the municipaii-
 Fig 12.1: New car sales
 to July 1989, and annual
 sales since the 1981
 peak year, Table 12.1.
 Fig 12.2: Driving up prices
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 SA car models have risen
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THE TOWNSHIPS

. CHAPTER 13: ARMANENTS

AND XKTERNAL SECURITY

IN THE 1960S arms sales to South Africa were first banned. This has been enforced, by more and more countries, in subsequent years. The result was exactly the reverse of the initiating countries' intentions. In less than a generation South Africa has developed its own lower-class armaments industry. The country is not only capable of producing most of its own military equipment. It is also exporting arms widely, with direct benefit to the country's foreign exchange earnings.

In one sense, however, the arms embargo has been effective. By forcing South Africa to become a major armaments producer, it increases the moral abhorrence in which the country is held.

Ignoring propaganda issues and sticking so far as possible to facts, South Africa is now one of the top half dozen arms exporters, after the USA, USSR, UK, France and West Germany. The reason is that its equipment is better designed than that of the other named countries for fighting the kind of warfare, and controlling the sort of civil unrest, which are endemic in much of the Third World.

South African armaments are cost-effective for many Third World nations, including dictatorships where a primary purpose of the armed forces is to control civil unrest.

DEFENCE FORCE ROLE

This is not the prime purpose of the South African Defence Force, at least in the thinking of its past strategic planners. They were concerned to oppose a Communist onslaught from the north, perceived as a conventional military threat preceded and accompanied by persistent terrorist incursion. This results in some urban terrorism, and widespread rural guerrilla warfare along an extended and thinly settled border. It was to keep these threats at a physical distance from South Africa itself that South Africa remained in Namibia for so long, defending a (deliberately) vaguely-defined 'operational area' in the north of that territory, including the extended Caprivi strip. The South African Defence Force is superbly equipped for fighting modern desert warfare, to the point where it escalates into confrontation with the First World superpowers. Theoretically the South African Defence Force is responsible for external defence, and the police for controlling internal disorder and fighting crime. In practice things do not work out that way. Rather, the police force

provides inadequate first-time protection, backed up increasingly by the army. With the ending of the war in Angola, and the collapse of the external military threat, the army's role is increasingly to contain the internal unrest, which it is reluctant to be seen to be doing. It is not the job of the army, at least according to traditional thinking, to do any more than contain the internal situation long enough for the politicians to reach an acceptable internal settlement. In fact, with the noticeable outbreak of peace on the country's borders and the virtual disappearance of the military threat, the army should be unemployed except as a deterrent to future incursion.

So what happens to South Africa's armaments industry?

Most likely very little. At least to its export sales, which should continue unabated, though the pressure for development of new systems and equipment will lessen. At least for some time, South African armaments will continue to be leading edge, if not in ultimate performance then in terms of what is practical in the field.

In terms of fire power, South Africa's combined security forces have more than sufficient to crush any credible

internal opposition, unless it is externally armed, financed and led. What they cannot do is win the present economic war, which will intensify if it is not settled in favour of reform.

Arm Scor is the single marketing organisation of armaments industry. As a single vendor its sales are claimed to be the largest of any company in the world, but Arm Scor is not so much itself a manufacturer as a co-operative marketing and enabling organisation for South Africa's arms manufacturing capability, which is intentionally dispersed among many companies, particularly those in the engineering sector. Most of the major companies mentioned in this report are undertaking at least some manufacture for Arm Scor. In relatively few cases it amounts to a majority of the total. Atlas Aircraft and Kentron

singled out. Production embraces small arms and other individual weapons and equipment, field guns, tanks, armoured cars and personnel carriers, aircraft including helicopters, ammunition, many types of bombs, missiles, small vessels, communications. radar and more, most of it field proven in the Angola/Namibia war. It is believed to have the capability for submarines, and as large surface vessels as it needs to patrol the Cape sea route, though not to oppose the navies of the major First World nations. The Second World it can confront, and match at least on the ground.

NUCLEAR CAPABILITY?

There is periodic speculation that it possesses nuclear weapons. or has the capability to produce them. The latter may be true, but if so it is thought unlikely to have made them, if only for lack of suitable targets in neighbouring states. South Africa declines to comment concerning its possible nuclear capability, which indicates to the author that it does not have one, though it does not mind keeping its opponents guessing. As in many countries, defence and internal security are officially taboo subjects, thereby encouraging press speculation.

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(missiles) are_

The country is .y virtually self-sufficient in armaments and in certain areas of high technology armaments it is a world leader. Arm Scor was established in 1964 with the object of making SA less dependent on external armaments supplies. Private enterprise was involved from the start. Today Arm Scor is associated with a large number of private contractors who account for about 70% of the armaments and ammunition manufactured in the country. There is 68% local content.

ARMAMENTS RANGE

In recent years Armscor and the SADF have announced and demonstrated several new weapons systems developed locally. These include the G6, self-propelled versions of the GS, the Olifant tank which is reputed to be a match for any potential enemy tank, new tactical radio systems such as the Ebbehout system, the 127 mm Valkiri multiple rocket launcher system, the SAMIL series of military vehicles, the new' Darter air-to-air missile, Seeker reconnaissance drone and the Krimpvark armoured 'family car' designed for use mainly by farmers in terrorist areas and people working in high-risk situations generally. Other innovations include the Ratel mechanised infantry fighting vehicle and mine-resistant trucks and personnel carriers such as the Buffel.

The South African navy is equipped with a flotilla of highly mobile strike craft built in South Africa and equipped with several batteries of guided missiles. These strike craft are supplemented by the 12 500 ton SAS Drakensberg replenishment ship launched from the Durban yard of Sandock Austral (now Dorbyl Marine).

Another local development is the Alpha XH1 tandem helicopter.

Armscor regularly participates in international armaments exhibitions, including Chile's biennial Fida international air show, where its exhibits attract a great deal of attention from military observers and foreign arms purchasers.

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It is, of course difficult to obtain exact breakdowns for military equipment exports, but it is reasonable to assume that military electronic equipment accounts for a large proportion of Armscor's R2 billion exports.

sector in most probability accounts for more electronics-related exports than all the others combined. and would earn more than R150 million a year in electronics-based products", said Ludin.

"This

South Africa's top fighter aircraft, the Cheetah, which is an updated derivative of the Mirage 111, is considered no match for the MiG-23 which it was encountering in the later stages of the Angolan war, but its armour and infantry equipment was generally better.

ROOIKAT

The South African G6 field gun is reported to be the best in the world, as is the Rooikat 8-wheeled fighting vehicle with a 76 mm gun, able to take on tanks (which it closely resembles). With a top road speed of 120 km/hour and cross-country speed of

50 km per hour its primary purpose is reconnaissance, in which role it replaces the SADF's obsolescent Eland armoured car.

Billeq as a unique blend of firepower, mobility and protection, it is said to be superior to any other wheeled vehicle in the world. It can be used by the 4-man crew against infantry, artillery, logistical support, enemy command and control points and air-defence systems and the African terrain - in which it is clearly superior to most First World products. It crosses a 1 metre wide trench at speed, crawls across a 2 metre wide trench, climbs a 1 metre vertical step with ease and sails up a 70% gradient in forward or reverse according to press reports from the launch. It is attracting a great deal of interest from the armed forces, not only of Third World countries but major First World nations whose own armaments industries too easily underestimate the harshness of the conditions under which their equipment will actually be used. It seems entirely probable that the Rooikat would be sold to or made under licence by such countries if South Africa returns to international respectability.

106 companies are involved in the production of Rooikat, which is South African designed for South African conditions, with 100% local content. As well as supplying the SADF's needs, the Rooikat is expected to be exported widely, adding 10-12% to the annual turnover of South Africa's Armscor according to a newspaper report of a year ago, when Armscor's turnover was reported as R3 billion. Later estimates put both turnover and percentage higher.

As well as the more obvious mechanical items, the South African armaments industry makes a broad range of HF, VHF and UHF tactical radios, including hand-held, manpack, vehicle and base-station transceivers, airborne radios and associated ground communications equipment. Defence electronics is another broad group of products, including tactical radar, avionics, guided weapon controls, digital gun and fire controls, navigation, mine detection and electronic warfare. Prefragmented weapons and fuses are other major lines.

These items are all included in the defence catalogue of Reutech, but are merely representative of the broader range.

Readers wanting a technical assessment of the capabilities of South African armaments are referred to the various Janes publications, the Armscor catalogue, even the (UK) Institute of Strategic Studies for a broad overview.

ISRAELI LINK?

An experimental armed helicopter,

the Atlas Beta XTPnl was recently shown, and there are persistent reports that South Africa has acquired Israel's Lavi fighter plane project, shelved in 1987 for lack of money. Certainly South Africa is working on a new fighter and it recruited many ex-Lavi people,

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new low-flying ground-attack jet which but it is thought unlikely that the resultant aircraft, when it is announced will be a direct copy of the Lavi, of which 70% of the components were to be supplied by the US. which spent \$1 billion on the original project. If the project is being pursued by Israel and South Africa in conjunction it will damage Israeli relations with the US. unless South Africa has reformed sufficiently to be readmitted to the international fold by the time the joint project is announced.

The 1986 Comprehensive Anti-Apartheid Act bans the supply of US military technology and equipment to South Africa - which however is technically capable of developing its own. The package of mild sanctions which Israel imposed on South Africa in 1987 is regarded as little more than window dressing designed to forestall US legislation banning American military aid to countries arming South Africa.

between South Africa and Israel is fairly widespread, in the industrial and military fields. Berets made in South Africa have reportedly been distributed to Israeli military units. An Israeli Finance Ministry delegation visited South Africa a year ago to renew a wide-ranging co-operation agreement first signed in 1976. South African Airways and the Israeli national carrier, El Al, have increased flights between Co-operation

the two countries. An air strike on the town of Lubango in Angola was apparently modelled on an Israeli raid into Syria, succeeding through the use of Israeli electronic equipment which may have been operated by Israeli personnel.

That both countries apparently need is a new low-level ground-strike plane capable of underflying all but state-of-the-art radar surveillance, which South Africa has held back from developing alone on the grounds of cost, although it is technically capable of doing so. Whether they are jointly engaged on such a project is still speculation.

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In a world where the US failed so dismally in Vietnam and the USSR in Afghanistan, South Africa's military planners have somehow kept a sense of proportion as to what is possible under field conditions. In the mid-seventies, for instance. South African forces could have taken Luanda. They refrained, for lack of American support, withdrawing to strategic positions along the Namibia/Angola border. where they have maintained sufficient strength including support for the Unita movement to fight the Soviet-backed Cuban forces

and MPLA government in Luanda to a draw. The Angola/Namibia operational area provided the best possible proving ground for South African military equipment, as the African townships have since the 1976 Soweto riots for the proving of equipment designed to contain 'civil unrest'. South African defence and security equipment - which the South African Defence Force will not thank us for linking, has the best possible credentials for countries more interested in its effectiveness than the moral stance of the vendor. The cessation of hostilities in Angola is, of course part of a larger picture, namely the ending of the Cold War, which was allowed to heat up intermittently in remote areas such as Angola provided the cost did not become too great. In the end the escalating costs of the Angola war became unacceptable for both sides. If Angola, Namibia and South Africa achieve relatively peaceful settlements (that is a big if) it is perhaps possible that conventional armaments will be perceived as what they are becoming - an obsolete route to economic impoverishment even if they are never used for mutual destruction. In the world at large that is probably a utopian scenario, until the advent of which there is an export market for South African conventional armaments.

FOR 'UNREST' CONTAINMENT

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market for equipment for
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which is perhaps Hi! to grow in the transition ahead. The only contra indication is the fact that the South African security forces are already sufficiently equipped to contain any realistic threat since the ANC has lost its military backer. Meanwhile the manufacturers may export widely. South African equipment in this category includes special police and troop transport vehicles, including trucks with V-shaped bodies designed to protect personnel against landmine explosions, close-combat weapons, riot-control weapons and protective clothing, and a whole range of security-related products for perimeter defence and access control. as well as raising the alarm.

There is also an increasing market for electronic surveillance, which is becoming a major feature of the modern police state. It will inevitably be a feature of post-apartheid South

African society, to ensure that minorities resort to other tactics than violence. Beyond that, however, South African security equipment is notably sophisticated and is expected to find major export markets in future.

NATIONAL KEYPOINTS

Security precautions are more readily defined, being dictated for many industrial plants by the National Keypoints Act. According to Frank Simms of Chubb, President of the South African Security Association (SASA), this act lays down standards for perimeter protection, access control etc, including maximum age and minimum educational qualifications of security personnel. Owing to the stringent nature of the mandatory precautions, security incidents at national keypoints are relatively low, and potential terrorist action quite likely to be deflected to neighbouring industry. Managements of smaller companies in the vicinity of Iscor, Sasol etc may examine and intensify their own security precautions or at least bring them up to scratch if they are not already, thereby at least pleasing their insurance companies so that the cost of doing this can be offset against lower premiums.

Crime of all sorts is on the increase, not just in South Africa but worldwide, though industrial crime is generally less than domestic crime. This is partly because industry is taking at least some precautions. if only at the insistence of its insurers. Interestingly, terrorist attacks form a very small proportion of total crime. Despite its recession, and its massive Third World population, crime is still lower in South Africa than in many western countries, as is the relative size of its police force - which is directly contrary to overseas perceptions. Violent crime is a high proportion of the whole and is strongly 'on the increase, as is deliberate breaking of apartheid laws, with which the authorities' patience is wearing thin.

SECURITY MEASURES

Security measures in general can be classified under three major headings: locks and safes, alarms. and guards and services, of which probably the largest proportion are provided by Chubb in South Africa today. Other companies are more specialised. e.g. Giant Safe, Mathieson & Ashley (fire-proof cabinets), 00 Electronics (alarms and electronic access controls), Fidelity Guards (guards and other services) but Chubb competes across the board. Because of the escalating political confrontation coupled with the extraneous poverty of the Third World urban slum sector. white First World South Africa has become very security conscious in the last few years. erecting walls,

barriers, alarms and access controls
- which in typical African fashion
often fail to function after a short
while. Thus the increasing tendency
to accept security experts' advice
as to the need to live in physically
secure premises is defeated by failure
to keep the systems functional, or
simply by their inconvenience for
normal living. First World South Africa
is not a particularly violent society
despite the image often painted abroad,
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hnd'the increasing tendency of insurance companies to insist that people act as if it were.

Saco Systems has been awarded the South African marketing and manufacturing rights to the DeFENCE intruder detection system, which comprises a microprocessor controier linked to a verticai array of capacitor sensor wires. Detection probability is cTaimed to be as high as 0.99, with an extremeiy low false alarm rate. (False alarms are the biggest problem with aTT such systems, and fire detection systems. If they occur too frequently, a genuine alarm is Tikeiy to be ignored.)

A Durban-based company Time 2 Taik - specialist software developer and computer consultant, has Taunched its watchman computer-assisted security alarm monitoring system, claimed to be so advanced that it borders on having artificial intelligence. Ignoring the marketing hype, the system has been taiored for secqrity companies with control centres monitoring domestic and industriai alarms and high-tech security controls.

It is marketed by sister company Secur-ity 2 and was developed in conjunction with Total Highway Security, to enable the Tatter to keep control of its rapidly expanding security business in the Pinetown area.

RADIO MONITORING

Security companies covering a of premises employ control central stations or more probabiy radio monitoring centres which are mushrooming in South Africa today. According to Geoff BeTT, technical director of Chubb Electronics (of South Africa), SA could be a world leader because of its understanding of radio monitoring. In fact there is every indication that South African security systems are in the forefront. if oniy because of the sloppiness of South African practice. FTy-by-night firms which instali inferior systems, or do not have the ability to back up even first-class products are a very real problem in the South African security market.

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The South African Insurance Association (SAIA) publishes a booklet and list of manufacturers on locks and keys recommended for insurance purposes.

HOS ACT

Every industrial pTant in South Africa is subject to the new Machinery and Occupational Safety (MOS) Act. which is being introduced in stages to repiace the relevant sections of the old Factor-ies Act. As the most recent, it is claimed to be one of the best acts of its type in the woer,_ but it presents major pitfaiis for unwary

management. In particular, it places responsibility for safety entirely on management, leading to a very high rate of convictions in those cases which have so far come to court. South African industrial managers would be well advised to study the MOS Act carefully to see how it applies to them, appoint a member of staff to see to the implementation of safety measures, call for regular reports from him and perhaps consult a specialist on the growing body of case law. Otherwise the unions are liable to do so first.

FIRE AND SELF-RESCUE

Fire is possibly the most frightening hazard, at home, at work or underground. Its possibility is taken ' seriously by South African industry and mines. The fire fighting division of Chemserve Systems, for example, markets chemicals and application equipment designed specifically for South African fire-fighting situations. The major customers are the oil and coal refineries (where fire hazards are of a particularly high order), chemical plants, forestry and sugar enterprises, Eskom and the state.

PMIE Systems, a wholly-owned subsidiary of the giant Premier group, is a leading breathing air specialist offering a largely imported range including Dräger breathing apparatus, self rescuers, gas monitoring and detection equipment.

The Fenzy self-contained self-rescuer for mine workers has received official government mining engineer approval. It is a joint South African and French design, claimed to be the most advanced of its kind in the world, which is available from two South African distribution companies including Cemtec, a division of the Cementation group.

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South Africa's safety record generally appears as good as that of First World nations if its generally-published disabling injury statistics are a guide, but is considerably worse when fatalities are taken into account.

The National Occupational Safety Association (NOSA) admits that the disabling injury figures are often fiddled.

A consultant who wished to be nameless P W Botha, then Minister of Defence, on guard. . .

admits that NOSA has done good work, but says that claims that South Africa's safety record compares favourably with major First World nations is nonsense. "In fact our safety record stinks". On the basis of Table 13.1 the author agrees.

Table 13 . .1'

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In the first South African impiementa-
tion of a new plant safety technology
known as faiT-safe control (FSC),
the Tocai industrial control specialist
Control Logic has been awarded a con-
tract to supply a R1 million emergency
shut-down controT system to the Caitex
oil refinery at Miinerton (Cape Town).
Sacred cow... .

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F19 14.2: Technical specification
for Meissner Power Systems' zectron III
controller for standby power units.

Fig 14.3: Pontins' light-
ning protection concept,
used initially on rail
weighbridges has enabled
insurance cover to be
obtained for the first
time in SA.

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Fig 14.1:
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showing method of 'measure-
and below,
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e 24 com isolated inputs suilable
lor 12 v lo 110 vol! AC or DC
a relays med at 16 amp/220 voll
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Control uvllch Aulo-Iesl-oll-manuala
Slan: Slop: Alarm Accept; Alarm
Resel: Normal; Slandb .
220 v AC ilo'hl-SO'A and/ov 10 -
30 VDC.
Tern - uiun Run - e 0 - GG'C.
Analogue Impuls a only 0 - 20 mA or 4 - 20 mA 0!
0 - 5 voll.
2 only RS 232 C compalible bl-
dlreclional ports.
1 only Cenuonics compaliblo
paullel printer port.

.HAPTER 14: MEASUREMENT AND CONTROL

SOUTH AFRICA is one of the world's
leading users of industrial instrumenta-
tion and particularly process control
equipment. This follows from the high
proportion of primary process industries
such as metals and minerals, electricity
generation and the scale and sophistica-
tion of such projects as Sasol Secunda.
Overall, South Africa provides a substan-
tial market.

Despite this, the great majority of
measurement and control equipment is
imported, and the situation is barely
improving at the present time.
According to a Frost & Sullivan market
research report dated May 1983, the
locally manufactured portion was only
8% of the total and a 1985 report prod-
uced by AMS of Pretoria put it lower,
at only 6%. The difference was partly
due to slight variations in terms of
reference, but there was a real percen-

tage drop at that time owing to cutbacks in local manufacture as the recession bit deeper. Since then there has been some economic recovery, the US imposition of sanctions and the corporate withdrawal of such major US-based suppliers as Honeywell which has materially changed the scene.

According to Altech, the South African market for advanced electronic systems and products remained buoyant during fiscal 1989 with further significant growth expected during the current year. It includes industrial measurement and control equipment, which however forms a minor part of the whole. Though it is difficult to measure, total local work is overshadowed by the imported content, nor is the situation improving significantly. The Industrial Development Corporation is looking into the possibilities of increased local manufacture, which may have been made more feasible by the weakness of the Rand. To a degree, of course, local manufacture is feasible in the case of simple equipment for the measurement and control of the more common industrial parameters such as temperature, pressure flow,

unlikely to be viable on owing to the high level of sophistication of the pH etc, but it seems a large scale dimensions, more advanced instrumentation and the very wide range of parameters which must be measured and controlled. The debate rages on, but the area is explored in detail here because of its importance to SA industry and the very significant moves towards greater self-sufficiency which South Africa is attempting to make.

THE MARKET

According to Ian Taylor, head of control and instrumentation at Anglo American and then President of the South African Institute of Measurement and Control, the South African market for instrumentation was depressed like the rest of the economy but there were notable bright spots. Even at the depth of 'the 'recession the gold mining industry was generating a lot of cash, paradoxically because of the weaker Rand. As a result that sector was not shy of spending money on the latest measurement and control equipment, which naturally helps to extract gold more efficiently and economically. Anglo, for example, placed several large orders for PLC networks in 1985. the crunch year. were being projects stations.

Other substantial implemented in the power but the industrial market generally was depressed. Forward orders, particu-

larly, were weak, owing to a tendency
:of instrumentation to lag rather than
lead other sectors of the economy.
Since that time there have been only
two major new projects - Mossel Bay
and the Lesotho Highlands Water Scheme,
neither of which is sufficiently advanced
to have brought in significant revenue
for the measurement and control people.
though work is in progress for Mossgas,
and major orders have been placed
for Mossref.

Martech Controls

As a result the instrumentation industry has been heavily dependent on replacement business, the industry Ted. A major recent project, for example, has

Sasol

smaller plants where more modern instrumentation has allowed improved productivity, efficiency or economy. which is considerable as is essentially technology re-instrumentation of are innumerable the and there been

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Major suppliers include AFH Devers (Foxboro), Kent Instrument, Edward L Bateman, Siemens, Control Logic, Control Instruments, Hartmann Braun and (formerly Honeywell), but these names are merely representative of a total of more than sixty suppliers. Virtually every major instrumentation manufacturer in the world has been represented in the South African market, which has not been shy, in the past, of adopting the latest technology, nor should it be slow to innovate in the years ahead.

Several smaller companies were squeezed out by the big recession, while others appeared to be recession-proof. Those doing well often did so by concentrating on particular parameters (Temperature Controls - temperature and temperature-related measurements), types of instrument (Hike Instruments - mechanical pressure gauges) or particular industries (Vaimet in paper and pulp. until its forced withdrawal for political reasons). Several new suppliers such as BBT (Asea) and Klockner Moetter offer excellent hardware which has compensated, more or less, for political withdrawals.

front, as regards microprocessor-based distributed control schemes are the order of the day. Local area networks (LANs) and fibre optic cabling systems a part

On the technical

large projects, are installed, at least on basis, e.g. at Harmony gold mine and Richards Bay Minerals. Programmable logic controllers (PLCs) are already used very widely.

-For the future, one can see increasing use of intelligent front-end devices, and a revolution in sensor technology, with use being made of silicon micromechanics. Another trend is the use of

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requires only computers for dynamic modelling of plant operations, following from computer aided design. As the plant's responses

are refined, it allows process conditions to be predicted and the control equipment to be set up in advance, so that it fine tuning on the actual developments differ little from expectations overseas, except where South Africa's applications are more advanced. This is offset in practice by the extent to which the equipment is imported, including ATT PLCs, most computers and most of the individual instruments.

process. Such

Some control valves are locally manufactured and assembled, and most panel work is made locally. Mechanical pressure gauges are predominantly manufactured or assembled locally. Other firms manufacture thermocouples, load cells, signal conditioning and interface equipment and small data logging and alarm systems.

THE COMPANIES

Control Logic, a subsidiary of Anglo American, is by far the largest local manufacturer, with a broad range of local and imported lines. The author is not up to date on its local manufacturing activities, three of which are singled out as typical.

Anaflex is a range of analog signal conditioners, trips and transmitter cards, locally designed and manufactured in South Africa for South African conditions by Control Logic. (Conlog) Closer to the consumer area, the company manufactures the Speedocruise range of speed control equipment for vehicles. Control Logic has signed an agreement with Pepperl & Fuchs which allows the company to manufacture P&F products under licence, for the monitoring of speed, motion and position, e.g. for conveyor systems and other moving machinery including motors, pumps and valves.

Initial manufacture at Conlog's plant in Durban with

flexibility to allow Conlog

products locally using

This sort of licence is capability.

ment and control

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sensors, but the licence gives sufficient to develop

P&F techniques.

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have substantial impact on local measurement.

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Following the US imposition of sanctions Martech

in 1986, Honeywell's South African subsidiary was acquired by the Murray & Roberts group of companies. Renamed Martech Controls, it remains the exclusive distributor of Honeywell products. Martech Controls formed under M&R Technologies, a relatively new division of M&R Industrial headed up by Richard du Piessis. M&R Technologies is headed by Max Bayerl, formerly MD of Westinghouse Beilambie, a M&R subsidiary which was jointly owned by M&R and Westinghouse Brake & Signal of the UK. The outstanding shares were acquired by M&R in 1985, its electronics activities - principally railway signalling and systems. were then renamed M&R Technologies and its mechanical activities relocated elsewhere in the M&R group.

M&R Technologies subsequently pursued an electronics acquisition policy which brought in industrial electronic systems (Sascan), personal computers (Micronics) then process control (Honeywell), of which the last should have been the most significant.

For Honeywell the deal was a disinvestment from South Africa, which had become an embarrassment for the US-based parent, which over the years has supported its outstanding TDC2/3000 (Total Distributed Control) system and other Honeywell and agency lines mainly aimed at the industrial control market. At the time of its disinvestment it had a R400 million South African installed product base, including the control scheme at Sasol Secunda which is still the largest TDC installation in the world. Largely because of the Sasol connection, the former Honeywell subsidiary had extensive total maintenance and test facilities which were retained, together with the field staff, by Martech Controls. Indeed, facilities were rapidly expanded, with a move by Martech into local manufacture of TDC which should be highly significant. The intention was certainly so, including the purchase of full documentation, future updates and ongoing supply agreements.

In practice the acquisition is probably less significant than was intended, since it is one of many M&R efforts to enter the electronics market, which it has repeatedly failed to succeed in doing over the years.

With a new 'made in South Africa' label on the world's leading process control system, which has easily the largest installed base in the region, TDC3000 should have been confirmed as the front runner for the Mosses Bay project, but it did not happen. EMSO (another M&R group company) preferred the Foxboro intelligent Automation series which is a later generation and available only as an imported agency line. IA

is the new leading-edge product line, but an added reason for bypassing TDC was probably that EMSO was unconvinced by Martech's local manufacturing pretensions. These amounted initially to no more than local assembly of some printed circuit boards in the old Hest-inghouse Bellanbie plant, accompanied by the successive leaving of many of the former Honeywell staff, and the Martech general manager who had been specially brought in.

A recipe management software package for TDC 3000 handles anything from baking cookies to blending gasoline.

After a considerable interval Controls has resumed promotion of TDC 3000 in a fairly big way - with a notable lack of reference to Tocai manufacture, of which there is actually very little.

In view of the importance of the product line, Martech/TDC should not yet be written off. It should consolidate its position, and emerge over time as a major force in process control, in Southern Africa and perhaps more widely. However the author now requires convincing.

entered into

distribution

Martech Controls has measurement equipment.

Sascom range of electromechanical belt scales and mass measurement equipment manufactured by the sister company

has proved that a wholly South African range can head the market in innovation and reliability in this area, but to supply the level of sophistication and additional services and equipment now required by South African users, Martech Controls has decided to combine the Sascom Tocal products and experience with those of the world leader.

The product range will continue to embrace equipment designed for materials handling, and provide users with the information needed for the precise physical measurement of batching, ratioing and blending, as well as the supply of bulk materials.

Saftronics is a South African electronics manufacturer which M&R notably failed to integrate, closing its component subsidiary High Q, and subsequently disposing of Saftronics to the Stratford Engineering group for less than asset value, after announcing that it would be closed. As in the case of Saftronics, and several previous cases over the years, M&R made the right strategic moves to get itself into electronics, then ruined its chances by trying to impose on the dynamic electronics business the sort of financial and administrative controls which are normal in its core construction and heavy engineering businesses.

The most recent M&R failure was 685 in the computer field (Chapter 11). Its success with Nestinghouse Bettambie indicates that it can make high-tech products technically, but perhaps only with a captive customer (in that case Railways). Whether M&R can get its act together with Martech/Honeywell TDC is still highly debatable, and its efforts to do so entertaining to watch.

Transducers

White electronics is at the heart of modern measurement and control methods it is rarely the simplest or most direct method nor, except in a few specific cases, is it capable of providing the interface with the measured or controlled variable. The interface is usually mechanical, and the development of

164

transducers (energy converters) transform the measured an equivalent electrical signal is a science in itself, and one where South Africa is lagging in relation to its progress in electronics overall, which variable to

Since most modern instruments and nearly all computers are digital and most measured variables are analogue, there is a further stage of analogue-to-digital (A/D) conversion in the case of measurement and D/A conversion in the case of control. Once again South Africa is lagging. Indeed, it is generally observed that South Africa has a bigger

Also the country Tacks the market to justify Targe-scale Tocai manufacture of, for example, transducers, of which it need's perhaps a day's production per year of one of the major US-based concerns.

Lack of knowledge concerning the availability of locally-made components coupled with unscrupulous dealers is costing South African industry dearly. Says Dr Danie van Vuuren, MD of Loadcell Services, "Imported electronic goods often cost five or six times as much as the local equivalent. This means that the supplier's commission will be several times greater if he sells the imported product. which he does, although he is fully aware that local products are available.... It

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a question of quality of customer preference. In many fields the South African products are superior to the imported..." A specialised company is Temperature Controls which, as its name implies, offers a range of temperature-related products. Thermocouples (for temperature measurement) have been manufactured

for more than 30 years, and the relatively new premises have enabled Temperature Controls to expand in that area. The company also has an assembly line for electronic interface modules and control system panels. Project engineering is also offered.

A small but significant

Rhomberg-Brasier Electronics of Cape Town, the first and only manufacturer of solid-state proximity sensors, of the inductive and capacitive type. Other products are electrical power modules, electronic timers and process control modules. RBE is making significant inroads into the South African sensor market, which was previously 100% import-dependent, and is looking to export, so far in a small way. company is

It was in 1986 that Nefic Ltd and Pieter Braster took a financial interest in the group, eventually buying out the founder who has started a new company, Rhomco, but Rhomberg-Brasier is the more significant. The company claims more than 30% of the industrial automation market (which must be very narrowly defined). The principal competition is from imports by such companies as Elektromatic (Denmark), Syretec (France), Telemecanique (France) and Omron (Japan). In sensors it competes with Pepperl+Fuchs, Efekt and Turck of Germany.

A Johannesburg company, Transelektron, manufactures some competitive 11-pin modules, marketed through Timecount and Elektromechanica.

Timecount's locally designed and manufactured programmable sequence controller is capable of carrying out up to 300 different sequences, filling the gap between fixed-programmable timers and fully programmable logic controllers (PLCs).

One of few public companies is Control Instruments Group (CIG), which suffered 19% decline in operating income on a turnover up 44%, as a result of losses incurred by its printed circuit board subsidiary Alumet. The steep fall in demand, especially from the Post Office - at Alumet resulted in a loss which could not be offset by strong sales growth achieved in other sectors of the group's business. The 1985 had been anticipated by the market, and was arrested by the sale of Alumet to Plessey for R3.8 million in April. Earnings were also adversely affected by the rationalisation of Ferris Instrumentation, which is being incorporated into the group under Control Instruments, which is now producing positive results. In spite of the setbacks, CIG had cash balances of R8.4 million at the financial year end on 30th June 1989. with effect from 1st July the group purchased the Industrial Instrumentation Division of Harvey

& Russell, which is being integrated with its manufacturing and distribution arms. The company handles VDO, Kienzle tachographs and other leading agency Tines, while its subsidiary Electromatic is a significant manufacturer and exporter of parking equipment, vehicle detectors, and a growing range of electronic measurement and control equipment, while the former Ferris factory concentrates mainly on mechanical pressure gauges. Exports account for a good 15% of group sales.

with Ferris over a considerable period. The author revisited the factory in August to study the changes. Considerable rationalisation is evident, but the basic activity continues to be the manufacture of traditional mechanical pressure gauges, which continue to be made in volume and exported on a considerable scale. Whether CIG will continue to make the very broad range produced by Ferris is still unclear, but the broad range continues to be available for now.

Being familiar

In the mid seventies Ferris had the lion's share of the South African market, which it supplied from old and cramped industrial premises. Its success at

that time led the company to acquire Targer, modern premises and facilities, which forced the company financially into tackling export markets. In this it succeeded sufficiently that it was named Exporter of the Year for 1983. The success of Ferris, over some years, tempted several overseas manufacturers to assemble locally, of whom Hika Instruments (Negand of West Germany) has grown to become a local manufacturer in its own right. Others tried and failed, the most notable being Bourdon of France, whose local subsidiary Safran Gauge was absorbed by Ferris. More successfully, Nika became Hegand's largest overseas manufacturing subsidiary, which probably took over from Ferris as South Africa's largest supplier well before the Ferris collapse, owing to Ferris' neglect of the local market for large-volume export business. Technically Hika relies for most of its R&D on Germany, accepting or modifying overseas designs for the local market but undertaking little original design work. With a product that has been established as long as the mechanical pressure gauge, however, little development is needed except in the application of new materials.

Because its parent company is actively marketing in many countries, Nika is effectively limited to selling in South Africa, which it does through a network of branches established in most main centres rather than relying on local distributors. Thus Hika grew to become major competition for Ferris, with some advantages in that it can make the more popular items only, supplementing them with a broad range of imports which are taken into local production at a later stage. It is backed by fairly large-scale overseas R&D, and its factory and head office are centrally located in Johannesburg.

Ferris was set up in Cape Town, convenient for export by container, with a second factory in the neighbouring state of Swaziland. Because of its isolation from competent precision mechanical sub-contractors (which exist almost nowhere in South Africa) Ferris manufactured virtually all its gauges in house with the exception of investment castings and materials. No gauge manufacturer in any fully First World country would do or consider attempting to do so, but the practice was justified for Ferris by the further export of components and sub-assemblies, including gauge movements which found their way into US naval purchases! Even as late as Ferris' failure, Nika's local content was less, though it was steadily increasing, as was its penetration of the local market. Local penetration has surged since the collapse of Ferris. Local content has not. Also Hika cannot, except by agreement with

its parent, extend to marketing overseas, so its success is local and limited. In the area of mechanical gauging two approaches are thus defined: locally-based manufacture aimed at both the local and overseas markets, and foreign-based manufacture for the local market only. Where the product is relatively simple, the first approach would be quite viable but for the imposition of external sanctions, at least while the Rand stays weak and provided the country does not try to reinvent too many wheels.

As well as mechanical pressure gauges, 9% of the Ferris business was in thermometers. Owing to the hazards of mercury, the thermometers use low carbon activated systems.

Another local manufacturer, Instrotech, has just moved into its own office and factory premises in Randburg. A full range of digital panel meters, electropneumatic calibrator and temperature transmitter are manufactured, as well as radio transmitters, the new Inspecta FFT tube leak detection system, a maximum demand timer for Eskom, and other systems designed to customers' requirements.

An interesting company is Hartmann & Braun which bucked the trend towards disinvestment by purchasing its local agent Process Control Instrumentation five years ago. So has Endress & Hauser and Sprecher & Schuh. All three are

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German or Swiss German based, and mostly importing at present, but the extent of their local manufacturing activity is rising.

A South African-designed mine monitoring and control system is Davmon, introduced by Davis Derby, of Boksburg (subsidiary of the UK concern). The first order was for Matia colliery for its No 1 mine.

The need to monitor shaft cage condition is fast becoming a necessity. The monitoring and interlocking of conditions such as cage weight, slack and tight rope, as well as door open and closed states greatly reduces the number of cage-related incidents. The Grinaker Process Controls subsidiary of Grinaker Electronics has developed a system which monitors on-cage conditions and transfers this information to the cage winder for visual, alarm and interlocking purposes.

The system consists of a data collecting outstation mounted in or on the cage, a data processing receiving station with visual indication panel and an optical computer. Data transmission is via radio using the inductively-coupled cage rope as the transmitting

antenna.

The parent company is the country's leader in underground radio communication, including systems capable of transmitting through solid rock.

Positioning

What is claimed to be a totally South African designed and manufactured linear positioning system for industrial and scientific applications is available from Microdyne under the Digimech name. Model LL has been engineered to incorporate as standard many features normally considered optional extras, which makes the commissioning of a complete positioning system fast and simple. Since customer engineering is limited to workpiece mounting.

The design is modular, and is available in three travel ranges of 150, 350 and 550 mm, utilising many common parts. Units can be assembled in any combination on X, Y and Z axes, for such applications as welding, cutting and engraving with lasers and electron beams, routing and conventional engraving, as well as PCB inspection and testing.

Telemecanique SA is making a major push into the South African pneumatics market today, which is seen as an extension of its electrical control business, brought on by the fact that most pneumatic (and hydraulic) equipment is electronically controlled today. Virtually every company supplying pneumatics in South Africa offers programmable controllers suitable for controlling its pneumatic line, and probably the majority are also marketed independently. There is in fact a general move towards electronic control in industry, however the effort is ultimately applied.

Festo, a direct affiliate of the German company of that name, is the leading supplier of pneumatic systems and equipment, other activities including electronics, complete control engineering systems, practical hands-on training and power tools.

According to Kurt Auf der Heyde, MD of Festo South Africa, "The control engineering market should grow in excess of the average... If it does not, then we have a very serious problem indeed. Statistics show the average growth in productivity in various countries... South East Asia tops the list with an average growth of between 18 and 20%, while South Africa is dangerously near the bottom with an average growth of 0.8%, on a par with Ethiopia!"

South Africa has one of the highest frequencies of lightning incidence in the world, particularly over the coalfields which cover much of the Transvaal highveld. In some areas lightning incidence is as high as 13 strikes per square kilometre per year.

Neighbouring, particularly rail weigh-

bridges with extended tracks and overhead lines; are particularly susceptible to both direct and indirect strikes, which can destroy Toadceiis and associated electronics. As a result, untii recently, danage from lightning strikes

incorporation of micro-h
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In a comparison report from Piet Retief of microprocessors for the manufacturer tizgzerit
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Other systems are available. in addition able to achieve A major problem in the South Afr
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South Africa is industrial bar coding,
in which Saco Systems (Reunert) seems
to be the local iader.
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On the applications front South Africa's
excellent owing to the
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little or no external piping
1. Control Valves do require external
power sources, but can be applied
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some of which concentrate on particular,
specialised niche markets while others
offer a reiativeiy broad product range.
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price/performance of their products _ ensuring the success of the prOJ ect process regula
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Another strong point is their abiity
to offer a more personaiised service.
One such smaii suppiier is Specitec,
which has a broad and interesting (im-
ported) product range and a small factory
the tax
For the factory or technical manager
who has to implement a process control
is the added worry of
without having the dedicated workforce
to see it through. In the worst case,
the company's electrical and mechanical
maintenance people become the project
team. Since they have other duties
which generaiiy take precedence, the
impiementation process becomes bogged
5. _Regulators are elticieht and
reliable, when properly sized and
selected
back-pressure application?
2. Perhaps a dillerential-reducing or
dilierential-reliei duty?
3. Or even a vacuum-regnlatng or
vacuum-hreaking service?
4. Identify the flowing llquid/vapour/
gas/steam accurately!
5. Vapour pressure. viscosity and SP.
5. Content Valves are generally the
most wnder used type oi linal control
element
Application I'niormation needed lor
expected to perionn?
2. ldentif y the flowing liquId/vapour/
gas/steam accurately!
3. Vapour pressure. viscosity and SP.
GR. at "owing temperature!
4. Will the demand (llow-rates) vary
or remain constant?
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and nominal headquarters in . . . y
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perature! , will the control valve operate?
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YERR
1990
1981
1982
1983
1984
1985
1986
1987
1988
" TABLE 15.1: SOUTH AFRICAN FERROUS CASTING
(excluding ingot moulds cast by steel producers for
their own use)
STEEL CASTINGS IN TONNES
Manganese
Carbon and other 1018L Grade White Heat-treatable 1561 TOTAL
Steel Alloy Steel STEEL Iron Iron Iron Iron IRON
99500 58600 148200 284300 22500 15901:- umn) 21900 391500
85400 56300 I 4 1700 29770!) 22000 22600 3390') 27000 403200
85700 48200 133900 237700 1880) 13500 29000 zuyyo 323000
61600 50600 1 12200 185700 17400 46'!" 2501') 22500 25521:!)
50100 53911:) 109mm 1 75:00 1860':- 4804' 24300 26900 247900
51500 55800 1 07300 1 25000 1 82".!) 2811"? 1 76'1":- 20500 188200
4320:) 43100 gun ' 108100 16100 28')" 14900 25400 167300
4091:;) 47401) 8831,11) 1092.00 18100 290'; 10700 53800 174800
39600 52500 9210) 98900 15400 221:0 6502! 35300 158800
INDEX OF SOUTH AFRICAN FERROUS 514511146 DUYPUL
1980 : 100
1980 1981 1982 1983 1984 1985 1986 1987

All
Manufacturing 100 106.4 103.1 97.3 100 94.9 95.5 98.5
Steel Castings 100 95.6 90.4 75.7 73.5 72.4 65.0 59.6
Iron Castings 100 105.2 8-1.7 66.9 65.5 49.3 43.9 45.8
Total Ferrous
Castings 100 102.9 86.3 69.4 67.8 55.8 49.8 49.1

Fig 15.2: Quarterly
civil engineering

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FERRIJS

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250900
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recovery of the
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industry
figures not obtained in time).

CHAPTER 15:

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SOUTH AFRICA's engineering industry
is broadly capable in many directions.
It is more so in heavy engineering,
which forms the subject of this chapter,
than in several other directions. Under
heavy engineering we consider large
one-off engineering projects, plant
engineering, and specific types of
plant: foundries, forges and heat

treatment plant, materials handling, thermal equipment - especially boilers, furnaces and heat exchangers, mechanical and fluid power transmission equipment. Broadly speaking, in most of these areas, South Africa is capable of producing most of what is needed, although it is less self-sufficient than the country's planners would wish. Apart from new categories of equipment employing new processes developed overseas, South Africa's heavy engineering industry is capable of producing the bulk of what is needed in technical terms. Whether it can do so economically, or find sufficient local market for doing so at all, are the big practical constraints today.

When the industry looks more widely, to exports as well as the home market, experience indicates that the country can succeed. It is South Africa's misfortune that, in the siege economy, many export opportunities are denied.

MAJOR PROJECTS

In the management of one-off projects South Africa has come a long way towards self-sufficiency. Most of the major project engineering companies have been bought out by their local managements, where they were not locally owned originally.

The boom in capital spending of the late seventies and early eighties has petered out, but many capital works are ticking over. Moreover Eskom's curtailed R14 billion programme to develop six new power stations during the eighties and early nineties has been supplemented by two projects

HEAVY ENGINEERING

of equivalent scale to the cut-back power stations, namely Mossel Bay and Lesotho Highlands. These are supplemented by many smaller projects in the public and private sectors, including housing, toll roads and property development. The mining houses, despite the fluctuating fortunes of gold, have continued to look to the future in terms of exploration and exploitation of mineral resources, and there is growing emphasis on producing finished goods rather than exporting raw materials. In fact South Africa is moving from a mining-based economy to one more broadly industrial, but seven lean years have consumed the preceding fat ones. Despite the recent upturn, the level of real gross domestic fixed investment (GDFI) is still substantially lower than in 1982. At the time of a Financial Mail supplement on capital projects in March, "The economy had passed into the advanced stages of a 'moderately vigorous' upswing. And the opportunity to increase capital investment further is limited." We have no capital forecast since the return of F N de Klerk to power and the release of ANC detainees headed

by Walter Sisulu, but it is strong
felt the economy is in a whole new
ball game./

The mining sector and cement industry
business are fairly slack, as is Eskom
power station work. Durban's
shipyard has not built a vessel in
a long time. Now it's working on the
Mosses accommodation module and is
busy with ship repair work.

- "The industry has become more efficient
and uses its labour to better effect"
says Michael McDonald, head of SEIFSA's
economic division. In 1981 it went
through a hiring spree and pushed
the - number of hourly-paid workers
to 450 000. Then the recession hit,
and one in four lost their jobs. In
1986, when the recovery started, the
industry employed 330 000 and the
number has now increased only slightly
to 350 000.

There has been some mechanisation, but not a great deal. There's a reluctance to put people out of work. Unlike the automotive industry, the heavy engineering industry does not need to mechanise or automate to keep abreast of overseas technology, he says.

There are about 9000 metalworking companies in SA, about the same as before the recession, when many merged or went out of business. They have been replaced by new start-ups by artisans who resigned their jobs, fearing redundancy, but the new start-ups are generally smaller. More than half the 9000 companies employ less than 10 people and some employ only one person.

In May it was reported that activity in the heavy engineering industry was outpacing the boom year of 1981. Recovery started in 1986 and will last through to the end of 1989, according to the economic division of the Steel and Engineering Industries' Federation (SEIFSA). Much of the recovery is due to Mossgas, which compensates for a fall in traditional demand for rolling stock. SEIFSA's definition includes shipbuilding and repair, construction, pressure vessel manufacture and many of the Mossgas contracts. The decade 1979-89 is regarded as an exciting one by the South Africa civil engineering industry. According to Kees Lagaay, executive director of the South African Federation of Civil Engineering Contractors (SAFCEK), reported in the 10th anniversary issue of *Engineering Week* in May 1989, notable achievements include innumerable major national road contracts, Garden Route bridges, du Toit's Kloof tunnel, the Huguenot tunnel. Uncle Charlie's interchange complex (Johannesburg), improvements to and doubling of the Richards Bay coal line, harbour extensions and industrial development at Richards Bay, Bapsfontein central marshalling yard, Hex River railway tunnel, Eskom power stations including Duvha, Matla, Lethabo, Matimba, Kendal and Majuba, Drakensberg and Palmiet pumped storage schemes, Koeberg nuclear power station, Sasols II and III, new coal mines for Eskom power stations and Sasols II and III, and the Greater Soweto

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roads and services upgrading project, followed by many other township upgrading and new construction projects throughout the country. Many of the major projects are winners, or in any case mentioned in the annual Fulton Awards for Excellence of the Concrete Society of Southern Africa. Concrete technology has been completely reworked and in many cases researched from scratch to suit local conditions, in which the Portland Cement Institute has played a key role.

The civil engineering industry has emerged strongly from a two-year trough and is in a reasonable position to withstand the present economic downturn. Contracts awarded in the first eleven months of last year totalled R2.6 billion or 45% up on the corresponding figure for 1987, and 75% up on 1986, but the rise was off a very low base.

"The industry is now healthy but has considerable capacity to expand further. Employment is up to 94 000 from a low of 75 000 in late 1986. But it is still far behind the highs of 135 000 in 1975 and 120 000 in 1981 says Brian Hackney, President of the SA Federation of Civil Engineering Contractors. Virtually all the major projects we mention involve some civil engineering work but the largest, Lesotho Highlands, has not yet come on stream in a major way at the contractor_level.

MATERIALS HANDLING

Materials handling is a major activity of the heavy engineering industry, of which a few projects and suppliers are mentioned as representative. PHB Hesserhutte SA is a major supplier of stacker reclaimers etc :to Eskom. ongoing business with which has led the company into local manufacture and exports. Early last year, for example it constructed and supplied a novel stacker/spreader for a Chile copper mine which is partly rail' and partly crawler-mounted, as sub-contractor for Bateman Materials Handling.

Aeroconveyors SA specialises in totally-enclosed materials handling conveyors

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in which area it is exporting at least expertise - to such anti-South African markets as Australia.

Bateman Materials Handling has secured the contract for the ash handling plant at Lethabo power station, a R21 million contract for a purpose-built plant with a capacity of 450 000 tons of particularly abrasive fly ash per year.

conveyor which perhaps

mention is the JPC

pipe conveyor available from Bateman

Materials Handling, which rolls up

to enclose the product, and to allow the conveyor to negotiate bends, but opens for loading and discharge, where it presents the same flat configuration as a normal belt conveyor. They are proving very popular and have been installed, for example, beneath the boilers at Lethabo power station where they are used for the removal of ash. The cramped conditions below the boilers force the conveyors to negotiate bends, and the enclosing of the abrasive fly ash is also an advantage.

One type of
deserves special

While process plant makes primary use of fixed conveyors and manufacturing industry of fork. lift trucks, most types of industry make at least some use of overhead cranes, whatever other methods of handling they employ. In heavy engineering, foundries, turbine halls, plant workshop and maintenance environments, overhead cranes provide the premier handling method.

The selection of handling method for a particular plant or type of application is a critical one whose importance is too often overlooked. Mistakes are expensive and - in the case of fixed crane installations - difficult and highly inconvenient to rectify when the plant is in operation.

For this reason the technical sales forces of the crane manufacturers in particular advise their customers as well as selling products. Said Bertrand Blackbeard, then MD of Tilghman Lasch. "It is far better. and generally cheaper for the customer, if we carry out a feasibility study and make a recommen-

customer's needs,
product which
less than

dation as to the
rather than supply a
is unsuitable or serves him
optimally.

Lasch cranes are of totally local design and manufacture. even to the electric motors which are assembled by Lasch from sub-contracted parts. The cranes are of multi-motor design, and normally built for general industrial duty.

All components are jig-built, resulting in complete interchangeability of parts, and low cost for a frame of the highest quality. Tilghman Lasch, which claims the largest local installed base of gantry cranes concentrates today on. the medium-size crane business, with spans up to 25 metres and 25 ton lifting capacity. though it has made 200 ton cranes in the past. Today it is generally felt that such monsters are over-specified for optimum work flow in most plants. Thus, where there is: a maximum lifting requirement of say 30 tons it may be more cost-effective and efficient to install two 15 ton cranes or even three 10 ton cranes

on the same gantry. The immediate cost of such a multiple installation is often only marginally higher, against which several areas under the gantry can be served simultaneously, - leading to smoother and faster work flow, while it is still possible to handle the largest loads using two or three cranes working together." Blackbeard left soon after our interview, the immediate result of which was to further strengthen competitor Condra; largely staffed by former Lasch personnel.

The other major suppliers are Demag and Morris. which tend to offer larger, and largely imported units.

While gantry cranes are often locally manufactured, fork lift trucks are mostly imported, for no good technical reason. Premier Equipment Manufacturing Company (Pemco) is probably furthest down - the local manufacturing route, with a capacity for manufacture and/or assembly of 25 Clark fork lift trucks, 4 Volvo BM articulated dump trucks. a variety of materials handling and construction attachments and the simul-

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taneous progress of a typical Euclid, say 370 ton, off-road dump truck per month about two years ago, when capacity was only about 50% utilised.

South Africa, of course, is not in the big league of equipment users. More than a dozen equipment suppliers compete for the relatively small market, so the economics of low-volume local manufacture are debatable.

"There is room for rationalisation, and those of us who have invested heavily in facilities, equipment and manpower should together enjoy a larger section of the market share" said Mark Whitehouse, CE of Pemco and group technical director of parent Premier concern. Massive pulleys, suitable for materials handling belt drives, are manufactured, for example, by Bosworth.

designed for the market are made a subsidiary of the

in a wide range

Heavy-duty castors

materials handling

by Tente Castors,

German Tente concern,

of variations.

BTR Sarmcol's Howick factory has produced a million metres of Powatock, an all-polyester woven conveyor belting claimed to be the ideal material for conveying coal in particular because of its fire-resistant properties.

Four fully-enclosed air cushion conveyors made from 3CR12 are being used at de Beers diamond mines on the west coast for security reasons.

An important body in this field is the SA Institute of Materials Handling which recently celebrated its 21st anniversary.

MECHANICAL POWER

While electric power is the most convenient form for general use and easily the most widely used in practice, it does not exist in isolation, nor is it the most convenient form in all cases. Electric motors and other prime movers are generally coupled to mechanical systems where speed of rotation

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must be increased or decreased, and through which the power is transmitted to its point of application.

Where mechanical power must be transmitted over distance, belts and pulleys, or chains and sprockets, are often employed. They are supplied, for example, by Idrivetech and Renold Crofts - a local distributor of bush roller chain, one of the most efficient means of power transmission though it was developed in the Nineteenth Century. Speed may be increased or decreased most simply by differential pulley/sprocket wheel

sizes or, most commonly, by a gearbox. Where variable output speed is required, mechanical variators may be employed as alternatives to the electrical variable speed drives which are most common today. Despite the greater popularity of electrical drives, mechanical variators have a place, and perhaps deserve a bigger place in the South African market than they have at present, owing to their mechanical nature and consequent ease of understanding. They are available from Ringcone/Varispeed.

Where fixed ratios suffice, a gearbox of some sort is normally employed. It should be of high efficiency today, with losses of perhaps 1-1.5% per ratio for simple gearboxes today. Industrial (non-automotive) gearboxes are available from four suppliers - Renon Crofts, David Brown, Hansen and Fiender, which are all manufacturing, or at Teast assembling, to meet local requirements.

A mechanical power transmission specialist is Renon Crofts, a Pietermaritzburg-based subsidiary of the British Renon concern. The Pietermaritzburg factor concentrates on materials handling chain, particularly used for sugar cane, as well as more sophisticated handling tasks. Recently the company installed an automatic transfer line for car body sheets at Toyota's Prospection plant. As well as 222 metres of conveyor chain with special attachments, the order included 14 geared motors and 48 chain wheels, some of which were locally manufactured in Renon's Benoni plant, whose major activity is industrial gearbox manufacture.

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Another contender in the non-automotive gearbox market is Benoni Engineering Works which has started 100% local manufacture as a licensee of Citroen-Messiah Durand of France. The company's Multirex and Ceterex gearboxes are ultra-compact units designed for coal and gold mines, industrial conveyor drives, agitators etc.

The local heavy gearbox industry is probably worth around R100 million p.a., shared now by five companies. Stewing rings for the mining, construction, marine and other engineering industries are made by several companies including Titanus Engineering.

Harnischfeger SA: supplier of some of the world's largest machinery for open-cast mining etc has recently made its manufacturing facilities available to the heavy engineering market. The company has the capability to produce precision-ground spindles, spur, helical and bevel gears from 25 mm to 5 m diameter, sophisticated welding assemblies etc.

Apart from simple ratio gearboxes, there is still a market for worm gearboxes (which are cheaper but less efficient technically). There is also a market for geared motors, large ring gears for Toca-manufactured open cast mining equipment such as draglines, and more specialised mechanical power transmission types.

The efficiency of all such systems is primarily dependent on minimising friction. This depends partly on mechanical design but mostly on minimising friction by suitable couplings, bearings, and above all adequate lubrication.

Ball bearings (SKF and others) are most widely used for general application, but tapered roller bearings (Timken) are more suitable in specific instances while plain bearings (Micheletti, Glacier) are preferred for large systems. Some modern bearing materials such as nylon and PTFE are self-lubricating within their design limits.

A Drives Handbook published by Communications Group deals with variable speed drives, servos, bearings, belt drives, clutches and brakes, controls, transducers and sensors, couplings, gears and geared motor units, motors and motor control gear, speed drives, and chain drives.

FLUID POWER

A comprehensive report entitled Market Research for fluid power equipment in South Africa details the results of a major investigation into the market for fluid power equipment. It was recently published by LHA Management Consultants. The scope of the investigation included hydraulic power equipment, hydraulic accessories and pneumatic equipment which jointly comprise a market estimated at R305 million in 1988, broken down by equipment category and market sector in Fig 15.4u

According to the consultants hydraulic power equipment represents almost 50% of the total and hydraulic accessories nearly 33%, which broadly agrees with the perception of the author. Mining, and mining OEMs represent the biggest sector(s), followed by agricultural OEMs, base metals and transport OEMs, but there is a large unsatisfied 'other' group. The total 1989 market was expected to grow by 5% in real terms, with real growth of 8.8% over the medium term.

Although in South Africa hydraulics and pneumatics are often considered together as fluid power equipment owing to the single institute covering both areas, their market applications are somewhat different. Hydraulics are most suitable when it is necessary to exert the maximum effort in a minimum space, so they are particularly suitable in the cramped mining and transport areas. Pneumatics are also used in mining, but their principal application is probably in low-cost factory automation, in which they provide particularly gentle handling.

Technical trends in the mining area which will increasingly raise fluid power equipment demand include trackless mining, hydropower and deep milling.

Two thirds of all fluid power components sold in South Africa are imported. Local manufacture is restricted mainly to simple components, particularly cylinders, hose and some valves, with gear pumps (the standard pump category) under consideration by several manufacturers, at least one of whom is locally assembling. Systems are locally designed. According to Slabbert Basson, a positive GDP growth is experienced, growth of the fluid power industry is at least four times faster. In the medium term the publisher predicted a healthy 14% growth rate which has probably been experienced in practice. whenever

Hytec is market leader in hydraulics, probably followed by Ernest Lowe Hydro-tube (ELH) and Hyflo. PSI, which once vied with Hytec for first place, is thought to be on the slide. There are also many smaller but significant suppliers such as Fenner, specialising in mobile hydraulics, Buchler Hydraulic: specialising in large cylinder manufacture and Optima Hydraulics in systems engineering.

Festo is the largest pneumatics company, probably followed by Tecair Pneumatics (same group as Hytec), Isando Pneumatics and more - the list of suppliers is extensive but their locally manufactured content is low.

According to The Fluid Power Institute, SA the country's use of hydraulics is on a more basic level than that of the UK or Europe and the same is probably true of pneumatics. Thus gear pumps tend to be used for most hydraulic pumping duties even when a variable volume piston pump would be more appropriate. Much of this very basic approach is due to the particularly rugged nature of the applications in South Africa's mining, metals and other basic industries but hydraulics ARE rugged and there is no reason to avoid the latest designs just because the application is demanding provided systems are adequately rated and, particularly, provided there is adequate filtration and fluid contamination control.

Despite this the President of the Institute reckons that South Africa is ten

176 years behind Europe in the hydraulic systems design area, and the gold mines are once again looking for very basic hydraulics on their underground vehicles for trackless mining.

Other areas in which South Africa is considered backward include the use of servo valves and proportional valves, while in the use of water and water-based emulsions South African usage is possibly ahead of overseas norms. In the steel mills and underground there is emphasis on 5:95 oil:water emulsions both for fire prevention and rock-drilling duties. There is

also increasing emphasis on very-high-pressure water hydraulic systems, used at Kioof and other deep level gold mines (Chapters 6 and 7).

Synthetic hydraulic pit prop emulsion from Castrol SA can be 'fine tuned' to the mines' individual water conditions. These vary widely from mine to mine, and even from shaft to shaft in some cases, with water hardness ratings ranging up to 2800 ppm, total dissolved solids (TDS) up to 3000 ppm and pH from 4.2 to 11.8.

Underground temperatures are generally above 30°C, as a result of which the mines have been fighting major pit prop corrosion battles, and excessive wear and scaling of pumps which standard mineral oil/water emulsions often cannot cope with.

Mineral oils are imported, and involve a serious fire hazard. Synthetic oils are fire-resistant (but flammable), toxic and very expensive. As a result South Africa is making serious efforts to find acceptable alternatives, of which Karbochem's water-based Senfluid is the most prominent. It has been successfully used in NEH, hydraulic installations, for example by Iscor. Unfortunately its incompatibility with traditional hydraulic fluids is such that it cannot be used retrospectively in installations which previously used oil-water emulsions, even with the most careful flushing of the system. At least it was rejected for that purpose after trials by Highveld Steel, where there were severe technical difficulties of implementation.

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are vital. They are of two basic types:
rotary shaft seals and hydraulic seals.
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There is some local manufacture of
both, but the great majority are impor-

ted. Design parameters and market requirements for the two types are totally different, despite a widespread tendency of South African seal vendors to market them together, often in conjunction with bearings.

Mechanical seals and packing are made by Haxmech Mechanical Seals and John Crane (formerly Crane Packing). both Springs-based.

SKF has recently introduced a self-aligning hydrostatic shoe bearing which is particularly suitable for supporting large mills etc in the mining, cement, pulp and paper and similar process industries. The first local installation is on a debarking drum at Usutu mill, Swaziland.

Hytec manufactures a range of locally-designed hydraulic power packs - which however make extensive use of imported components.

FOUNDRIES

The local foundry industry, like other sectors of engineering, finds itself facing a major shortage of skilled and semi-skilled people which is liable to get worse. The industry peaked in 1981, when it was working at 85% of capacity. This fell to 45% in the depths of the recession in 1985-86, which led to reduction in capacity, with the closure of some foundries and the mothballing of others, as a result of which many people actually lost their jobs.

According to Danie Slabbert, MD of Steloy Stainless Precision Castings, the specialist stainless steel foundry formed to produce castings for the pump and valve manufacturers, "This is something that the South African foundry industry can ill afford. It takes many years to train skilled foundry men and if these people are lost to the industry now, it is highly likely that they will never return. Although this is certainly not critical at the moment, once the upturn comes, and it is likely that this will be felt in the foundry industry earlier than many other industries, it could have very serious repercussions".

Steloy is operating an ongoing training programme which alleviates the problem for this highly specialised producer, but the problem is significant for the foundry industry in general and indeed for the engineering industry as a whole. The political situation together with the weakness of the Rand make it very difficult to attract skilled overseas people, but the SEIFSA figures for casting tonnage, which illustrate the problem for the foundry industry, could be duplicated for every major engineering sector.

Most have slight over-capacity, which switches rapidly to under-capacity. More serious than the capacity problem, however, is the shortage of skilled

manpower problem, the only long-term answer to which is to train the South African population adequately. Meanwhile the shortage of skills, whether of local or overseas origin, leads to a drop in the quality of engineering output as soon as volumes start to increase significantly, which benefits no-one but the vendors of imported products.

Poor quality castings is a bane of many manufacturing sectors, for example the local pump industry, which however is claimed to be largely a thing of the past. One major overseas foundry has entered the local market, but Danie Slabbert, MD of Steloy Precision Castings believes that such competition is healthy, and that the local industry should also look to export. Updated figures for casting tonnage were not received in time for inclusion.

A major non-ferrous metal foundry is Bronze Castings, which offers castings in aluminium bronze and other exotic alloys.

A practitioner of investment casting is Fuchs Electronics of Alrode, which

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troduced the specialised process for agmaments manufacture but now markets tee facility's capabilities generally. William Bain, a division of Cementation (Africa) extended its hmnner forging facilities, which inciude a tooiroom and forge hammers ranging in size from 0.5-13 ton. They can produce forgings such as gear bianks ranging from 0.3 to 85 kg. It will not be long before South Africa manufactures many more gears and gearboxes from Tocal materiais.

Many other companies in the business were exhibiting at last year's Foundry, Welding and Heat Treatment Exhibition, held concurrentiy with the premier Electra Mining event.

THE MAJOR GROUPS

The largest group in the heavy engineering sector is Dorbyl, with a turnover in excess of R2 billion and 23 000 employees. In fact the group is a supplier of quality products to the complete spectrum of engineering industries, which have a manufacturing or construction base, including motor vehicles, mining and refining, building and construction, power generation oil, ship building and transportation. Dorbyi's Vecor and other works engage in the largest engineering activities, up to the manufacture of major components for the Tow-pressure stages of KHU's steam turbines for Eskom's dry-cooied Kendal power station (which are individually designed) and, on a series basis, production of casings for main boiler feedwater pumps for this and other Eskom power stations which are manufact-ured 10cally by Sulzer.

The upswing in the motor industry had a particuiarly favourable infiuence on group results. and the manufacture of pipe and tube by Tosa is important, whiie supply of capital goods to Eskom, SATS and the mining industry was unsat-isfactory despite cutbacks. It remains group policy to maintain manufacturing capability for heavy capital goods even if further scaling down becomes necessary. Exports provide a significant but unstated proportion of sales.

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Hurray & Roberts

M&R heavy engineering activities are vested in a group of companies which operate more or less autonomously, but c0llectively give it considerable strength, for exanpie in power station construction and other areas related to civil engineering. The group was the prime contractor for construction of Lethabo power station.

M&R's heavier engineering have been transferred to subsidiary Genrec, another public company now majority-owned by M&R which controls such companies as Elgin

Engineering. Eigin is a heavy mechanical engineering company based in Durban which absorbed Heat Exchangers, a formerly separate subsidiary. It caters primarily for the Natal sugar industries but undertakes a wide range of work.

Many of activities

Other M&R companies transferred to Genrec are Consani and Cape Steel operating from adjacent premises in Cape Town. Consani is responsible for series production of tank containers, many of which are exported, and used in such demanding locations as the Alaska oil industry. Genrec is constructing the jacket for the offshore Moss gas platform at Saldanha Bay. Genrec as it is now constituted combines light and medium engineering, structural steel fabrication and mechanical, piping, electrical and instrumentation erection and lagging and insulation contracting.

Several companies in the M&R group specialise in valves, of which Right Valve and BA Buckley are specifically mentioned.

Of the major engineering groups M&R are particularly well set up to handle large one-off projects, as the parent company of Engineering Management Systems (EMS) and EMS Offshore (EMSO) which was set up to manage the Mosse Bay project.

A major company with fairly major problems is Edward L Bateman, which produces a fairly uninformative annual report revealing a turnover of R735.6 million to 30th June 1988, up from R375.4 million the previous year. Bateman should now have finalised its acquisition of a 60% share in Lurgi SA, securing a "treasure chest" of technologies for SA. The Lurgi process is used by Sasol and an extension of it is to be used by Mossref. (Chap 2). Bateman is mostly engaged in the implementation of large engineering projects in the mining and primary processing industries, a high proportion of which are beyond the country's borders.

NEI Africa, the largest local engineering group in the energy field, has recently rationalised its industrial boiler operations, with subsidiary John Thompson (Africa) concentrating on industrial shell-and-tube boilers, stokers and firing equipment, pressure vessels, heat exchangers, rotary driers and associated equipment, while International Combustion Africa Ltd (ICAL) of Johannesburg markets the complete range of watertube boilers.

Large watertube boilers are individually designed and engineered, a typical example being the more than R2 million unit supplied by ICAL to the Firestone factory at Brits. It is designed to provide 15 tons of saturated steam per hour at a pressure of 1725 kPa.

Babcock Africa has just moved into a new corporate headquarters at Sandton where it has invested over R8 million in a computer-aided plant design system. It is a major boiler contractor for Eskom, also big in materials handling, earth moving equipment and other fields. Babcock Africa is mainly concerned with utility boilers, including the pioneering Lethabo designs, but has supplied a major fluidised bed industrial boiler to AECI at Modderfontein. On a smaller scale the company has reached an agreement with Dunn's Locomotive and Boiler Works of Nitbank, whereby Dunn's manufacture and market Babcock Robey boilers and Oldbury stokers previously produced by PVD (in liquidation). Group 5, which recently added 5 M Goldstein's construction companies is a major supplier of building construction, civil engineering and other heavy engineering work. It is busy into 1990, when it sees signs of "fail-off" in new work. The group was subject to a dramatic management buyout in August 1987 and now has 145 managers and 400 employees as shareholders, and all directors of subsidiaries are required to buy shares. The total workforce is 12 500, and the group is working "flat out".

Steinmuller Africa, which celebrated 25 years in 1987, is a prime contributor to the power generation infrastructure, which since the Eskom cutbacks has been diversifying into petrochemicals, materials handling, processing and mining equipment, and structural steelwork (Steinmuller Lavis). SA Linde Chemical Engineering and Manufacturing is a subsidiary, as are Fuller International Inc and Mannesman Anlagenbau (ANLGB).

Another major contender is Industrial Machinery Supplies (IMS), which majors on bringing overseas equipment for projects into the country, as well as on local manufacture of other items.

The company's new furnace division (formerly with Leys Engineering - in liquidation) recently installed two bogie furnaces for the Vecor works of Dorbyl at Vanderbijipark.

During 1986 the Unihold group increased its interests in the foundry industry with the acquisition of Chamdor Stainless Cast Products, which was amalgamated with Rely Precision Castings of Boksburg. The parent Unihold group has another investment in Boksburg Foundry, a much larger but more general operation. The abrasives division of Thomas Foundry has recently commissioned a plant for the manufacture of Ferrosad, a high-quality, low-carbon steel shot (for shot blasting) claimed to provide up to 30% longer life than traditionally manufactured high-carbon steel shot. Standard Brass, despite the name, is apparently the chosen vehicle for

the Malbak group's entry into the engineering industries. The main subsidiaries are Abertech Industries, which makes metal roof tiles, automotive springs and other metal pressings and products, Fluid Holdings which

makes and distributes pumps, valves and meters, Hail Longmore which makes and distributes pipes, pressure vessels. drill steels and undertakes pipe-laying contracts, and Union Carriage (railway coaches and locomotives). Unlike most conglomerates, Maibak understands the engineering sector if its track record in electronics is indicative.

Or maybe it simply knows enough to let its experts do their jobs?

Another major company manufacturing industrial plant is APV Kestner of Pietermaritzburg, which produced the evaporator for Saiccor's mid-eighties expansion at Umkomaas and manufactures mixer drives etc. The company trades internationally and, on an even larger scale, supplied a R5,2 million gold ore oxidation plant for a California gold mine.

Elca Engineering has recently completed its largest heat exchanger, designed for air cooling, for the CSIR's new wind tunnel. Brass inner tubing is used with aluminium outer tubing, finned to 50 mm outside diameter. More than 6 km of brass and aluminium tubing was used.

Geotechnical and Structural Engineers (GSE) is a leader in the design, supply and installation of underground bulkhead water control doors, manufactured locally to GSE's design, which uses finite element analysis.

Fibrecon of Randburg manufactures massive GRP structures, up to and including 12 ton lids with diameters up to 20 metres, manufactured for Sasol Secunda's sulphur plants.

A major Natal producer is HCHillam Steel of Isipingo, near Durban, which has recently installed two 15 ton electric arc furnaces as part of a general modernisation programme.

The largest private company in SA is the publicity-shy Macsteel, with a turnover of more than R4 billion. In the area of steel construction South Africa's sophistication is up to that of most countries. The Institute of Steel Construction makes annual awards, which on different occasions have gone 1-80

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to a 30 metre lattice mast which can be transported on a two-ton truck, assembled and erected by six men in under two hours and later dismantled in less than one hour. It has to carry a dish antenna and be torsionally stable to less than 10 in gales of up to 160 km/hour without a solid foundation. Novel mining headgears are frequent award winners.

A leading foundry specialising in the manufacture of wear-resisting components is Eclipse, which produces white iron, grey iron and spheroidal graphite or ductile irons to South African and overseas specifications. Casting masses vary from 0.5 to 900 kg. The bulk of

the output goes to the South African mining market but Eciipse'has been exporting to the US since 1977;. - M&R Industriai and Hudaco are pooling their abrasives businesses in a joint company, which will represent a major restructuring of the abrasives industry. After a period of rationaTisation the chairman of the South African Pump Manufacturers Association (SAPMA) is cautiously optimistic as to the industry's future. It is perhaps on the threshold of some big export orders as a result of the weakness of the Rand.

According to SAPMA 70-80% of pumps required in the country are made iocaiiy. Any centrifugai pump can be made in SA. Submersible pumps are predominantly imported, as are most process pumps and others required in small volume. The market is estimated by SAPMA at R300 miliion p.a., plus R200 miTTion of spares, a high proportion of which are- pirated. is Ainsworth Engineering, which secured the bulk of the orders for the Kriei-Kendal pipeline from the Department of Hater Affairs .

Ainsworth recentTy acquiredeex Vaives _ from Lennings .

Another supptTier of valves, up to and including large waterworks-type butterfly vaives, is Bestobeli Engineering.

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Another major in the _valve business _

A wide range of v! are offered

by 6 C Baars, a smai part of which are Tocaiiy manufactured.

Krugersdorp Engineering, a large private company run by Duncan and Maicoim

VeaTe specia'lises mainly in Targe

stainTess steel fabrications, for

which it was jointiy named "Fabricator of the Decade" in 1988 by the SA Insti-tute of Welding .

The South African Institute of Welding is over 40 years old. Strong industry and internationai support has enabled it to grow into one of the best insti-tures of its kind in the country.

In 1982 the industry took a quantum leap forward with the introduction of a two-ieveT certification scheme for weiders. There are now over 300 qualified supervisors in the country. profession with the announcement. of the formation of the South African

Engineering Association (Fig 15.5) .
 Ship-buidding is not yet a major indestry
 but it is being carried out increaSingiy
 by such companies as Dorbyl Marine.
 As well as new buideing, thefe is consid-
 erable and significant rebuilding work.
 MV Dougias Bax, a former bulk carrier.
 was recenty transformed in Table Bay
 harbour for de Beers Marine into the
 Targest sea bottom sampling vesse'l
 operating off the Nest Coast.
 A later, purpose-buiit vessel .
 Louis G Murraz, aiso oper'ating
 t e Namaqua an coast, where its purpose
 is to test various sub-sea mining meth-
 ods. Both make extensive use of Cutler
 Hanmer motor controil gear.

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Fig 15.5: Structure of the newly-formed
 South African Engineering Association.

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 defined, manufacturing is mo
 WHILE HEAVY engineering, dealt with
 in the last chapter, is fairly clearly
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 engineering and other
 It includes
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 sectors dealt wit
 terms it makes extensive
 use of suqh specialised disciplines
 as electronics and pneumatics, as well
 as machine tools - which in one respect
 are heavy engineering items, not consid-
 ered as such in the last chapter because
 so few are lccally produced.
 In practical
 In this chapter we consider overall
 manufacturing and related production
 statistics, consumer durables, machine
 tools, productivity, technical manpower
 needs, maintenance and repair, and
 other matters not elsewhere covered.
 THE BROAD PICTURE
 According to a bookletopublished last
 year by the Bureau of Information,
 manufacturing accounts for more than
 one fifth - the largest single share

- of the gross domestic product, but this includes many sectors which have been dealt with in separate chapters of this report. "In recent years", claims this document, "the manufacturing base has been widened to such an extent that South Africa can manufacture most of its essential imports should circumstances so demand. The main stimuli for industrial development have been an abundance of natural resources, stability, incentives by Government, a strong reservoir of entrepreneurs with the necessary know-how, a growing market and a vast pool of labour," with which we agree - with the fairly substantial reservations indicated in the various chapters. Statistically, manufacturing is at the tail end of a mini boom which ran out of steam as a result of rising costs and interest rates - or rather it had done so before the election. Turnover in the metal industries is expected to exceed R40 billion in 1989, up from about R36 billion in 1988, but recent measures taken to curb imports and damp consumer demand signal

1990 and uncertain prospects beyond. The Board of Trade argues that protection. During the period 1947-70 when substitution was promoted, the manufacturing sector was primarily with profitable production for the domestic market. In export-led countries manufacturing growth,

CHAPTER 16: MANUFACTURING

and little or no growth during substitution of key industries from foreign competition to promote import substitution, and cutting down on imports to save forex will promote real growth. Professor Merle Holden of Natal University comes to the opposite conclusion. import the manufacturing concerned the like South Korea the exports led to and a similar trend is evident in South Africa after 1970 when import substitution was not actively promoted. The expansion of exports and the increase in manufacturing output accompanied one another. While light engineering implies mechanical engineering to most people, both pneumatics and electrics/electronics fall within its orbit. Pneumatics, considered together with hydraulics under fluid power in the previous chapter is largely a lighter engineering category although there are some heavy mining cylinders. There are also miniature cylinders, perhaps the most characteristic application of pneumatics being the low-cost factory automation. Electronics, of course, is inherently a light engineering activity, although

it may be used to control heavy or light engineering activities - including pneumatic and hydraulic systems. All television receivers are made in South Africa to demanding SABS specifications, from largely imported components. Some audio products are made locally but most hi-fi etc is imported. Stoves are mostly made locally as are many other appliances, though broadly supplemented by imports at the luxury end especially.

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first microwave oven
in Durban at
Sohth 'Afirica's
plant has been opened
the Tek Appliances facility. The R8
million plant initially employs 43
people producing 100 ovens per ay,
which was expected to increase to
200 by the year end. The magnetron,
timers and transformers are importeo
at this stage, so that local content
consists of little more than packaging
and cosmetic features. but no doubt
that aspect will improve. The range
is being marketed under the Defy label.
The Tek group comprises Tek Electronics.
Tek industrials and Airco in additior
to Tek Appliances. It has factories
in East London as well as Durban,
producing kitchen appliances, home
entertainment products, printed circuit
boards and air conditioning equipment.
It is an exporter of PCBs and some
kitchen appliances.

Gallo Africa is reported ready to
buy a R10 million compact disc (CD)
manufacturing plant which should be
operating in Johannesburg by 1990. Tapes
and records are both made and imported.
but it

later figures,

election

that the

There are no

is strongly felt

result and the release of detainees

etc will give the whole economy a

boost, which will turn into a long-

reform can be achieved

If not, manufac-

still be

term boom if

in an orderly fashion.

turing statistics should

boosted in the short term.

Gross domestic fixed investment (GDFI)

grew by more than 19% in the first

half of last year. We do not have

the full year's figure, but last year

was the first since 1982 when growth

and it has been

was in double digits,

slowing down subsequently. Moreover

the high growth recorded last year

was off a very low base.

In June, which is thce most recent

month from which we have cement by

Financlal Mail, uncertainty about

government intentions was fuelling

fears of a slowdown in manufacturing

investment growth. Lack of co-ordination

and stop-go policies. coupled with

a growing perception that it is the

bungling Department of Finance rather

than Trade and Industry

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that is calling

0 '

IDC predicts growth

in real fixed manufacturing investment

should be sustained because of import replacement demand and a relatively stable level of business confidence. The Federated Chamber of Industries' industrial confidence survey, however, indicated that confidence may be diminishing. We have no figures subsequent to the election, but confidence should begin to improve now that the major political uncertainty is out of the way.

the tune. The

MACHINE TOOLS

Of all the categories .

machine tools are the most important, as the means by which all others are ultimately made./

Only very limited quantities and types of South African machine tools are at present being manufactured. Guillotines, press brakes, presses, pyramid type plate banding rolls and drilling machines are all of sufficient standard to be used as viable alternatives to imported products. However they are all of conventional types. There are some other machine tools such as centre lathes and turret milling machines which are partially manufactured in South Africa, but the exercise is mainly cosmetic. There is strong resentment of protective duties granted to such machines, and representations have been made to the Board of Trade and Industry to remove these protective duties, which are highly inflationary and detrimental to the country's interests. The number of CNC machine tools being manufactured in South Africa is minimal. Machines built by Efa Machine Tools are of a high standard, but they are not meeting more than a minute fraction of the market for CNC machine tools today.

In the opinion of Bobby Skok, a leading merchant of machine tools selling mainly overseas products there is no way they could do so, now, or in the foreseeable future, which view he justifies by pointing out that 2 million man hours were spent by one Japanese company he represents in developing their latest 32 bit CNC controls. The cost of the develop-

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ment work alone amounted to more than \$2 million. "It is clear that no South

African company company could contemplate this sort of capital expenditure," with which the author does not necessarily agree.

No South African company would spend that much money now, but the major armaments manufacturers can certainly contemplate it, and might welcome a move into machine tools if they find arms sales have fallen off, provided by then the company is assured of an open world market. Even without it they might enter the bottom end of the machine tool market with simple products suitable for artisan education. With a reasonable grounding in simpler machine tools it seems unlikely to the author that an industry capable of making main battle tanks, howitzers and guided missiles is unable to teach itself to manufacture advanced machine tools if this is judged to be a national priority. At present there are no South African machining centres, CNC wire cut machines, CNC spark erosion machines or CNC grinders.

in ;the machine companies and specialist

All are. widely used, shops of manufacturing as production machinery by engineering firms.

For almost two centuries, only one method of cutting diamonds has been employed, using the conventional diamond saw. Now Laser Optronic Technologies (Laser Optech), a member of the Altron group, has made a breakthrough with the application of laser technology. The tools and dies of South African-designed products are, for the most part, made locally but the machine tools as such are predominantly imported. During the depths of the mid-eighties recession South Africa's hard-pressed machine tool trade engaged in the dubious practice of buying back machine tools from bankrupt customers and re-exporting them, before the government (quite rightly) put a stop to it. The result is that there are very few second-hand machine tool bargains in South Africa, and any company wishing to start manufacture at this stage is virtually forced to buy new at current import prices.

At present. while the machine tool market is buoyant, local manufacturers. should be-pressed to achieve far more, otherwise import duties should be reduced or entirely removed.

Even if SA begins to do so, it will of course be many years before it is producing machine tools to rival those of Germany, the USA or Japan, but it is thought that machine tool manufacture should be high on the list of strategic planners, if they are planning for continuation or intensification of the siege economy. As a national priority

it is perhaps less critical than large computer manufacture, but only just. And, unlike computers. where South Africa has no inbuilt technical strength, it has the metals industry and the armaments industry to support machine tool manufacture. And, in a siege economy the captive market.

It should be understood by all observers that the siege of South Africa is an economic siege only at this stage, and with the cessation of hostility in Angola the country's under-employed armaments industry will be looking for new opportunities, of which an IDC-sponsored machine tool industry is a distinct possibility if not a probability. '

From the point of view of the country's friends it is less danaging in public relations than anns exports, and it may have very long-term national benefit. South African designed and manufactured machine tools may be a no-no in the world market today, but if they are technically competitive will Taiwan really care? Or the world, when South Africa finally achieves respectability? which it is convenient to consider at this point, are not locally manufactured to any degree for no reason except the reasonable price of importing today. One should make a distinction between power tools and those where human beings provide the muscle. The present importers of power toois insist that it would be uneconomic to manufacture locally. Perhaps, but it would be entirely possiblet and it is starting to happen in a small way.

Hand toois,

Machine tools, materials handling and other technical equipment and processes are employed in the manufacturing industry, to produce whatever is required. In South Africa this is done less productively than in the First World countries, owing to past emphasis on catering for the import replacement market rather than exports. How to improve productivity is a major conundrum for the country today. In the author's opinion it can only be done in a major way by placing the major manufacturing emphasis on exports. Productivity is promoted by a National Institute for Productivity, the importance of whose function is generally acknowledged, but not acted upon to a sufficient or significant degree.

Moreover, where it IS acted upon, result is often negative in terms of social impact, since unskilled or semi-skilled workers displaced by more productive machinery are not re-assimilated in other roles but simply made redundant. Except for the safety net provided by the informal sector (Chapter 2). the

The more successful informal initiatives will eventually join the First World. formal economic sector, meanwhile they can soak up the inevitable unemployment resulting from more productive manufacturing activity.

A Just-in-time Industry Group (316) was formed in 1986. Founder members included Hewlett-Packard, Toyota, GEC and others.

A key factor in the equation is the still acute shortage of skilled people. University graduates have met only half the demand since the early seventies and the current levels of the 'brain drain' are a major cause for concern. The roles of the technicians and technologists are as important as those of professional engineers, and the Output of SA'S technicians would have to be quadrupled to meet the demands of the local industry in the decade ahead. The shortage of technically qualified people is a major cause of SA dependence on imported expertise and goods and, with increasing privatisation of exper-

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ience-linked services, attention will continue to be focussed on the shortage of skilled manpower.

Without adequate managerial, executive and professional skills, South Africa runs the risk of sinking into Third World Banana Republic status. For this reason many people were aghast at last year's draconian education subsidy cuts, ranging from the abolition of subsidies for most industrial training schemes to 25-29% cuts in subsidies at university level.

To quote Martin Nestcott, MD of PE

Corporate Services, "South Africa hardly needs an ever-increasing pool of unskilled or semi-skilled labour, as poor education strategy in the past has resulted in the country .being swamped by the unemployed and the unemployable. Nith subsidy cuts it will become increasingly difficult for universities to offer the quality education required to ensure that our graduates can compete internationally....

"The decision to save on education costs is most dubious - and at best short-lived. South Africa still needs to learn the lesson of the East and those high-growth economies of South Korea, Japan, Taiwan, Hong Kong and Singapore. All these countries earmarked enormous budgets to education and training which lifted their rural backward polulation to beyond First World standards within one generation. The investment paid off handsome y and has not precluded the containment of total government costs to relatively modest levels. South Africa needs to copy the successful economies rather than experiment half-heartedly with cost-cutting exercises."

South Africa needs an aggressive and carefully thought-out education strategy prepared .to meet the country's need for different levels of skills - managerial, technical and supervisory - in order to meet the projected future economic needs. Obviously different skills are acquired at different tertiary educational establishments, all of which must meet the challenge to equip the working population with meaningful skills.

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There may be some scope for cutting subsidies for (economically) unneeded degrees - provided it is balanced by increased subsidies for degree courses and lower level courses in disciplines that are in high demand (engineering being the most obvious current example). already

It is interesting that there is ' taking

a tendency towards students out loans for later repayment. Much more encouragement should be given to that development, including government sponsorship of interest rate concessions. A pre-university bursary scheme (PBS) run by the engineering faculty at the University of the Witwatersrand is beginning to improve the success rate of black engineering students (who are very few and their success rate low). The one year bridging scheme, launched as the Anglo American Cadetship scheme in 1980, now accepts up to 60 students per year. Of the 300 applicants a maximum of 150 can be accepted between the Hits scheme and sister programmes launched last year at the Universities of Cape Town and Natal. "Surprisingly enough, students from isolated areas such as Venda often cope better during the bridging year because they have succeeded in their schooling through natural ability and self-motivation, without access to many of the resources such as libraries which are available in larger centres", says Jeffrey Hillman, responsible for the scheme.

15-20% of students enter technikons after the PBS year, where they can obtain exemption at the T1 level from some year-end examinations. Most students who successfully complete the year go on to start their degrees in various engineering disciplines at the universities.

In 1987, 95% of black graduates and 75% of white graduates from South African universities were non-technical. In the same year there were 110 000 students at technikons and technical colleges, and more than twice the number at universities. The South African economy needs technical skills but it is not getting them. In 1986 only 5% of university students graduated in engineering.

most urgent priority

technical education

secondary

which, so

Nationally, the

should be a massive

programme, especially at

school and Technikon level

far, simply is not happening.

what happened was that

technicians and artisans were brought

in from overseas, many of whom are

still occupying such positions. Some

will continue to do so, but others

are expected to leave if the economy

and the political situation deteriorate further.

Traditionally,

Theoretically this will leave the door

open for the further advancement of

blacks and other non-white groups,

who will mostly remain in South Africa

whatever happens. If they are to fulfil

their potential in this regard, however, it is essential that they have the basic educational requirements necessary. At the present time they do not: Nor is the educational system oriented to encourage them. What are needed are basic literacy and numeracy, and encouragement of those with any aptitude towards mathematics, science, and more specialised technical disciplines, training facilities for which are inadequate as the need for them is barely perceived at this time.

It is to be hoped that the drastic weakening of the currency following PHV Botha's 'Rubicon' speech in 1985 will result in a rethink of educational priorities in the not too distant future. At the subsequent exchange rate it is no longer practical to buy in technical expertise from overseas, nor does that option do anything for the long-term health of South African industry 'which forms the subject of this report. One major educational medium not exploited significantly today is broadcasting. It could be used much more to teach such subjects as mathematics and science where there is such a shortage of personnel. The move by Eskom towards nation-wide electrification and the move to manufacture television tubes herald a major initiative in that direction. They make it possible.

MAINTENANCE AND REPAIR

Maintenance and repair of equipment are partly dealt with in separate chapters. which is right so far as practices are specific to one industry. Here we are concerned to identify common threads to the activity. It should be said immediately that South Africa's theoretical capability in maintenance and repair is well up to First World norms and in some respects greater than the norm in Europe owing to three specific factors:

distance

sources

t The country's and isolation of supply.

geographical from overseas

t The serious and prolonged recession of the mid-eighties which forced many South African managements to run their existing plants as long as possible, even beyond their originally intended economic lifespans.

i The worsening siege conditions under which the economy now operates, which is encouraging management to buy the best possible quality with the specific intention of making it last.

whatever the theoretical situation M&R is no better in practice and in many cases worse than that in other countries, the reason being that it is an ungainly activity to which the best brains are rarely attracted. Too often in practice it is left to relatively unskilled labour, inadequately supervised, undermining the often elaborate systems and excellent facilities.

DESIGN

The best maintenance is no maintenance, which can never quite be achieved in practice, but a great deal can be done towards minimising the need for maintenance in the original design of the plant or equipment. In South Africa as elsewhere, service intervals for motor vehicles have lengthened, as the improved design of the product. including materials and lubricants, has lessened the need for regular tuning and adjustment.

the industrial are including many categories of equipment manufactured and designed in South Africa.

The same trend is evident throughout. For minimum maintenance, the general aim is simplicity of design, with a minimum of joints and abrupt transitions. In any practical equipment they cannot, of course, be entirely avoided, but their minimisation is important since they provide fatigue stress and corrosion start points. This is generally understood by South Africa's engineering designers, who perhaps act on it to a greater extent than their counterparts in Europe owing to the relative scarcity of competent maintenance personnel.

THE K FACTOR

A tacitly understood design! requirement of any equipment is that it must be Kaffir-proof, frequently euphemised today with an oblique reference to the K factor. However it is described, the requirement is for the equipment to withstand gross mishandling by semi-skilled or totally unskilled black labour, which imported equipment is rarely designed to do.

For this reason South African designed equipment is often superior for Third World operation and maintenance to more sophisticated equipment originating from purely First World countries.

The South African Bureau of Standards (SABS) was established in 1945 to promote quality and standardisation in the South African manufacturing sector. There are 60 laboratories where most products made in South Africa can be tested. The SABS mark of approval is important to any Tocaity-made product in the Toca market for which a SABS standard has been issued.

Of perhaps greatest importance in the engineering industries today is SABS 0157, the quality assurance standard, which is identical to ISO 9000.

By the end of 1989 some 350 South African companies are expected to be listed as complying with SABS 0157, which is, theoretically, not granted in perpetuity but reassessed regularly.

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The Council for Scientific and Industrial Research (CSIR) was founded in 1945 to provide research and development support for South African industry.

Until the recent past, however it was perhaps too orientated towards pure research to provide the practical support it was intended to give. Following a major budget cut in the mid eighties it has rationalised from the former 22 research institutes and Laboratories into 11 more market-orientated research, development and implementation divisions with supporting information and computing services.

Its most important contribution is probably still in common areas of national concern, such as Tightening research and Low-cost housing, but the 11 divisions also make significant inputs to their respective industries, as do the universities in their various areas of excellence.

The CSIR's Foundation for Research Development promotes the development of high-level scientific manpower in South Africa, manages comprehensive national research programmes and facilitates Tables 17.1e2: Marine corrosion index (MCI) and industrial ties and maintains liaison with international science on behalf of the country.

At the same time it is deriving an increasing proportion of its income from contract work carried out for private industry and government bodies. These facts of industrial life have been recognised for many years, as a result of which those in charge of industrial equipment above specified ratings are required to be current holders of a 'Government Ticket' or Certificate of Competence to handle such equipment. This rule is strictly enforced throughout the mining and electrical distribution sectors, as a result of which 'certificated engineers' represent a prominent group, with their own magazine. The Certificated Engineer. The is less advanced than a university degree or membership of one of the professional engineering institutions, but is a well-established route in South Africa for practising engineers without high formal academic qualifications to achieve professional standing in the areas of operation and maintenance.

index
corrosion
of aluminium cladding at various South African sites.

MCI CORROSION RATING

3.8	Severe
6.6	Moderately Severe
15.9	Severe
9.0	Moderately Severe
11.1	Severe
17.0	Severe:
12.8	Severe
8.7	Moderately Severe

CONCRETE CONSTRUCTION
ACTIVITY INCREASES 51%

Very	Severe
Very	Severe
Very	Severe
Moderate	
Very	Severe
Moderate	
Very	Severe
Moderate	

thnhage. Workshop
Warehouse. Durban
Paper Mill. Springs
Power Station.

GROWTH IN CONCRETE
CONSTRUCTION .-

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CHAPTER 17: BUILDING AND CONSTRUCTION
IN THE SOUTH AFRICA of the nineties,
building and construction must play
a key role, as the enabling technology
for the proper housing of South Africa's
millions of black citizens living
in Third World conditions. That, however
is not the situation seen today. What
one sees is a relatively small industry,
undertaking First World construction
for the First World sector, with a
few larger firms entering low-cost
housing still in a small way.

BUILDING MATERIALS

Most of the engineering materials
(Chapter 8) have at least some building
applications. Steel, of course, is
extensively used in a structural role,
as well as for cladding as corrugated
iron. Glass and aluminium are also
extensively used for cladding, the
latter in naturally oxidised, painted
and anodised form. Anodised aluminium
is extremely attractive. One of the
largest aluminium anodising plants
in South Africa was therefore recently
installed by Hispeco, the aluminium
window frame producer.

Technically, aluminium cladding is
most interesting in its unprotected
form, or perhaps one should say self-
protected. If not anodised, it is
frequently painted for the sake of
appearance, but protects better when
uncovered, since the surface layer
of aluminium oxide itself protects.
Some industrial atmospheres will attack
it, but even the hot and humid Natal
coast air will not. Experiments carried
out on the roof of Addington Hospital
in Durban show that 'unprotected'
aluminium roofing material is good
for a life of at least 20 years under
the most severe coastal conditions.
Corrugated iron lasts little longer
than its galvanising.

Flat glass is used not only as a window
material, but also for the full cladding
of modern buildings - particularly
those erected for Anglo American Proper-

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ty Services (Amaprop). The cladding
material is imported. Almost all the
window glass is made locally.

The materials we are primarily concerned
with in this section are, "however,
the non-metallics brick, stone, tile,
cement, concrete, thatch, wood, and
various paneling materials, most
of which are made or prepared in South
Africa. There is some import of building
materials, but it is limited to luxury
and exotic items. For practical purposes
the country is self-sufficient.

Bricks are made by a number of suppliers
but a single company, Corrobrik, domin-
ates the market. A full range of build-
ing bricks is produced.

Stone, sand and gravel are quarried
fairly widely, used nation-wide and

exported in a small way. Granite quarrying is becoming an activity of note. Cement is manufactured by three major suppliers: Pretoria Portland Cement, Anglo Alpha and Blue Circle. It is used both for mortar and concrete. South Africa's cement and concrete building practice is as advanced as that of any First World country. The country is well advanced in industrialised building practice.

R50 million is presently being spent by PPC cement on the upgrading of its Riebeeck cement works in the Cape. In general the cement industry is performing satisfactorily in financial terms.

The cement industry is improving financially, but is still suffering from excess capacity, as a result of major additions which came on stream in the mid eighties in response to market shortage at the beginning of the decade. To date the industry has not suffered the ban on cartels, collusive practices and price fixing which are now general government policy, though the matter is under review again at the time of writing.

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A possible future synthetic building material is pulverised fuel ash (PFA), which Eskom produces in abundance and dumps today.

Tile is quite extensively used for roofing, in addition to which a wide range of decorative tiles is produced.

Thatch is quite extensively used, as a luxury roofing material in the First World sector, and for hut construction by some primitive Third World tribal elements. It is a dangerous roofing material which cannot be fire-proofed adequately, for which reason insurance premiums for thatched First world homes are always higher. Despite this deliberate deterrent, thatched premises remain popular - practically because they are warm in winter and cool in summer, but mostly because of their pseudo 'rural' character.

Hood is an important building material, used for timber framing, doors and windows and much internal paneling, built-in cupboards, 'furniture etc. For paneling. and shelving, wood is used both in the form of timber. and as composite chipboard, fibreboard, Masonite etc. Interboard. is a fairly major player, which has just undergone a major management upheaval, as a result of Reserve Bank investigation into alleged currency irregularities. Also used for paneling. is asbestos

board, which it is now widely recognised should not be used for health reasons except where absolutely necessary.

Adequate substitutes are generally available for building purposes, but brake linings are another matter. Long-awaited regulations governing the use of asbestos were promulgated in 1987 and incorporated in the Machinery and; Occupational Safety (MOS) Act. They cover the use of asbestos in raw material form and the processing of materials containing asbestos.

They prohibit the spraying of asbestos, lay down stringent procedures for its removal from buildings, require the training of all employees working with asbestos, and the keeping of long-term records after termination of employment. Employers making use of asbestos, or materials containing asbestos, must arrange for monitoring to determine which regulations apply, the monitoring to be carried out by an inspection authority approved by the Department of Manpower. Penalties for contravention are severe.

House prices in all sectors were reported to be at historical highs in the second quarter of 1989, increasing nationally by 12% to R96 000 average according to United Building Society, which of course mainly caters for the First World sector.

Despite this, mortgage bond arrears amounted to a massive R1.5 billion at the end of August, threatening to throw an estimated 21 500 home owners on the streets. The number made homeless in practice will of course be substantially less than this, as the building societies and courts are relatively accommodating, but the figures are highly reflective of the pressure under which whites, particularly, are living.

In the last five years a very sharp rise in building costs, from about R400/m² to R1000/m² has occurred, attributed mainly to increasing cost of building materials, putting enormous pressure on the low-cost housing sector.

LOH-COST HOUSING

Perhaps the biggest achievement of the eighties was not the number of homes actually built, but the shift away from the public sector as the dominant provider to the private sector, made possible by changes in attitude, government policy changes, and certain important legislative developments. There are still some who argue the need for continued public sector housing provision, but there seems little doubt that the private sector will dominate in the years ahead.

A recent report estimated that over 21 million people living in South

Attica are without electricity. to
 xectify which will cost over R9 billion.
 One of the biggest problems facing
 developers is the Group Areas Act,
 according to which citizens of particu-
 lar race groups are obliged to live
 in designated areas. in fact the law
 is ignored in Hillbrow (Johannesburg),
 Salt River (Cape Town) and a growing
 number of other illegally mixed suburbs,
 to keep sane control over which the
 government proposes to establish non-
 racial settlement areas, of which
 five new areas have been mentioned
 FHA Homes, a housing utility company
 originally established by the Urban
 Foundation in 1983 as the Family Housing
 Association. has grown from R2 million
 in 1984-85 to a projected R103 million
 in 1988-89. It is currently involved
 in the development of nearly 30 000
 and recently issued a challenge
 industry to come up with
 a method of construction of basic
 durable shelter in the form of a build-
 ing system affordable to dwellers
 with a family income of R500 per month.
 Rather up market is LIA Comiat Homes,
 which sold about 1000 houses to black,
 Indian and coloured cunnunities last
 year. It has the potential to build
 15 000 over the next few years according
 to a recent press release.
 Another significant factor has been
 the entry of home loan finance institut-
 ions into the upper end of the iow-
 cost housing market.
 Many attractive home ownership packages
 are now available for black, Coloured
 and Indian huneowners
 the company,
 still do not apply through
 According to Dr J N Reddy,
 of the (Indian)
 however, all the money
 will not solve the
 in the Indian community as
 simply insufficient land
 to satisfy existing requirements.
 housing
 the formai private
 In 1988,
 some 45 000
 constructed
 2
 192
 according to
 but many who are eligible
 ignorance.
 leader
 House of Delegates,
 in the world
 crisis
 there is
 available
 sector
 units for
 black households, in elition1 to which
 more than 100 000 formerly rented
 homes were purchased by former tenants.

The policy change by the government in 1983 was significant. Not only did it recognise that government had inadequate resources to solve the housing dilemma, but it admitted that, by involving the private sector, considerably greater resources could be mobilised, and formerly untapped initiative and experience could be drawn on. At the same time housing practitioners were having to come to terms with the self-help concept of 'sweat equity', as well as 'controlled squatting' and 'site and service schemes'. According to Mike Morkel, MD of SPT Housing Consultants, it was recognised that housing includes the formal private sector, the informal sector and even the individual. Actual housing provision in South Africa today is totally dominated by the private sector in all its forms.

The role of the Public sector role has been reduced to macro-spatial planning, the allocation of land for township development, establishment of standards, regulation of township establishment and development, provision of housing subsidies and SOME housing provision for the aged, infirm and destitute.

Of crucial importance was the transfer of housing to 'own affairs' in 1983, and the granting of much greater powers to black authorities to initiate and control development. This has been accompanied by the abolition of influx control legislation and changes associated with the Black Communities Development Act.

As a result, many of the larger contracting firms previously operating in the white First Worldy sector have diversified to embrace the black housing market. and many black-owned contracting firms have arisen. Although still small, it is anticipated that many will grow much larger in time.

The activities of the Urban Foundation utility companies and South African Housing Trust are also significant.

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The willingness of the Development Bank of Southern Africa and the Regional Services Council to provide funding is also important, as is the role of the building societies and banks. Real progress has been made, but an enormous amount remains to be done. In particular, housing backlogs have

in no way been lessened. The current urban black housing backlog stands at about 800 000 units, 100 000 units for coloureds and 45 000 for Indians. To meet these needs, and future family formation, about 200 000 units must be constructed annually until the end of the century and beyond.

A major challenge facing developers is that it continues to be essential that the houses provided are affordable. Exactly how far down the income spectrum private sector developers will be able and willing to go is uncertain at this stage. The willingness of financial institutions to venture the very low income housing market is also unclear. Realistically one must expect that considerable numbers of poor South Africans will continue to be forced to see to their own housing as they do at present, and many more may have to reduce their aspiration levels. For the very poor, site and service schemes will probably become the most viable method of ensuring that basic infrastructure is provided, while the progressive upgrading of informal settlements must somehow be achieved.

To ensure that the problem remains containable is perhaps a bigger headache than catering for existing numbers - which South Africa can do in time, but barely so. The Directorate of Population Development - whose job in plain English is to STOP population development, has perhaps the least enviable task in the bureaucracy, since averting a population explosion must centre on blacks. White numbers have virtually stopped. growing and Indian and coloured populations are stabilising. Significantly, these groups are urbanised, it is the black rural population whose growth is out of control, in fact it is presently increasing at a disastrous rate.

The directorate has warned that if South Africa goes over 80 million population - at present it is nearly half way there - the result will be "catastrophic". Even 80 million, which the country may reach when many of today's toddlers are in their prime, is barely sustainable. Today, with nearly half that number, far too many are hungry, homeless, and lacking education or job opportunities.

The directorate has appealed to everyone including central government departments to co-operate. The state continues to hamper urbanisation - the one sure way to stabilise populations. Once a country's population is 50% urbanised and South Africa is at that half way stage then the process accelerates and, despite initial squatting, the end result is normally advantageous. Only after 50% urbanisation do economies take off, as South Africa's must do

if it is to provide homes, jobs, education and so on. There are no rich rural nations.

If the country is to avoid the fate of Ethiopia it is clear that the government must stop hounding squatters, the blacks must stop breeding so prolifically and the world must relax sanctions. Perhaps we will at least achieve two out of three?

Many South African buildings, and almost all those with thatched roofs on the highveld, are provided with a simplified form of lightning protection, comprising a lightning conductor which diverts the strike from the building itself.

INDUSTRY AND commence

For whatever reason the construction industry is looking forward to prosperous times, according to the scaffolding and formwork specialist, Form-Scaff last year.

A surprising feature of the present market is the extent to which industrial space is still in short supply. Such shortages tend to be regional, but the PHV area was short of industrial space last year. as a result of which the demand for industrial land has taken off. A major new industrial

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township entitled Midrand Industrial
 Park has just been opened between
 Johannesburg and Pretoria. It will
 be non-racial (a major sign of the
 times).
 Serious shortages of industrial land
 are also evident in metropolitan Durham
 and Cape Town.
 Office space, by contrast, was 16%
 oversupplied in Johannesburg in February
 which however applied to the C80 only.
 In fact Johannesburg is mostly suffering
 from an exodus of corporate head offices
 to Braamfontein, Parktown, Rosebank,
 Sandton, even Midrand - half way from
 Johannesburg to Pretoria. Vacancy
 levels at the beginning of the year
 amounted to only 3.5% in Parktown,
 and 6.4% in Randburg, while Pretoria
 (1.2%), Cape Town (5.4%) and Durban
 (5.9%) were all lower than the golden
 city CBD.
 There are several reasons for Johannes-
 burg's high vacancy level, including
 a high proportion of D-grade space,
 compared to almost none in Durban
 and very little in Pretoria. The vacancy
 factor in this D-grade space is as
 high as 26.7% compared to 9.5% for
 A-grade space, which brings Johannesburg
 1 817 000 units
 2 803 667 units
 Backlog
 Natural increase
 191;)! annual housing requirements:
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 Public sector (urban)
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 to the year 2000 (above).
 of informal settlement - The Urban Foundation.
 1 million vgggl: PWV (inner)
 PWV (Outer)
 Winterveld
 Kwa-Ndebele
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 3111'; Durban
 Rest 01 Natal
 95%; Province
 95%; Cape Town
 Port Elizabeth
 East London
 Rest 01 Cape
 400 000 units a year
 Additional housing needs calculated
 and estimated extent
 1,6-2.4-million
 1,7-million
 About 5-million
 much closer to the
 There is more than
 office space in Parktown, Rosebank,
 Sandton and Randburg and about 25
 000 m2 in such areas as Crown Mines,
 Mill Park and Ellis Park, so that
 the suburbs account for 25% of the
 office accommodation in greater Johan-
 national norm.
 1 million m2 of

nesburg. Almost all the suburban space has come on the market in the last ten years.

According to Grahame Lindop, letting director of Amaprop, it amounts to an additional 110 000 m² per year of additional space, mostly in the northern suburbs of the city, despite which he predicts a major turn-round for Johannesburg in the next 18 months. Part of this may result from some firms reversing earlier decisions to decentralise, and a tendency to proceed with new office building only when tenants have been secured.

short-term position,
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it seems probable
racial.

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CHAPTER 18:

THIS REPORT is primarily concerned with South Africals First World industries, all of which may be considered to cater for the consumer indirectly. In this chapter the services and industries which cater most directly are briefly reviewed.

AGRICULTURE

While the primary process industries are regulated to a considerable degree, agriculture is regulated almost entirely. The whole area is characterised by producers' co-operatives, state control boards to which the producers have to sell at pre-determined prices, and massive wholesale and retail chains

with a high degree of vertical integration . Free trade, where it happens at all, happens with the blessing of the control board or illegally behind the board's back;

A degree of regulation seems desirable in agriculture, but the extent of it in South Africa is excessive, resulting from the original 'platteland' constituency of the National Party government, whose main voting support has since moved into the towns. In the writer's view it is highly questionable how far agricultural regulation serves the interests of producers or consumers today.

The major crops are maize, wheat, rice, potatoes. sugar cane, grapes, pineapples, oranges, peaches, melons, pawpaws, squash, pumpkin and a host of less prevalent varieties, and the non-food crops tobacco, cotton and wool (Chapter 8). The most important livestock categories are sheep, cattle, pigs and chickens. In this chapter only a few of these are discussed, as representative of the larger whole.

Maize

Maize is the largest cereal crop.

Characteristically, the crop is sold through a Maize Board whose thinking

is beyond the ken of simple businessmen. This year the board hoped to export a surplus crop of 5.5 million tons, despite which maize consumer prices have increased, while farmers receive lower prices than last year. In the case of yellow maize, farmers will receive R126 per ton less than the consumer price of R333 per ton, while the price differential for white maize is R142 per ton. Maize Board officials hasten to justify the system, but consumer representatives say the board should rather follow the example of the Potato Board, which operates a surplus removal scheme and has allowed prices to drift downwards to R3 per bag as a result of a huge surplus. Meanwhile on the maize front consumers look for cheaper substitutes while farmers try to circumvent the anomalies of the system which forces them to subsidise export losses.

Potatoes

In the financial year 1987/88 more than 162 000 tons of potatoes were sold for almost R84.5 million on the Johannesburg fresh-produce market, compared to 154 000 tons worth almost R57 million the previous year.

In South Africa it may be noted that potatoes are not a seasonal crop, being grown the year round in different parts of the country. More than 55 000 hectares of potatoes were planted in 1988 and a crop of almost 1 million tons was produced. The income from table and seed potatoes amounted to R605 million compared to R485 million

in 1987. It was estimated that from January to June 1989 this year, more than 21 million 15 kg bags would be sold on markets in controlled areas, an increase of over 49%.

Producers have a market choice. They may sell their crops where, when and at a rate and price of their choice. In practice reasonably free

producers send their crop mainly to fresh-produce markets where they are sold by market agents on commission. About 10% of the annual table potato crop is processed to produce crisps, frozen chips and canned potato products. The Simba Chips Isando factory is reported to process between 20 000 and 30 000 tons per year.

Hine

Fruit and wine are two of South Africa's major agricultural exports, although the majority of wine consumption is local. South Africa ranks eighth among the world's major wine producers, despite having only 3% of the world's vineyards, and ranking only 17th in area planted to grapes. Of the 100 000 hectares of vineyards, some 92 500 are wine grapes. In 1985, the 70 co-operative cellars and 5500 winemakers in the republic produced 8.4 million hectolitres of wine, generating an income of R262.4 million according to our rather dated figures.

Exports account for 20% of the production.

KHV is the co-operative founded to protect the interests of wine farmers. It is blamed for constantly rising prices and recurring shortages of good wine, allowing farmers to over-produce poorer-quality wine and still get paid good prices for it. According to wine merchants and wholesalers wine prices are set at artificially high levels by the KHV board, which consists of wine farmers. and is protected by a powerful parliamentary lobby. The principal problem area is good red wine, of which there is a shortage, and a wine of lower quality red and white wines. According to Stellenbosch Farmers' Winery there is no problem with supply of medium-quality wines, but high-priced wines are still in short supply.

The 1989 grape crop was expected to reach a record 917 megalitres, up from the previous record of 911 megalitres established in 1983.

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Considerably more than half of the vintage is for the production of white wines.

Sugar

Sugar cane is the major crop of much of Natal, and much smaller growing areas on the Transvaal and neighbouring Swaziland. The industry is largely controlled by the South African Sugar Association (SASA), which according to Financial Mail is arguably the most despotic cartel in the country. The major producers are Tongaat-Huettner and C G Smith.

Since the attack on the cartel by FM, the sugar industry has unveiled proposals for deregulation to the extent of allowing freer access to

black growers in return for government approval for an ethanol plant,¹ which is seen as a long-term solution to the over-production of sugar, of which there is a basic world glut. Indications are that the government is satisfied with ethanol plant proposal which will get government approval shortly. Meanwhile SASA proposes to scrap quota allocations for small back growers located within 30 km of the 15 existing sugar mills, and make payment to smaller growers at a higher domestic price. A small grower is defined as one producing less than 150 tons of raw sugar or sucrose p.a., most of whom are blacks located in KwaZulu. Quota allocations will remain in force for existing large (mainly white) growers, and outside the 30 km radius. SASA estimates that free production areas created by this move total 27 800 hectares - which matches SASA's estimate of sugar growing land recently lost to timber and urbanisation. At the same time existing large growers will have their quotas raised by 25 tons p.a. Approval for the ethanol plant is apparently required as a pre-condition for SASA's agreement to the building of a new sugar mill in the Onderberg area of the eastern Transvaal.

Cotton

Since the sixties cotton has been planted on a commercial scale in South Africa, and the industry is presently experiencing a boom period. Nearly 180 000 hectares have been planted to cotton in the Republic and neighbouring Swaziland giving a yield of almost 340 000 bales worth R199 million, and at the present rate of extension the country could become self-sufficient for cotton in the fairly near future. At the present time local cotton farmers run no risk of over-producing. All the cotton produced being processed locally. Cotton is reported to account for 74% of the natural fibres and 42% of all fibres processed in the South African textile industry. As local production increases, the present shortfall of 70 million m² of cotton textile which is imported is expected to be drastically reduced. The textile industry, in which cotton has a large market share, is one of the most labour-intensive worldwide. In South Africa, textiles are being manufactured in 660 local plants employing 102 000 workers. The output is made into garments in 1304 formal clothing factories at a recent count, providing a further 111 500 jobs. Altogether the South African textile industry and affiliated trades employ nearly 500 000 people. contributing 5% to the GNP. Many of the manufacturing plants are strategically situated to utilise available manpower in the

Cape Peninsula, south-western and eastern Cape, Natal and the PNV area. Mainly white, black, Coloured and Indian workers are employed. In the agricultural area cotton is a labour-intensive crop, employing 260 000 black and brown farm labourers in the central and northern Transvaal, eastern Transvaal Lowveld, northern Natal and northern Cape Province. The largest percentage is grown on dry land, with about 30% of the total production coming from irrigated areas served by the Loskop Dam scheme in the central Transvaal and the Orange River scheme in the northern Cape. The crop flourishes in marginal maize-growing areas and is reported to be most successfully planted in a three-crop rotation, alternating with soy beans and ground nuts. Dry land yields vary from 800 to 2000 kg of seed cotton per hectare, ranging up to 5000 kg per hectare for cotton grown under irrigation. South African cotton is reported to be of a better standard than US cotton or the world average because so much of the local production is harvested by hand (about 75%), so contains less impurities and discolouration than the mechanically harvested product. More important, hand-picking provides jobs in a country where unskilled labour is plentiful. average per capita reported to be 11 kg of textile fibre, but there is a big difference between white consumption (21 kg) and black (5 kg).

South Africa's consumption is

Red meat

Control of South Africa's ten abattoirs is in the hands of the state-owned Abattoir Corporation (Abakor) which is to be privatised. The abattoirs are situated in the main urban meat markets, leading the Organisation of Livestock Producers (OLP) to suggest that the giant meat co-operative Vleis-sentraal, closely linked to the Meat Board and the official Red Meat Producers' Organisation (RPO) will get effective control of Abakor. This would give the co-operative great power, and virtually eliminate free market forces from the price-forming process in the urban, controlled red meat markets.

The R4.5 billion p.a. red meat industry is already over-regulated. Only meat slaughtered at Abakor's 10 abattoirs and the Maitland municipal abattoir in the Cape can be sold in the large urban markets, which has forced the farmers to pay expensive transport and slaughter fees, forcing up the price of meat at a time when red meat sales are declining. Abakor denies it operates a monopoly, saying it only accounts for 42% of all slaughter-

ings of cattle, sheep and pigs in
SA. Be that as it may, beef consumption
grew only 1.1% from the mid 1950s
to 1988, while chicken consumption
jumped 10.1% p.a. From 1970-1988,
beef and mutton prices increased 1353%
and 1171% respectively, while chicken
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prices rose 493% and eggs 513%. As a result, in 1988 chicken consumption exceeded that of beef - traditionally the choice most favoured by consumers. From 1956-88, red meat consumption per capita fell from 27.2 kg to 17 kg, while that for chicken jumped from 1.8 kg to 15.1 kg.

Ex-abattoir revenue on all red meat totals R2.8 billion, including a Meat Board levy of R73 million. The average wholesaler markup is reported to be about 9%, adding R259 million to total costs, while the retail mark-up is about 42%, adding R1.3 billion to consumer costs. About 37% of the total meat bill paid by consumers therefore goes into marketing, and the question must be asked if this is not too high.

According to marketing

Jim Linsell, one solution could be central cutting, deboning processing, packing and marketing of meat. "This is five times more efficient from a labour point of view. While siting abattoirs close to the cattle source could lead to huge savings on transport and processing costs". No doubt the debate continues, while customers continue to move to cheaper alternatives.

consultant

Malt and liquor

Recently the

promulgate a

vertical

government decided to

new Liquor Act, ending

integration in the liquor

industry, which is meeting with a

mixed reception. Predictably, Raymond

Ackerman of Pick 'n Pay doesn't like

"this type of deregulation. Let the

producers and wholesalers have their

retail outlets and let the market

decide what it wants. The most successful will survive".

Meanwhile SA Breweries, with a turnover

of R8.7 billion, making it the largest

company in the country in terms of

market capitalisation is reviewing

its expansion plans. Three of its

biggest expansion projects, initiated

in 1987, have come on stream at a

cost of R460 million, but a

of further projects have been scheduled

back because of signs of economic

slowdown. Since its absorption of

Intercontinental Breweries in the

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number

late seventies it has an effective

national monopoly, with only fringe

and strictly local competition.

The South African packaging industry

has been extremely innovative in liquid

packaging, pioneering the packaging

of wine in 5 litre flexible containers,

which in turn are packaged in cardboard

boxes. Present efforts seem to be

directed towards the development

of reusable plastic containers. National

Beverage Services, the Coca Cola franchise holder is awaiting the outcome of tests on a plastic bottle designed for at least 20 trips (returns).

Fishing

This industry includes both off-shore fishing and inland fish farming on the Transvaal escarpment.

In the western Cape, the centre of the offshore fishing industry since the fishing out of the once-massive pilchard shoals off Walvis Bay, many fishing vessels have been built. The country's pelagic fishing fleet numbers 380 vessels measuring 55-120 ft in length, most of which are wooden vessels. Steering, winches and some other deck machinery are mechanically operated, mostly by hydraulic machinery powered by the ship's propulsion engine today.

FOOD PROCESSING

While the cultivation of food and other crops is highly labour intensive, at least as it is practised in South Africa, the processing of the end product tends to be capital intensive. The largest company in that area is Premier Milling. Owing to the need for hygiene, most food processing equipment, and virtually all dairy equipment is in stainless steel. Most of it is imported today, though South Africa is starting to manufacture simpler items. The larger food and drink processing plants are similar in many ways to industrial plants, requiring sophisticated instrumentation, ultra-clean working conditions and often elevated process temperatures and pressures.

The use of cold storage is widespread - probably more so than in Britain

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owing to the generally higher ambient temperatures. For the same reason consumption of liquids per person is higher than in colder climates, and there is greater demand for iced and cold drinks. Walk-in refrigerators for beer storage etc are the norm in the larger bottle stores - whose trade is relatively greater than that of off-licensed premises in the UK because South Africans (of all races) not only drink more than people in Britain,

but more of it is consumed at home. Cooled lager beers sold in disposable bottles or cans are the norm, though in licensed premises there is growing demand for draught.

According to Andrew Murray, in an interview with Engineering News, great advances have been made in the automation of equipment, the trend to aseptic processing equipment (both from the packaging and heat-exchange points of view), changes in packaging, new generations of heat exchanger plates and other heating methods such as microwave and ohmic heating, and also radiation of food. Individual quick freezing is also important.

Perhaps the most exciting new development (says Murray) is the aseptic processing of particulate foods which has been made possible by pumping equipment for this type of product becoming available - the equipment for which is however imported.

Because of the decreasing value of the Rand there is a trend both to local manufacture of food and beverage equipment and also to refurbishing of existing equipment. Sophisticated equipment for control is usually imported, as are speciality items such as heat exchanger plates (though very high grade frames are locally produced) and centrifuges. Local manufacture embraces tanks, materials handling equipment, retorts, screening equipment, evaporators and driers, mixing equipment and some pumps, as well as butterfly and other valves.

Mono Pumps recently launched its Clean range of pumps, and peristaltics are now being fabricated locally. Centrifugal pumps are apparently still imported, though local industry should have the capability.

Some hardware is being exported. Aseptic packaging machines are now being locally produced, as are membranes for reverse osmosis and sophisticated retorting equipment, as well as (domestic) microwave ovens, stoves, refrigerators and a broadening range of domestic appliances.

RETAILING .

South Africa's First world consumer market is served by major and minor retail outlets of normal First World sophistication. Checkers and Pick 'n Pay are the largest food chains, but there are many smaller chains such as Spar, and others trading regionally. Supplementing the supermarkets and hypermarkets are a large number of corner cafes, mostly run by Greeks for some reason ('Greek cafes' apparently don't exist in Greece), which are used as convenience stores, being open longer hours. Their prices are naturally higher and the range of goods carried more restricted.

Pick 'n Pay's turnover for the financial

year to 28th February totalled nearly R3.9 billion. Nearly R3 billion is estimated to be sold by spazas operating informally from homes in the black urban areas by Trade Opinion Panel (TOP). Nearly all stock the same basic ranges: small packs of fresh and leading brand staple foods, beverages, confectionery, household goods, cigarettes and Tiquor, toiletries, health and beauty products. They operate seven days a week and trade from early morning to late at night. They range in sophistication from very crude operations With no more fittings than a few shelves to premises with freezers, cool drink refrigerators, freezer display cabinets, glass display counters and even electronic cash registers. Prices are up to 145% more than supermarkets and 50% more than white suburban cafes, the premium being due to the convenience and safety for black shoppers. for whan there are insufficient retail facilities.

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Operating iHegaHy, they remain largeiy
,hidden from the formai white sector.
obtaininirig most of their stock from
cash and carry outlets. and banding
together for bulk buying at a discount.
Other retailers specialise in clothing,
furniture etc, of whom most of those
(in the JSE are doing remarkably well
on paper. though cioser inspection
reveals that growth is Tittle ahead
of the infiation rate. First Horld
consumers may not be saving but they
are buying. The larger groups seem
particularly favoured over the smaller,
iess efficient retailers, with steady
movement towards more supermarkets.
hypermarkets, seTf-service and cash-
and carry outiets, and enclosed malls
and shopping centres. Each of these.
if it is to succeed, necessariiy hosts
a Targe Checkers or Pick 'n Pay.

LEISURE

An important sector is the hotel indus-
try, largely dominated by Sun Interna-
tional and the reiated Southern Sun
group, followed by Rennies' Holiday
Inns. Tourism is an important industry
and potentiaHy a much Targer foreign
exchange earner in the event of peacefui
poiiticaI accommodation.

MEDICINE

South African medical treatment is
world cTass. It is no accident that
it was Cape Town's Groote Schuur hospi-
tal where the world's first heart
transplant was carried out. Public
hospitai services are provided, with
nominally separate facilities for
whites and Hacks, which are being
Tess and less enforced, though there
are major anomalies. Both patients
and staff at Groote Schuur are quite
ethnically mixed today, while more
than han of Johannesburg's general
hospital is standing empty for Tack
of white patients and medical staff.
Partiy as a result of the bed shortage,
but mostly as a gesture of financial
one-upmanship, a large part of the
white population prefers to use private
medicine, financed by a iarge number
of medicaI aid schemes. Many of the
nursing staff of the private clinics
x200 .

and hospitals in.)hannesburg are
non-white in practice, while most
of the medical staff at Soweto's Bara-
gwanath hopitai are white. J G Strijdom
hospital in Johannesburg, which mostTy
caters for Afrikaans patients, is
in serious trouble owing to the threat-
ened withdrawal of consultancy services
by Hits University medical department
as a result of its insistence on preser-
ving strict apartheid, while the hospi-
tals of Pretoria and more conservative
towns to the north no doubt preserve
strict raciaT barriers. In Johannesburg,
Cape Town, Durban and all other major
cities, medical apartheid is dying
if not yet dead.

A major problem for the medical authorities is the number of newly qualified medical people leaving the country, and not returning as they have done in previous years. Because of that, and the financial stresses imposed on the medical system by the present rate of inflation, the quality of South African medical services is under serious threat today.

FINANCE AND ADMINISTRATION

The financial services Sector was mentioned in Chapter 2. Here we review consumer financial services - individual banking, mortgage and insurance services. Their lines of demarcation are becoming increasingly blurred, with major banks providing mortgage bonds and building societies providing banking services. While teller services are provided, they are extensively supplemented by electronic services, which are perhaps becoming the norm, and certainly the most economic method for the banks to handle smaller personal accounts.

Standard Bank is considered the most advanced in electronic banking, but the others are not far behind. The largest is First National Bank (formerly Barclays), followed by Nedbank then a clutch of smaller banks such as Trust Bank and Volkskas.

The banks are considered more dynamic in their pursuit of consumer business than the building societies, of which

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the largest are u.%, Allied, Pennant and Natal Build Society.

Insurance companies offer the full range of life and short-term insurance services. The largest life insurers are Sanlam, Old Mutual and Liberty Life. The insurance companies are the fastest-growing of the three major categories of financial services, as the growth in assets of Old Mutual and Liberty show (Figs 18.1 and 2). There is some indication that the growth in consumer prices is slowing (Fig 18.3).

Supporting industry and the economy are the full range of administrative services which it is convenient to mention at this point. Throughout Fig 18.1

Liberty Life's growth in nu." (R-billion).

R1430

31 DEC 1967 30 JUNE 1986 31 DEC 1965 30 JUNE 1939

Jan Feb Mar Apr May Jun Jul

Annual men's income in R-CH.

R1736

the administrative sector there is constant pressure for office automation, which is pursued particularly strongly by the financial services sector. First World commerce, government and semi-government are reasonably efficient in administrative terms, as are most of the First World industries dealt with here. There is considerable ongoing interest in the annual Business Efficiency Exhibition (BEXA), which promotes business equipment, office automation and other ideas for administrative efficiency which are not pursued in detail, because the great majority of equipment is imported. Some office furniture, a few accessories, and a proportion of consumables are made locally. The great majority of office equipment is imported.

Fig 18.2

R b plq Mutual'si

SD " total assets under management

2.1 11" IND! I'll! 11) MW

itLike word processing. which was not used for production of this . report. which was done instead on a portable typewriter. The author does not decry technology, which he mostly writes about for a living, but does not necessarily trust. In this case his lap-top computer. purchased specially for this Job in Johannesburg. stopped working on the flight to London. where it is lying in a cupboard unused. for lack of service under guarantee. Electronics is not that international.
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CHAPTER 19: SOUTH AFRICA AND THE REGION

THE REPUBLIC of South Africa, as was stated in the first chapter, is bordered by Namibia (South West Africa), Botswana, Zimbabwe, Mozambique and Swaziland and entirely surrounds the independent kingdom of Lesotho. Further to the north are Angola, Zambia, Malawi and Tanzania, Zaire and Kenya, all of whose economic focus is towards the south, though the countries immediately bordering the republic are most influenced by it.

There are also the four TBVC 'countries' of Transkei, Bophuthatswana, Venda and Ciskei whose independence is not recognised except by Pretoria, and the six 'self-governing' territories of Lebowa, KaNgwane, Gazankulu, QwaQwa, KwaZulu and KwaNdebele, of which KwaZulu is the most important. Their independence can be dismissed, since they are funded by Pretoria to the extent of R9 billion in the latest budget (Chapter 2), in addition to which Pretoria has guaranteed large debts of these territories. Transkei, the largest, is about to apply for reintegration with the Republic, but the degree of autonomy of these territories is considerable, and may play a considerable part in the shape of any post-apartheid society.

BOPHUTHATSHANA

Of the four TBVC countries, Bophuthatswana is the most successful economically, with tax revenue from mining likely to be 50% over budget this year. Because of inadequate statistics, GDP cannot be quantified accurately, but it is estimated by Bop's (white) Minister of Finance, Leslie Young at R11 billion. He believes the country grew 5-7% last year compared to SA's 3%. The population is 2 million, so GDP per capita was R5500 on that basis, compared to SA's R4000. Government's share of the economy is less than 25% compared to more than 40% for SA. Bophuthatswana was over-borrowed before the good times in mining and tourism, but it reduced state debt 20%

to R600 million. Interest on state debt is 6% of the budget. In SA it is close to R10 billion - about 20% of the total. Education, at R418 million is the biggest item on the budget. The World Bank and IMF have frequently cited neighbouring Botswana as a model of economic prudence in sub-Saharan Africa. Young contends that Bophuthatswana has a better claim. "They have diamonds and tourism. We have platinum, nickel, copper, chromium, industry and tourism. But I believe we have a lot more above the ground."

The attempted coup in 1988 and allegations of corruption have led to much tighter financial control, to the point where public servants are reported

to have complained that it is impossible to get authorisation for an ashtray. It is the state, not President Mangope, which owns two luxury residences in London and Paris, which are claimed to be good property investments, and successful in their primary purpose of taking the place of embassies, and attracting new investment in Bophuthatswana. Currently a huge 'seven-star' hotel is to be added to Sun City, an equally ambitious hotel-casino is expected to be built near the Harm-baths road, and SA, German, French and Taiwanese investors are reported to be setting up shop at Babelo, Gaborone, Mogwase, Thaba Nchu and Taung. The capital of Mmabatho is impressive.

As in the rest of Africa, there are great disparities of wealth and education but a new university is in place and schools are being added apace. About 800 teachers graduate every year. Dozens of factories are rising in industrial areas.

After the fiasco of the abandoned power station (Chapter 4), Bop buys its electricity from Eskom, which is too expensive for its subsistence farmers. There is also the regional shortage of water and skills - both

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debatably worse % for SA at large, but critics (including the author) who dismissed the country after its abortive coup and former overspending must rethink their positions. Bop may be an awkward anomaly, and geographically impossible (there are seven separate pieces) but it works economically, thanks to minerals, proximity to the PNV and to SA's Calvinist gaming laws. Compared to the other TBVC countries it seems well-administered.

NAMIBIA

Considering South Africa's neighbours individually, Namibia (once German South West Africa) has been administered as a South African colony on behalf of the League of Nations, then the United Nations, then despite UN demands

that South Africa relinquish its grip. South Africa's presence has been administrative and military, and Pretoria has conceded independence to Namibia only with the departure of the Cubans from Angola. What political complexion the new government in Windhoek (the Namibian capital) will have is not yet clear. It is by no means certain that it will be led by SWAPO, the South West African Peoples' Organisation which has been recognised as the sole legitimate claimant by the UN, although its support is largely tribal.

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It should be noted that Walvis Bay, the principal port, is nominally a part of South Africa's Cape Province, whose eventual handing over to Namibia is liable to become a political issue, which all parties are playing down for the present.

Namibia is a barren country with limited mineral wealth (including diamonds and uranium), and very dry farmland, verging into desert. Tourism may become a major industry since the Etosha Pan in the north of the country is a major game sanctuary. The formerly prosperous pilchard fishing industry based on Walvis Bay no longer exists owing to over-fishing of the resource. The southern coast of the country near the mouth of the Orange river is diamond territory, mining of which is increasingly carried out by dredging offshore (Chapter 7).

SWAPO's election manifesto has called for a mixed economy, as a result of which a flood of new companies seem to be setting up there. .

Not only South Africa, but Namibia has offshore oil - the Kudu field off Luderitz. The concession holder is Swakor, a state-funded body, which is looking for partners, having run out of money. Apparently it has insufficient funds.

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technical information to inter-
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Est q)ropective partners for long,
but if there is oil in comercial
quantities it could prove an enormous
the newly-
can

boost to the economy of
independent Namibia provided it
get the venture off the ground.

BOTSHANA

Of all South Africa's neighbours,
Botswana is doing best economically
which is a remarkable transformation
for what was one of Africa's poorest
countries when it became independent
only 23 years ago. Like Namibia it
is an arid country, but with three
of the world's richest diamond mines
it has foreign exchange reserves of
\$2.4 billion, other significant economic
activities being cattle ranching and
tourism - which are in conflict for
use of the undeveloped land resources.
With a very one-sided economy. Botswana
is totally dependent on imports which
arrive in the country via South Africa.
It is a member of the nine-country
SADCC committed to links with South
Africa, and is of course one of the
'front line' states. Although Botswana
insists it has never provided bases
for the ANC it has been subjected
to cross-border raids by South Africa,
from whose territory the former Bechua-
naland Protectorate was administered
for many years. A noted project apart
frun diamond mining is the Sua Pan
soda ash project (Chapter 8). The
country is one of Africa's few multi-
party democracies.

Orapa and

The Jwaneng,
1988, rating Botswana
carats in
in the world.

Jwaneng has been
Oppenheimer as "the most
Kimberlite discovery since Kimberley."

LESOTHO

Of South Africa's neighbours Lesotho
on the Repub-
the
independent
survival is a political fluke, resulting
its founder,
is perhaps most dependent
lic, which entirely
mountain kingdom. Its
surrounds
from the astuteness of
Moshoeshe I, who established the
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ORANGE FRE

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diamond mines produced about 15 millian
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third largest diamond producing country
 Of the three mines,
 described by Harry
 important
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 Surplus/dehcn
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 Fig 19.2
 Botswana's healthy indicators.
 territory as a
 tribal remnants
 refuge for
 fleeing
 mountain
 tribes and
 the might of the Zulus and the Boers
 settling the Orange Free State. Failing
 militarily against the Boers in three
 successive wars characterised by sieges
 of the kingdom's mountain strongholds,
 Moshoeshe I sought and obtained the
 protection Queen Victoria, whose sub-
 jects enforced the independence of
 the kingdom, when the British author-
 ities on the spot would certainly
 have preferred otherwise.
 In theory, legislative and executive
 power today are vested in King Moshoe-
 STATE
 shoe II, who acts? the advice of
 a military council an civilian council
 of ministers. In practice executive
 power is in the hands of Major General
 Lekhanya, who ousted the former prime
 minister, Chief Leabua Jonathan in
 a coup 'triggered by a South African
 blockade, as a result of the former
 premier's anti-South African policies.
 Lekhanya is pro-South African, not
 through choice but economic reality,
 to the extent of increasing military
 co-operation, deportation of ANC members
 and granting of a semi-diplomatic
 presence in the form of a South African
 trade mission in the Lesotho capital
 of Maseru.
 The principal source of revenue of
 the 1.7 million population is the
 provision of labour for South Africa's
 ! industry and especially its mines,
 ,.. which will be progressively overtaken
 by another - the provision of water
 to South Africa from the Lesotho High-
 lands water scheme coming on stream

in stages over the next 30 years (Chapter 6). The major problem area is agriculture, in which the country was once self-sufficient. To quote Julian Ozanne in the recent Financial Times survey, "Years of over-grazing, inefficient land-use policies, hostile weather, deforestation and poor farming practices have taken their toll on the agricultural sector which once provided the country with its food needs." As a proportion of gross domestic product, in current prices, agriculture has plummeted from around 50% in the early seventies to 21% in 1984 and an estimated 16% last year. Yields . . per hectare have more than halved for the the three main staple crops, which are maize, sorghum and wheat, while soil erosion is a massive problem. Lesotho, once self-sufficient in food, is now a massive importer of maize and wheat. In normal years the food deficit has averaged between 25 and 40%, which has risen to 60% in drought years. In the landlocked mountain kingdom only 10% of the land is cultivable and the quality of that is declining. It is widely recognised by the government that reform of the land tenure system and the introduction of grazing regulations are critically necessary, but politically sensitive.

ZIMBABWE

Of the neighbouring countries, Zimbabwe, the former Rhodesia is the only one formerly owned by Britain which achieved its independence by military means. As many British readers will remember, the white government led by Ian Smith declared independence from Britain unilaterally, resulting in widespread sanctions and guerilla war with the independence movements of Zapu, led by Joshua Nkomo. and Zanu led by Robert Mugabe. Zanu came out on top in the elections following independence, because the two movements are divided on tribal lines. Zapu is the movement of the Matabele and Zanu of the larger Shona tribe who were not traditionally warriors. Should the Shona ever loosen their grip it is considered entirely probable that the nation will split along tribal lines, with the Matabele based on the second city of Bulawayo. A most important crop is tobacco, which after a disastrous year in 1987 when prices plummeted owing to drought, recovered entirely owing to a vintage crop last year. The 1988 crop was up 80% to a record 23472 million (US \$262 million). Experts were forecasting further - though slower - growth this year.

Zimbabwe's economy seems healthy, though growth is falling from 5.3% last year to 3.5%. Industrial growth is likely to be somewhat slower than last year's 4.9%, despite a very strong start to 1989 when output rose more

than 8% in the first quarter. This has since slowed. as transport, energy. construction and skills constraints have started to bite. Inflation of 12.6% last year was forecast to drop back to an annualised 12%, or double _to 16% according to source. According to the University of Zimbabwe, none of the three preconditions for sustained economic growth in 1990 are being met - price stability, fiscal discipline and policy credibility. The Mugabe government is urged to accelerate promised economic reform . The country has coal, other minerals and relatively prosperous agriculture, generally boosted by the building

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of the Kariba Dam on the Zambezi river which separates Zimbabwe from Zambia. The circumstances under which Zimbabwe achieved political independence are not directly comparable to those of South Africa, but the parallels are close enough to prove uncomfortable for beleaguered whites. In that case, too, the white government had sufficient fire power to contain the situation militarily, but was too isolated economically to continue the struggle alone indefinitely. In South Africa, the whole scale of the problem is greater. There is not quite open war and there is no colonial power to grant independence. Instead there are nearly five million whites who must somehow be accommodated in a post-apartheid society and which the country needs to retain if it is to maintain anything like its present First World industry and infrastructure. They control enough fire power to devastate the entire southern African region, to avoid any possibility of which it is necessary for all sides to sit down together and talk, otherwise industrial and economic forces will take their course. Or military force will dictate an alternative solution.

ZAMBIA

As recently as August, immediately before the visit of F H de Klerk, a three-man delegation from South Africa's Associated Chambers of Commerce and Industry (Assocom) was told by President Kaunda that Zambia would welcome open trade and technical links with South Africa provided apartheid is entirely scrapped. No doubt F H de Klerk was given the same message. Zambia seems remote from South Africa, but is diplomatically as well as geographically important as headquarters of the exiled ANC. Copper mining is the premier industry.

MALAWI

The third member of the former Central African Federation is Malawi, which is most notable for totally refusing to take the antithetical African attitude of its neighbours, much of its workforce providing migrant labour for South Africa's mines. This has ceased, apparently due to the prevalence of AIDS, which must damage the economy. Malawi's Dr Banda and Zambia's Dr Kaunda, must give way to younger men soon.

MOZAMBIQUE

Of South Africa's neighbouring states, Mozambique is the most disrupted by war. Faced with the Frelimo Marxist regime in Maputo, South Africa covertly supported the Renamo resistance movement to the point of thoroughly destabilising that country, then proceeded to distance itself from Renamo and sign the Nkomati Accord with the Frelimo government. This accord has been reaffirmed, and

South Africa may give real assistance to Mozambique now that Frelimo is playing down its Marxist principles in order to obtain IMF loans, assistance from Britain and other sources. Many South Africans would welcome the re-establishment of good relations with Maputo - the former Lorenzo Marques, which was a favourite holiday resort for South Africans in the Portuguese era. 'LM' prawns are still extremely popular in South Africa._

Anglo American's Chairman, Gavin Relly recently stated that the company is "keen to help develop Mozambique", in which it is behind at least Sappi and Premier Milling, and foreign-based companies with SA subsidiaries such as Siemens.

Siemens, incidentally, is servicing Mozambique business from Germany, or via a Mozambique subsidiary established for the purpose, not via Siemens Ltd (of South Africa), indicating the desire of multi-national corporations to distance their regional activities from the Republic at this stage. If Apartheid is really dismantled, that attitude may change, but all companies are deterred by possible security problems.

"Opportunities exist in forestry, mineral and agricultural development and the exploitation of natural gas",
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says Relly. Hit use kind of carrots, only the security situation prevents SA investment from taking off. It may be noted that then National Party leader F N de Klerk visited Maputo in July, just before a week-long Frelimo congress, and a month before the visit to President Kaunda of Zambia, tentatively confirming that current National Party thinking favours regional reacceptance as the route back to international respectability.

SHAZILAND

South Africa's last immediate neighbour, Swaziland has long-standing good relations with the Republic, on which it relies for much tourist revenue. This has declined somewhat owing to the rise of the much nearer Sun City in Bophuthatswana, but Swaziland remains a popular venue for those wishing to get further away from the PNV area. Apart from tourism, there is mining and quarrying, intensive agriculture (the country enjoys good rainfall) and forestry (Chapter 8), as well as a variety of mainly 'light' industry. Transport routes out of the country are via South Africa or Mozambique. For Swaziland, Maputo is much nearer, geographically, than Durban, but the links with the South African port are better, as are the port facilities.

TRANSPORT

As reported in Chapter 12, the road and rail networks of the Republic

extend into neighbouring states, which however are less developed in that regard. Many of the country's regional neighbours are dependent on South African road and especially rail transport for the majority of their imports and exports, without which the economies of several regional neighbours would collapse. The transport systems are inter-dependent to the extent that South Africa allows free movement of its rolling stock on the railway systems of Zimbabwe and other 'Front Line' states, many of which are outspokenly anti-apartheid. Despite the political embarrassment to such noted critics as Robert Mugabe, the interchange is to all countries' economic advantage. With Namibia on the way to independence, and the civil warring parties of Angola and Mozambique coming to terms, South Africa may lose its stranglehold on the region's trade routes. At present roughly 60% of Zimbabwe's trade goes through South African ports, although Durban is three times as far from Harare as Beira in Mozambique. Malawi, even further from South Africa, sends more than 90% of its trade through Durban. As a result, since 1982, when rebels ripped up the railway lines through Mozambique, the price to Malawi of many imports has doubled. Freight costs, said to be the second highest in the world, have also hit Malawi's exports of tobacco and tea. Meanwhile the Angolan civil war has disrupted the Benguela railway, so Zambia's copper has to be exported via the stop-go line to Dar es Salaam. This suffers from landslides rather than guerillas, as well as a shortage of wagons and engines. Those supplied by China in the seventies are reported to break down frequently. Earlier this year 50 000 tons of fertilizer for Zambia was stranded in Dar es Salaam. The 'Tazara' line's managers

Fig 19. 4: Southern Africa ' 5 regional rail network, showing the region 's dependence on South Africa when Angola's and Mozambique's lines were damaged.

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want to double its capacity, for which need \$123 million in aid. They seem likely to get it, as well as eight new engines, which have been promised by the USA. Meanwhile the Beira corridor is kept open despite war - by an army of 10 000 Zimbabwe soldiers stationed along the line.

UN VIEH

An October 1989 report by the UN Economic Commission for Africa quantifies the cost of Pretoria's military aggression and economic destabilisation of the region as \$10 billion in 1988, or \$60 billion since 1980, as a result of destruction of transport routes, direct war damage, higher energy costs, destruction of export commodities, reduced productivity through rural terrorism, trade boycotts and embargoes by South Africa, and extra costs on defence and transport.

The figures are arrived at from the questionable assumption that, in the absence of hostilities, the region's annual GDP growth rate would have averaged 5% rather than the 3% actually achieved. In practice there are many other problems, not the least of which are economic inefficiency, corruption and adherence to unworkable policies of African socialism. It is also quite unfair to blame South Africa for all conflict in the region, though it has certainly supported Unita and Renamo, and engaged in conflict directly at least in Angola. What about the notorious Zimbabwean Fifth Brigade, which stamped out Matabele opposition to the Harare government in particularly brutal fashion, 10 000 of whom are now mostly failing to keep open the rail link to Beira? And the Portuguese, who simply withdrew from their former colonial territories without leaving viable governments in place? When all is said, however, South Africa has significant responsibility for regional conflict. the resolution of which is now to all parties' advantage.

Since 1980, 1.5 million Tives have been lost, more than half of them infants or children under five, from war-induced starvation, the destruction

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of health services. civilian/military casualties. Another 1.5 million have fled their countries, 6.1 million are internally displaced, and countless more have been thrown into poverty. Mozambique and Angola are singled out by the report as having borne the brunt of South African regional destabilisation. Mozambique has been a key target because its transportation network is vital to the region's attempt to reduce dependence on South Africa. Pretoria's policy of "commando attacks,

sabotage of economic installations and mass terrorism", mostly carried out by the South African-trained and financed Renamo rebel group, have caused nearly one million war-related deaths, driven 4.6 million people from their homes and cost the country 515 billion between 1980 and 1988. Most of the economic losses are attributed to devastation of the three main railway corridors, to the ports of Nacala, Beira and Maputo, lost production and exports, and excess defence spending.

In Angola, Pretoria's military support for Unita and their economic sabotage of key transport routes such as the Benguela railway contributed to an economic loss of \$4.5 billion in 1988 and 527-30 billion between 1980 and 1988. An estimated 500 000 lives were lost in this period and more than a third of the population uprooted from their homes.

The report says that external funding needs of the region to ameliorate the burden of South African aggression are 33.5 billion p.a., which is \$2.5 billion more than is currently being provided. Predictably, it calls for tougher economic sanctions and embargoes against South Africa.

The report comes rather late in the day, at a time when peace is already coming to the region, with SA support. A peaceful Africa presents an enormous number of opportunities for South African engineers in the region, one of the earliest to come into focus being rail track rehabilitation.

, - A reduction

PROSPECTS for individual sectors were dealt with piecemeal in preceding chapters, at least so far as the main scenario was concerned. This chapter is concerned to elaborate on the main scenario, and consider some less likely and long-term developments. Before doing so, we will review the present position as it is summarised by another industry observer.

According to H F de la Harpe Beck, chairman of Murray & Roberts group, the business climate in which the group would operate "would be determined largely by the success with which solutions to our socio-political problems were found. In this regard it would be difficult, if not impossible, to implement and sustain the change and reform taking place, and still needing to take place, towards creating a more just society unless we had a strong and expanding economy. Key ingredients for this were:

- o The continuation of the free enterprise-based system _
- a The vigorous pursuit of privatisation and deregulation
- o The rate of reduced

inflation had to be
in the share of Gross
Domestic Product taken by the public
sector. These ingredients were first
mentioned in 1987. In 1988 were added:
a Balance of payments constraints, and
I Boycotts and sanctions.

Notice that industry was saying two
years back what politicians are coming
round to now. The time lag is typical.
As regards the balance of payments,
"The present situation derives ' to
a large extent from South Africa invol-
untarily becoming a net exporter of
capital. Much is being, and can still
be, done to ameliorate the problem.
He need to stimulate internal savings.
to discourage imports particuTarily
of consumer goods, to promote a "Buy
South Africa" campaign, to stimulate
exports and concentrate on import re-
pTacement industries... we need...
changing overseas perceptions of our
CHAPTER 20:

PROSPECTS

society and reverse the flow of foreign
capitaI and know-how back to South
Africa. For the rate of real growth
to match the needs of the rapidly
growing popuiation, South Africa will
continue to need foreign capital and
know-how...

"Boycotts and sanctions are retarding
economic growth. In order for this
trend to be reversed there will have
to be a change in the perceptions
of our society externally and to a
degree internaIIy... The perception
that requires change is that it is
not a just society and ignores human
rights. If we were to accept what
our most vehement critics advocate,
the result would be chaos and economic
disaster. But... other poiicies
are presentTy causing intensification
of the overseas campaign against South
Africa. Exmhples are the Prevention
of IliegaT Squatting Amendment Bill
(which has since been shelved owing
to internal opposition from the non-
white houses of parliament) and the
threat to prohibit foreign funding
of civil rights organisations (which
is now law). Many in business believe
that... the cost of proceeding with
these and simiIar policies in terms
of loss of foreign earnings, economic
growth and unemployment will far out-
weigh any possible benefits... and
that the financiaT evaluation shouId
be the criterion for decision-making...

"The extent to which that will occur
or not is no longer solely an economic
question. South Africa's economic
growth in the difficult past year
has underscored its resilience but
the real issue is whether we shaII
free up the economy to enable us to
achieve the 5% annual growth in GNP
that it is widely agreed we need;
that in turn depends on whether ideoiogy

which is provenly outdated, will be
all0wed to frustrate our economic
potential by legislation that ensures
we under-employ our most important
resource, the nation's people. Double-
digit inflation, the declining Rand,
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the denial of foreign capital, our relatively low productivity etc, and the multiplier effect of all of these, are rooted primarily in political not economic policies."

Lately people have felt the economic noose getting tighter, due to a process of inflation, higher taxes, lower or static wages, and a general process of impoverishment. All the while, government grows bigger (despite frequently expressed intentions to the contrary) and people have to borrow money to try to keep up their living standards. GST was zero in 1970, 13% now; prime lending rate is up from around 8% to 20%; inflation, then at 5% is now CLAIMED to be about 15%; consumer prices have increased just under ten-fold; petrol is up from 9.3a to 112C per litre, a real increase of about 20%; personal and corporate income tax revenue has increased 24-fold, more than doubling in real terms; new commercial vehicle sales of 95 800 in 1980 were only up to 127 400 last year, not keeping up with the 50% rise in population so falling per capita, and government consumption spending has risen from 12% to 18% of GDP. On top come the major blows of sanctions - . particularly financial sanctions, and disinvestment, aggravated by the continuing decline of the gold price./

In the past, in South Africa, politics dictated the economic climate, but that was before the politicians ruined the country economically. A reversal of emphasis matches the tide of history. Government spending is grotesquely too high, and the incumbent party almost lost its overall majority at least partly through economic mismanagement, which is not over. Now that the election is over the economy is likely to be subjected to more of the sane mismanagement as in the past decade, says Financial Mail.

Internal tightening up will help, but the government is in a financial Catch 22 situation. from which it can only escape by a process of reform, on which platform it has been elected.

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It is the author's belief¹ that the _EVETEEEHf'_7HTT__.EtteeET'_t6-_TETEE as fast as possible, at least so far as the external s of apartheid are concerned, as the only way it can realistically return to international respectability and relaxation of the external financial pressures. That is why it has moved so quickly on the release of Walter Sisulu and his fellow detainees, to test the water for the release of Mandela, the unbanning of the ANC, negotiations for the enfranchisement of the non-electorate, the rescinding of the Group Areas Act, and other laws guaranteeing white

privilege, which have simply become too costly to maintain in terms of their economic consequences. Transkei is considering Tegalising the ANC, which is part of the legitimation process.

THE MAIN SCENARIO

In practice it seems South Africans (of all race groups) will reach an accommodation fairly quickly, in response to now Overwhelming forces for change. Such a development is by no means certain, however, nor is it possible that reform will be as fast, or go as far, as outside observers wish. .By the new year it is anticipated that the :world will be complaining about the obduracy of FM de Klerk - whose likely delaying tactics will be designed not to prevent reform occurring but to _secure the best bargain he can for the Afrikaners, and do the best he can for the country as a whole, which the present government in some sense represents. Meanwhile the external pressure on South Africa will be mounting, including pressure probable that for increased sanctions, which de Klerk will try to avoid by making concessions. In practice the newly returned government CANNOT dismantle apartheid overnight. There is some urgency, however, in that the. present parlimment is considered to be probably the last opportunity for a reasonable resolution of the problem. If the government delays beyond that period it seems likely that events will slip beyond its control, so ar as they have not already done so. In the author's view, at least, South Africa is already in a process of unstoppable

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change. The only questions are how orderly the changeover will be, and what shape the new dispensation will have.

While many outsiders seem to expect some variation of the Westminster system, i.e. a unitary system based on one man, one vote, this is not considered a viable option for South Africa. The problem is to find a formula which allows government with the consent of the governed, prevents permanent

domination of one racial group by another and provides the best possible guarantees for minorities in a country entirely composed of racial minorities. Even the whites divide linguistically into two major groups which have been at war in the not too distant past, while outsiders' perceptions of the blacks as a simple racial majority is simplistic in the extreme. The blacks mostly think of themselves as belonging to particular tribes. The two largest are the Zulu and Xosa, both numerically inferior to the whites, and spearheaded politically by Inkatha and the ANC, engaging in private civil war in the fringe area around Pietermaritzburg. They do not even speak the same language.

The most likely solution seems to be some sort of federal system, possibly based on the Swiss model with the whites, at least initially, having voting weight disproportionate to their numbers, but the author is no constitutional expert so will refrain from further speculation in that area. Sticking to economic and technical issues, it would seem to be highly desirable that whatever constitutional system is adopted works with economic forces rather than against them, since the economy is the greatest single force for unification. South Africa, if not the region and the world, has a single unitary economy, of which the common language will be English. Afrikaans will remain the home language of a majority of white and Coloured South Africans (it is difficult to get away from the country's racial concepts), but its political association with apartheid makes it unacceptable to many blacks, who cope on a day-

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to-day basis with multiple languages. Most blacks are relatively uneducated, but they are highly adaptable - more so in the author's view than most white South Africans.

Lumping the blacks together in a single group, as even South Africa's white planners are inclined to do, it seems certain that, at least, a fourth chamber of parliament will be created for them, starting with those who have become detribalised city dwellers, or will that stage be bypassed?

Under the present system, each of the three chambers votes separately on its 'own affairs', and they combine, collectively, for 'general affairs'. Suppose the voting strengths of the (assuming there will be a fourth house) are adjusted to reflect the taxes paid by the four groups, and/or the right to vote is restricted to taxpayers in good standing? Such a system might be viable for an agreed period such as ten years,

during which an increasing proportion of matters would be dealt with under general affairs, at the end of which it could be replaced by a unitary system. In practice it might be found to be sufficiently effective that there is no desire to change what becomes a pioneering economic model, certainly more valid than simplistic socialist experiments to the north. four houses

Whatever system is adopted should accommodate the needs of the economy, for which free enterprise has been proved to work best. Capitalism in the raw is unedifying, but it can be circumscribed, and diffused to produce a high degree of employee participation. Capitalism is desirable objectively, to mobilise the country's economic resources efficiently. Which means less government interference! Apart from a free-enterprise economy, the biggest need of business is stability. Anything else makes planning ahead more risky. Business is used to taking calculated risks, and often does so on no more grounds than personal hunch, but it eliminates variables so far as possible. That is why business is taking such an active political role now. The present political uncer-
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taint? makes it impossible to plan ahead confidently, reducing major projects to massive gambles. Those responsible for forward planning would much rather know the worst now than put their necks on the line to shareholders for megabuck projects which may have to be aborted, written off or totally revised, in the light of the new political dispensation. At this stage Anglo and SA industry would certainly bankroll the revolution, provided they can be part of the new dispensation, the economic case for which is irrefutable.

Assuming that reform occurs. but more slowly, and to a lesser degree than outsiders wish, the economy seems likely to be under external siege for some time. and possibly increasing sanctions for a while. By and large the de Klerk strategy will be to concede fast enough to avoid that happening, but sufficiently slowly to ensure continuing stability.

ALTERNATIVE SCENARIOS

One way or another, it is believed there must be a major political shift, but so many factors are bearing on the situation that the author's only confident prediction is that no prediction made now will come to pass in its entirety. The major alternative scenarios are that the government will concede quickly, or delay too long in conceding at all, in which case the situation will slip out of its control (in either case), with consequences which are, literally, incalculable. The whites control enough fire power, and economic power, to fight or delay if they wish to, and they will certainly win any military clash in the short term - which would be more in the nature of massacre.

What they cannot win is the resultant economic war - which like the present economic war will not just be with SA's own blacks but the world at large. Assuming warfare with the world stayed primarily in the economic domain, South Africa would possibly withhold gold and strategic minerals. The world can perhaps do without gold, whose monetary use is essentially historical, 212

but it is more important for electronics than many people realise. Technically there are substitutes. But there are few substitutes for high alloy steels, for the manufacture of which South Africa controls most of the alloying elements.

Moreover it is by no means certain that warfare would remain in the economic realm, owing to South Africa's lack of natural oil reserves. Does the country have sufficient for its needs strategically? If not, some 30 tankers per day round its shores en route from the Middle East and

SA has sufficient missile patrol boats to play pirate. With that possibility the US could probably reroute its oil supplies from the Middle East via the Pacific but the inconvenience and cost would be enormous, while western Europe has no alternative to the Cape sea route. SA blacks would suffer the effect of oil embargo first.

thought that the steps to militarily

In practice it is

US and Europe would take

neutralise South Africa

rather than allow its interference with the Cape sea route, and their possible options for doing so are

interesting. It is the Soviet Union which has the world's largest fleet

by far, which since the collapse of the Cold War is totally unemployed.

Would the USA be prepared to allow its new eastern friend and neighbour

to blockade the South African coast. or would it be prepared to undertake

that task? Only the USA and USSR are thought to command sufficient force

to protect the Cape sea route from South African aggression today.

If a pretext for aggressive action by the major world powers were needed.

the author suggests his favourite dunes Bond-type scenario. The Mossel

Bay oil rig is some 60 km offshore, very close to the major shipping lane,

off a coast notorious for freak waves and some of the worst weather in the

world. Suppose a derelict oil tanker were to bear down, out of control,

towards the rig, giving the South African navy the option of sinking

it or seeing the rig destroyed. The derelict tanker could be covertly

given by the CIA to the ANC, provided

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it flew the Stars and Stripes and was crewed by anti-apartheid activists

prepared to die for their cause if necessary... Preceded, perhaps by

diplomatic recognition of the TBVC, perhaps even KwaZulu, in return for

their breaking ties with Pretoria. A Zulu army, equipped with AK47s,

has major potential for destabilisation. So does the present white right, now

more dangerous than the black left, if only because it is better armed.

Since the world triumph of militant socialism is no longer on the Soviet

Union's agenda, the ANC has lost its military backer. It probably still

has some buried arms, but not sufficient to be a military threat, while the

right wing is being supplied secretly by the South African security forces.

During his recent visit prior to the election the author stated, and he

repeats here, that he needs convincing

that any bomb blasts are not caused by right lwing action. They may use Soviet limpet mines or AK47 rifles. The security forces and right wing have plentiful captured supplies. Some are certainly getting into the hands of irresponsible extremists, who are using them specifically to stir up anti-black sentiment among the whites. On the road to reform, there will certainly be some turbulence which the government seems prepared to accept. If it gets out of hand, de Klerk will have little option but to hand power back to the seCurity forces, who will use it to regain control. If he does not, the situation may drift towards something uncomfortably resembling Lebanon, which all sides have shown enough restraint to avoid so far. It is, perhaps, in this critical period of talks about talks about talks that the wrong finger on a trigger could be particularly dangerous - and futile, whichever side pulls the first trigger. The result, in the short term, must be massacre of blacks by whites, further tightening of the economic siege and material impoverishment if not slaughter to the point where there is eventually nothing worth saving. When the parties will still have to talk. Ignoring apocalyptic scenarios, it still seems likely that the South African economy and industry will remain under siege for some time, perhaps increasing siege, unless and until there is visible adyancement towards a settlement. The present level of sanctions is causing the country serious inconvenience rather than direct economic damage. The main damage has been indirect, in the shaking of white South Africans' confidence to the point where they no longer believe they can go on indefinitely, and in causing the technically qualified and those of call-up age to leave. Both trends will continue in the event of continuing sanctions, and perhaps escalate. The skills shortage in the computer sector is already severe, and will continue to escalate until there is some sort of settlement, which shortage will be felt to some degree throughout industry and the econany at large. Increased sanctions may cause direct damage, but it is thought this will be far less in practice than indirect, including the discouragement of new overseas experts from signing on, except under short-term, expensive contracts. As soon as it can possibly do so, the US government should abolish sanctions and resume normal trade relations with South Africa, if only because the present situation poisons relations between the countries. White South Africans, rightly or wrongly, enormously

resent the role the US has played in pressurising them, which has seriously weakened American influence in the region. at least economically. Most of the products which have been withdrawn are available from alternative non-US suppliers, so American exports to the region have been hit. The volumes of business lost are not serious, but more important, given a legitimate pretext. South Africa will engage in more projects aimed at self-sufficiency, withholding raw materials as necessary. The planned South African stainless steel mill to be established with Taiwanese backing must inevitably result in the withholding of some ferro-

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chrome from the world market. More of the same may follow, as well as strategic alliances with other producer countries to the north and other regions entirely, in particular the Soviet Union. The First World's economic planners are advised, right now, to work out the economic consequences of an alliance in strategic minerals between South Africa and the Soviet Union, which seems likely to happen in the long term now the communist onslaught has gone away, whether the SA government is white NP or black ANC controlled. Desire to get close to the Soviet Union could be a significant factor in bringing SA's whites and blacks closer together. In the event of an internal settlement in SA the big loser is likely to be the USA. So would Canada and Australia lose, except there was little trade with them in any case. Rather, they are South Africa's natural competitors in many exports, but if a 'respectable' SA is readmitted to the Commonwealth, one can imagine President Mandela or Deputy President de Klerk raising the question of other indigenous people. Certainly they should insist, if only tongue-in-cheek that a North American Indian or . Australian Aborigine be included in any group officially monitoring change to majority rule in SA. Soviet-backed militant communism may have gone, but there is an easy identification in the African mind between communism and communalism. with which most rural blacks are quite familiar. Several experiments in African socialism to the north have been unmitigated disasters, most recently abandoned by Mozambique, which has necessarily accepted western economic discipline in order to borrow from the IMF, but has the message got through to South Africa's blacks?

Most of them, and certainly the more radical, are much inclined, temperamentally towards the socialist model, which is hardly surprising in a country with vast disparities of wealth, mainly though not exclusively on racial lines. One cannot fault the message of a poster raised by the PFP in a previous election - before its absorption by Party - "Apartheid remains to be there is time the Democratic breeds communism". It seen whether or not to undo the damage.

MAJOR CONSEQUENCES

Because of the is working under, African industry is to rectify strategic so far as possible. siege conditions it the shape of South

being distorted
deficiencies

The fact that an economy with South Africa's natural wealth and considerable First World sophistication cannot go it alone in the nineties - not in high-tech only but in sectors as diverse as automobiles and mining, is very strongly indicative of the trend towards unification of the world economy as a whole. South Africa, despite outside perceptions, is not controlled by some strange sort of white monsters. On the contrary, they are ordinary people of mainly European descent who took a wrong turning politically as a result of a natural desire for independence, confirmed by the later desire to preserve the life they made for themselves. Today, the imbalances of wealth and privilege are grotesque, and it is recognised by most whites that they must allow at least equal opportunities to the blacks. Many are frightened, but it is believed they will make room, more or less voluntarily, before they are pushed - which this report implies must happen if they try to hang on.

Despite that consideration it is Vre-emphasised that the country's planners are not entirely unhappy with the present level of sanctions, which forces the country towards strategic self-sufficiency so far as it is achievable. Okay, so that is not very far in practice, but in areas as diverse as armaments and computers the country is more self-sufficient now than five years ago, or than it would have been if sanctions had not occurred.

How much of its new-found capability will remain after sanctions have gone away is debatable, but probably a great deal. The result of sanctions, in the short term, is to make South

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African industry more capable technically than it would otherwise have been, so more able to help raise the Third World towards first World norms. In the writer's view it also increases the prospect of South Africa becoming a far more important world player. but that ydepends on it mobilising its economy and industry efficiently when it again achieves political acceptability. It also depends on the country reaching an accommodation of the races fairly quickly - it is suggested in the life of the present parliament, before too much erosion of its economy occurs. Somehow itygyst stop the exodus of technically qualified people in such industries as electronics and computers. New investment is starting to happen, still tentatively. Industry is testing the temperature, waiting 'to sEe if there is going to be real progress, which will not in itself restore economic confidence or canget-

ence. Whether or not the country reforms it should tighten up its economic management, and in the end it must do so.

OPPORTUNITIES

The present restructuring of South African industry presents opportunities for foreign investors willing to take the political risk, on attractive financial terms. The best opportunities are apparently being taken by the Taiwanese - or is Hong Kong money behind these moves? Whoever, it is simply gambling until the political direction is clear, and unless political stability is assured, but the gamble is clearly acceptable to some. The major world financial centres are still, officially, hanging back. They may fall over themselves to reinvest once true movement towards reform is established - by which time the best investment opportunities will already have been taken by Taiwan and others.

There will be other particularly in the area of local manufacture with a view to import substitution, low-cost housing and education. In the last two areas a restructured South Africa needs to opportunities, spend massive amounts to redress historical imbalances. Such a restructured South Africa should be able to afford the investment easily provided it keeps the free enterprise system and addresses itself to restoring badly-needed fiscal discipline.

Internally, SA is now making a lot of right moves, at least working on low-cost housing, large-scale electrification, widespread communications, and self-sufficiency so far as possible. A massive education programme is needed, and perhaps can be afforded with the ending of hostilities in Angola and Mozambique - which open up export opportunities provided there is sufficient internal settlement to make South African products acceptable in markets to the north. And to relax the overseas financial pressures sufficiently to allow South Africa to buy freely what it cannot yet make internally. What is needed, politically is a new vision, but practical industrial and economic policies are essential to implement it. First World industry must be given an international climate where SA is politically acceptable. Export incentives, and exhortations to greater productivity may help, but with the right international climate they will hardly be necessary for First World industrial South Africa. As a corollary the internal distributive sector needs no encouragement to greater efficiency. Rather, the First world distributive sector must be restrained from forming too large, non-competitive groups, while

the informal sector is allowed if not actively encouraged to soak up the masses of the unemployed, at least until they can be trained for something better. The more successful informal initiatives emerge in time to join the formal sector. Meanwhile they ensure that many of the nominally unemployed actually have an income of some sort. Major First World industry must be encouraged towards employee shareholding, more corporate responsibility programmes, and preferential support of local black enterprise and education. And education. And more. By the millenium, South Africa should be a modern industrial nation with full employment and rising living standards.

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If the government loses its nerve. It simply continues to keep the lid on the unrest without implementing major reforms, the siege economy will persist and escalate. In the author's estimation the authorities have at most five years to contain matters in that way, at the end of which there will be a violent shift of power.

If the siege, even at its present level, lasts until the millennium the result will be a Lebanon situation. Without much industry or economy left to say. That scenario, fortunately, is considered unlikely. What seems much more probable is that the country will reach a politically acceptable settlement, or that the siege economy will escalate into war.

Not war with the country's own blacks, which would be more in the nature of massacre, but war with the First world. White South Africa would inevitably lose as it is losing the present economic war.

Frankly what is needed is statesmanship by the country's political leaders, most of whom (including those in government) have previously shown themselves unable to think and act beyond the very short-term interests of their respective tribes.

Whether FN de Klerk is cast in a more statesmanlike mould remains to be seen. He is believed to be far more pragmatic than PH Botha. He is also, like most Afrikaners a noted family man, and one who is close to a far more liberal brother, who has been in contact with the ANC. On such threads does the fate of SA hang.

South Africa's very mixed population made up entirely of ethnic minorities represents a challenge and conundrum for the country's leaders which they, and the human race MUST somehow solve peacefully. It represents, in microcosm, the emergent global village, whose nation states must learn to do the sane.

Despite the enormities of their police state, and the blatant injustices of their society, white Africans do somehow succeed in personal interaction - above all, perhaps, in industry and economic life.

The country, in race relations, has a great deal to teach the rest of the world; as much or more, probably, as it has to learn from others.

The final Table 20.1 is a Research Support original, placed at the end of the prospects chapter rather than up front with the summary of findings because it is essentially a crystal gazing exercise, based perhaps on estimation and a few known figures as regards 1990, but entirely dependent on political developments for 1995 and 2000. The broad assumptions are

that the government will continue to pursue its reform initiatives, which will effectively dismantle apartheid by 1995, but not get rid of sanctions constraints significantly beforehand. Beyond 1995 it is assumed that sanctions will be gone and a by-then-booming SA economy will be able to compete freely in black Africa and throughout the Third World. where its own significant (though by then dwindling) Third World component will serve the country in good stead as regards product design etc. Whether SA is a significant player in the First World may not matter by then if it has favoured nation status in the Third World. '

As regards the table, import content includes complete imported products sold in competition with local offerings and imported components and assemblies. Imported content and local content comprise 100% of the local market. Exports are calculated on a different basis as a percentage of SA production. The whole calculation could be totally invalidated by the uncontrolled spread of aids, adverse climatic and other changes (the greenhouse effect), a world economic slump, war or other adverse political developments, so it is not considered worth discussing the individual figures at this stage. They are simply provided as a baseline against which actual performance may later be judged. The general assumption is that the data is reliable.

P19 20.1: Estimate of imported and local Content of various goods sold in the SA market, and of the exported proportion of SA production, 1990-2000.

1990 1995

CATEGORY

ENERGY

Coal -

Oil 60

Nuclear -

Other MES 40

Electricity -

Water -

Gold/Plat/Diamonds -

Base minerals 20

Iron and steel 20

Non-ferrous metals 30

Plastics 40

Ceramics 50

Glass 20

Wood 20

Pulp and paper 40

Chemicals 40

ELECTRONICS

Components 60

Telecommunications 30

Radios and other com 35

Mini and mainframes 98

PC and micro 80

Office equip MES 90

Cars 45

Commercial vehicles 50

Announcements 30

Security and surveillance 40

Measurement and control 90

Mech power equip 50
Fluid power equip 70
Elec power equip 40
Machine tools 95
Heavy engineering 40
Civil engineering 25
Buildingtconstruction 20
Project management 25
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is that SA will become far more broadly industrial and consumer-led, but we shall see.

The last quotation is from Anthony Robinson, writing in the Financial Times survey of South Africa, published this June, in whose opinion "South Africa's slow-motion revolution, the glacier-like erosion of apartheid, is about to pick up speed.

"Abroad, superpower co-operation has brought an end to the war in Angola and progress towards the independence of Namibia under the de facto supervision of Pretoria, Washington and Moscow. The economy, buffeted by the declining gold price and hobbled by debt repayment, is poised for a downturn after last year's 3.2% growth. But it has weathered sanctions and disinvestment in leaner shape and could prove a trump card in future regional co-operation plans.

"In short South Africa is heading for the 1990s with a fortuitous combination of circumstances which provide guarded grounds for optimism about the future. The die is not yet cast and the future is full of hostages to fortune. But the way in which this ethnically diverse country faces up to the challenges of the next few years will decide whether the modern, first world sector is able to uplift and absorb the third world part - or be dragged down by the dead weight of a rapidly rising population, a white exodus, violence and disease...." v

in the months
were printed,
e those paragraphs
itself published

as soon as possible after the 6th
September general election in South
This report, which was largely written
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Africa, which allows the road forward to be seen more clearly. It has attempted to be non-partisan, but the author does not delude himself. On the options facing South Africa it is impossible not to take sides, and the author is quite clear as to which side he
15 on.

Overseas businessmen, at least in Britain, seem to have lost interest in the South African situation despite broad media exposure. At least an advance mailing to 500 UK companies known to have business interests in South Africa produced a single negative response. SA businessmen and politicians should be aware that their traditional UK business supporters are simply adopting a wait-and-see attitude. If there is no SA reform they will simply write the country off, beyond doing business under the counter so far as they can do so without further embarrassment.

What remains to be seen is whether
South Africa's politicians will see
the road ahead as does the author,
whether they will seriously try to
sell that future to their respective
constituencies, whether the electorate
and non-electorate will now accept
the economically inevitable, or whether
they will continue to strive for their
respective political cloud cuckoo
lands. If they do, the wheels of indus-
try will, at best, inevitably slow,
and may eventually be brought to a
grinding halt.

Reynold Crofts

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An outstanding year for Elcentre
GROUP HIGHLIGHTS
Turnover increases by 53% to R518 million
Operating income up 87% to R61 million
Income aftertaxation up 61 % to R49 million
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