West African TECHNICAL REVIEW

The International Magazine for Industrial & Business Management

April 1981

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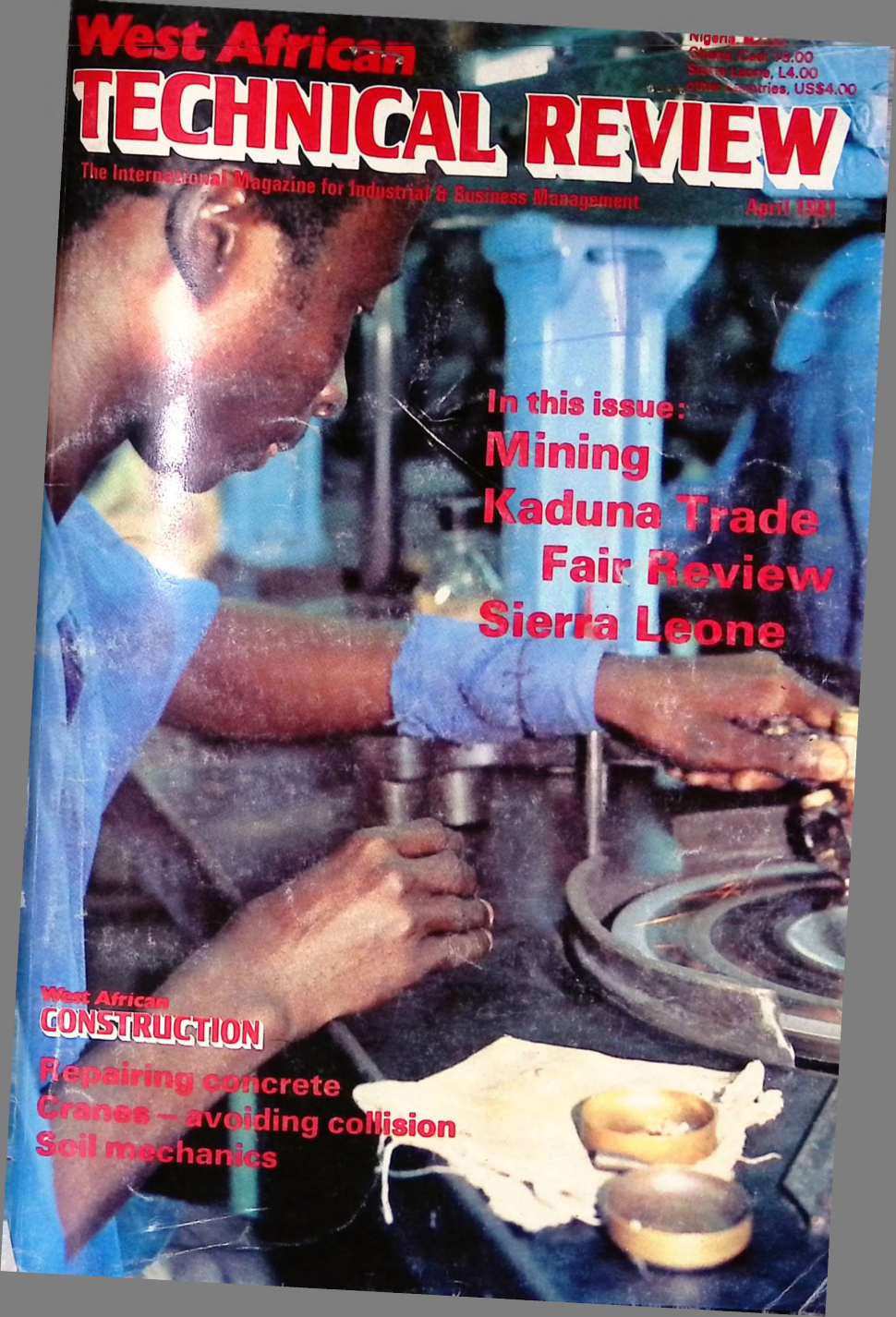
Sierra Leone, L4.00
Other Countries, US$4.00



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CONSTRUCTION

Repairing concrete
Cranes – avoiding collision
Soil mechanics

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This month's cover: gem polishing at the Sierra Leone Diamond Company, Freetown. Photo by Mike Manifold.

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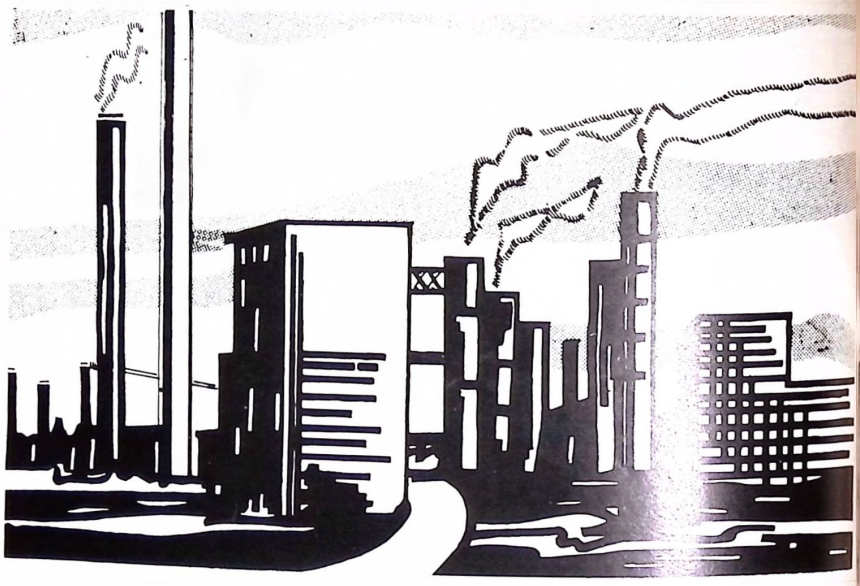

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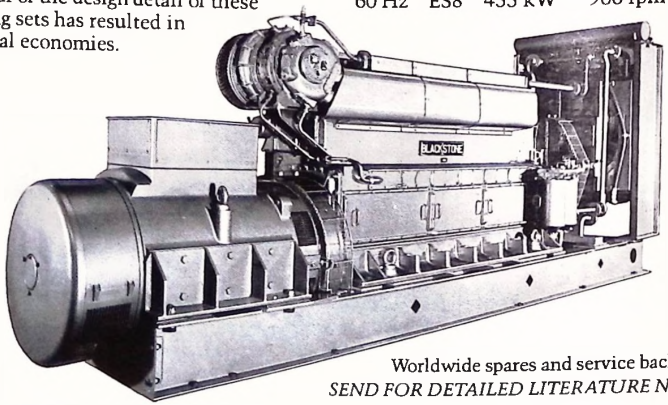

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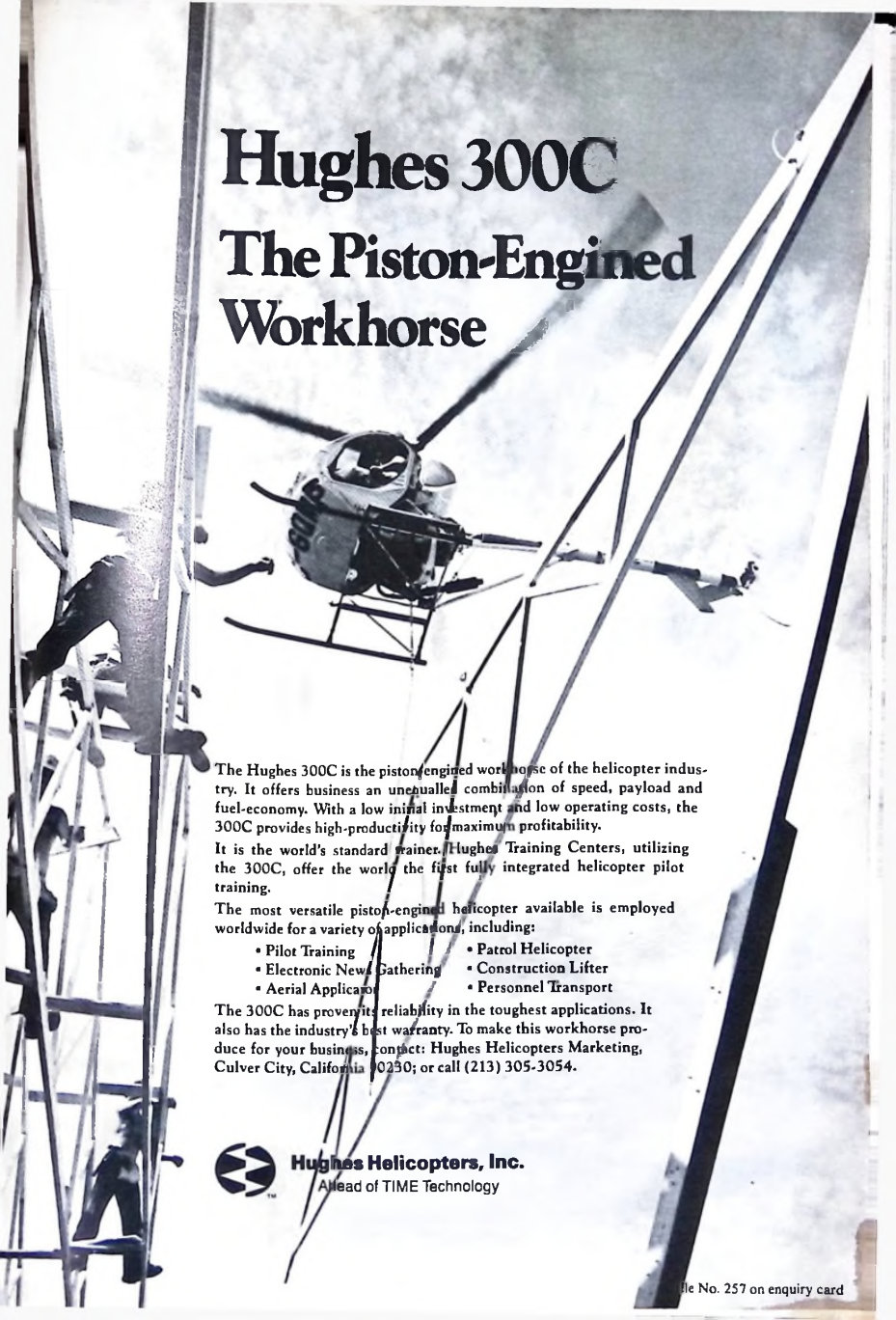

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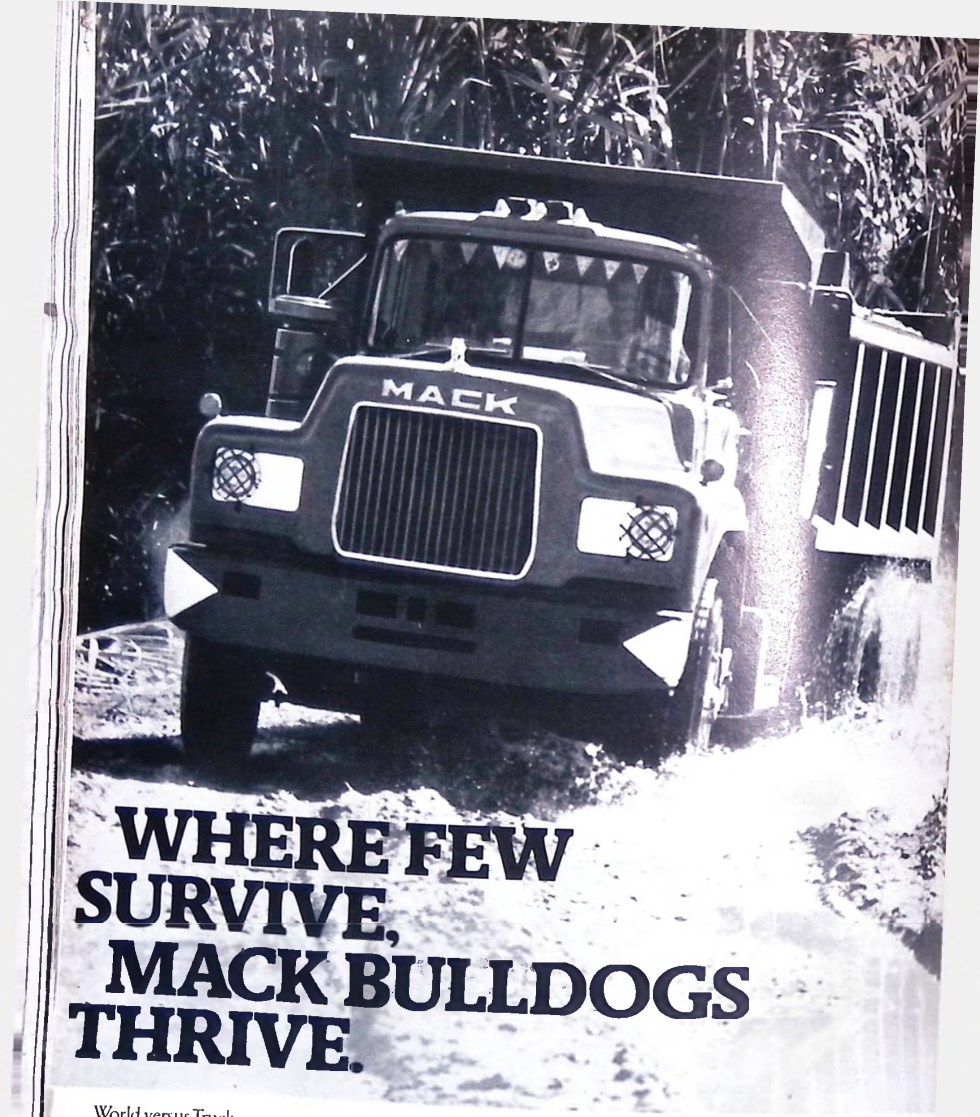

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Liberia Minister in UK

Dr Nogba Tah Tipoteh, Minister for Planning and Economic Affairs, Government of Liberia, asked a group of British consultants last month to suggest how Liberia can develop her immense resources productively to improve the country's living standards and halt the downward trend that has been a feature of the economy through the past decade.

The occasion was a meeting, arranged by the British Consultancy Bureau (BCB) at their Westminster office. Dr Tipoteh was accompanied by Mr George Williams, Deputy Minister and Director of Investments, National Investment Commission of Liberia, and Mr Mark Carneh, Chief of External Aid Co-ordination, Minister for Planning and Economic Affairs, Government of Liberia. The meeting was chaired by Dr J. H. Stevens, a member of the BCB Africa Group Committee.

Dr Tipoteh emphasised that Liberia's basic economic system had not been greatly altered since the change in government last year. The country believed in free enterprise and welcomed foreign investment as long as it was directed towards the use of local resources and manpower. Collaboration with government as well as independent business were both desired, and in furthering this policy the government had cut "red tape" to the minimum.

Dr Tipoteh told his audience that his government hoped to be ready to announce a new four-year development plant on July 1 this year. He said that while the major emphasis would be on rural development, there would be scope in many fields including hydro-electricity, the mining and processing of minerals including bauxite, uranium, gold and precious stones including diamonds, and the development of port facilities and railways, especially for the transportation of iron ore and other raw materials.

Alhaji Shehu Shagari, pictured here during his State Visit to the UK, at a Grosvenor House luncheon. On his left is Sir Peter Masefield, President of the UK Chapter of the Nigerian-British Chamber of Commerce. A British trade mission will visit Nigeria in mid-October, this year, Sir Peter revealed at the conference.

Promoting economic co-operation

Ministers of Industry from 28 developing countries, invited by the United Nations Industrial Development Organisation (UNIDO), attended a solidarity meeting in Khartoum last month. The four-day meeting, which opened on 23 March, was the fifth of its kind designed to promote economic co-operation among developing countries and achieve collective self-reliance. Others were held in Afghanistan, Tanzania, Haiti and Bangladesh.

A portfolio of industrial projects, prepared by the Government of Sudan and UNIDO, has already been sent to invited countries. Its emphasis is on increasing productivity of existing industries, completing unfinished projects and upgrading managerial and technical skills.

The countries invited to participate are Algeria, Argentina, Brazil, China, Greece, India, Indonesia, Iraq, Kenya, Kuwait, Libya, Malaysia, Mexico, Morocco, Nigeria, Oman, Pakistan, Philippines, Republic of Korea, Romania, Saudi Arabia, Senegal, Singapore, Syria, Turkey, United Arab Emirates, Venezuela and Yugoslavia.

● The Kuwait government has given substantial support to the uranium mining company concern, Tassa Ntaghalgue company which mines deposits estimated at 20,000 tons in the Arlit region.

Flow of foreign exchange through the Central Bank

(₦ million)

Items	July 1979		June 1980		July 1980	
	Receipts	Payments	Receipts	Payments	Receipts	Payments
Merchandise trade (non-oil)	18.2	440.3	30.6	704.2	17.5	852.1
Payments by oil companies[1]	689.2	12.1	1,041.1	47.0	1,295.6	55.4
Other transactions	60.0	153.2	84.8	195.9	153.8	118.2
Total	767.4	605.6	1,156.5	947.1	1,466.9	1,025.7
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[1]*Includes foreign earnings of the National Petroleum Corporation.*

Source: Centre Bank statistics.

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Enugu, 49 Akpabio Street, phone 042-253 735.

Circle No. 248 on enquiry card

ILA '82

ILA '82, the International Aerospace Exhibition which will take place from May 18 to 25, 1982 at Hanover, will enlarge its exhibition and conference programme. This will become particularly apparent in the expansion of the defence technology and helicopter sectors and means that ILA '82 will become even more attractive for additional exhibitor and visitor groups.

The subject of defence technology will be given a new emphasis at Hanover. In close co-operation with ILA '82, IDEE – The International Defence Electronics Expo '82 – organised by Kiver Communications SA, will take place for the first time at Hanover from May 18 to 20, 1982. This highly specialised exhibition will be accompanied by an extensive conference programme. As the ILA exhibition complex at Langenhagen Airport is not large enough to accommodate both events, IDEE – The International Defence Electronics Expo '82 – will take place at the Hanover Fairground.

The 14th International Helicopter Forum at Bückeburg will further strengthen the helicopter section of ILA '82. This forum will lead to an even more active participation of the helicopter industry and its equipment and component suppliers in the ILA '82. The conference programme at Bückeburg scheduled for May 24 and 25, 1982 will be divided into civil (Hanover) and military (Bückeburg) aspects. The Helicopter Forum will be organised jointly by the Helicopter Centre, the BDLI (Bundesverband der Deutschen Luft- und Raumfahrtindustrie), the Deutsche Gesellschaft für Wehrtechnik as well as the Deutsche Messe- und Ausstellungs-AG.

Circle No. 31

UK training programme

Following successful programmes run in 1979 and 1980 a third ITS/IPM programme for overseas personnel and training staff started with a briefing at the British Council.

The current programme has attracted participants from India, Sudan, Somalia, Phillipines, Bangladesh, Nigeria, Trinidad, Belize, Indonesia and Pakistan.

The 13-week programme comprises four blocks of residential instruction covering a wide range of training skills with emphasis on identification of organisational needs, learning design, technical training and management and organisation development. Speakers from key British training establishments will give the members a clear picture of the British training scene.

Members are also sent on individual attachments to British organisations relevant to their work back home and the group will be visiting a selection of British training centres.

Transportation

New UK/Port Harcourt service

Tradewinds Express, the international express airfreight and air courier company based at Gatwick airport, UK, will introduce the first non-stop weekly service between the UK and Port Harcourt, in Nigeria's premier oil producing area, on 1 April 1981.

The company, a specialist subsidiary of Tradewinds Airways, will use 41.5 tonne capacity Boeing 707-320C jet freighters owned by the airline, flying direct to Port Harcourt on Wednesdays departing at 2300 hours.

Tradewinds Express, formed in 1980, is introducing the service following a demand from British, European and American manufacturers and shippers for a regular service to Nigeria's Rivers State since the new Port Harcourt airport opened for international traffic in November.

Flights will arrive at Port Harcourt at 0700 hours on Fridays and depart for Kano shortly after unloading has been completed. The freighter returns to Gatwick Airport on Friday mornings.

Tradewinds Express general manager said that the service offers clients a fully inclusive rate, free warehousing facilities and no handling charges. There will be no pre-clearance formalities and a charges collect facility will be available in Nigeria.

The service will be particularly useful for companies requiring a direct service operation to Port Harcourt, without the necessity of pre-clearance formalities – the alternative being transhipment over Lagos, either by road or restricted bellyhold air freight capacity.

The Port Harcourt service will function in addition to Tradewinds' twice-weekly Gatwick-Lagos and Gatwick-Kano service.

Tradewinds Express, which also offers a daily courier service from the UK to all major commercial centres in Nigeria, operates from its own office complex at Suffolk House, Massetts Road, Horley, Surrey, close to Gatwick Airport. Tradewinds offices outside the UK are located in Lagos, Khartoum, Kampala, Lusaka and New York and a new office has been established in Port Harcourt to facilitate the new direct cargo flights.

EXECUTIVES' CALENDAR

A monthly service listing some of the major events in West Africa and around the world that could be of interest to our readers. Further information on these events can usually be obtained from the Embassy (commercial office) of the country concerned.

MAY		
4–6	International Surface Treatment and Industrial Finishing Exhibition	PARIS
5–8	SPCI – International Exhibition for Supplies to the Pulp, Paper, Board and Conversion Industries	STOCKHOLM
5–8	International Building Products and Services Exhibition	LONDON
5–8	Trade Exhibition of Office Machines	MUNICH
8–17	International Trade Fair	LISBON
10–14	Cement Industrial Technical Conference	LANCASTER (PA) (US)
13–17	EXTEXPO – International Trade Fair for Building and Construction	JONKOPING
14–20	INTERPACK – International Packing Exhibition	DUSSELDORF
19–22	PROTECTION – International Labour Safety, Security Services, Fire Protection and Environmental Protectional Exhibition	STOCKHOLM
23–27	INTEL – International Electrical and Electronic Exhibition	MILAN
25–29	International Mechanical Handling Exhibition	TOKYO
27–30	International Building Exhibition	HONG KONG
28–31	DACH + WAND – Specialised Exhibition for Roofing and Wallfacing	NUREMBERG
27–2 June	International Trade Fair for Machinery and Equipment for the Wood Industry	HANOVER
JUNE		
2–5	Temperature Controlled Storage and Distribution International Exhibition	B'HAM (UK)
11–17	International Mining Exhibition and Congress	DUSSELDORF

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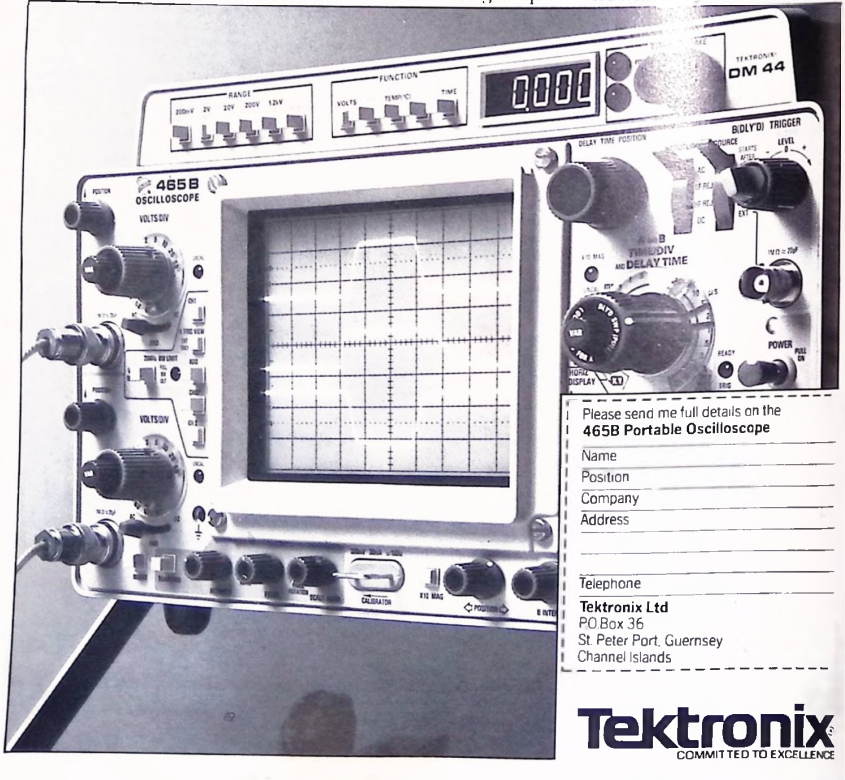

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Transportation continued

German agent for OTAL

Independent liner operator to West Africa OT Africa Line (OTAL) has named a second agency to support its marketing drive in Germany. The Line has appointed Hamburg-based Ernst Glässel GmbH for representation throughout Germany – with the exception of the North Rhine/Westphalia region. Swickert und Witte, of Dusseldorf, continue as OTAL agents in this area.

In a related development, designed to improve the convenience of service for German shippers, OTAL is now using a Hamburg/Bremmerhaven – Rotterdam ro-ro feeder service to connect with West African sailings.

"Hamburg is a vital export centre for Germany's trade with West Africa, and this appointment is designed to increase our share of this important traffic," said Line Marketing Director Peter Ritchie. "From Hamburg and Dusseldorf together, we can now offer a local customer service operation to a much wider range of key exporters in Germany," he added.

Ernst Glässel GmbH was established in 1936 and is a daughter company of Menzell and Co. Schiffsmakler. OTAL accepts a wide range of wide range of liner cargoes for all destination ports, including containerised, rolling and general cargo and project shipments. The mainstream schedule offers sailings every ten days from Felixstowe, Rotterdam, Zeebrugge and Le Havre to Dakar, Monrovia, Abidjan, Tema and Lagos (Apapa).

Nigeria Airways new station manager

An airline official who has served Nigeria Airways on three separate continents has been appointed the company's station manager at Heathrow Airport, London.

Ilorin-born Mr Alhaji Sayi, originally joined Nigeria Airways in 1967 as a trainee cadet before being promoted to the airline's sales department as a passenger officer, following graduation. In 1976 he was transferred to Kaduna airport as passenger manager before returning to the airline's training school as an instructor in 1978.

Mr Sayi's first overseas posting came later the same year when he was appointed station manager at Karachi. He later worked as district manager in Jeddah.

Mr Sayi, who is married with three children, commented: "I consider the Heathrow appointment to be the most challenging so far. From London we are currently operating daily services to and from Nigeria, while evaluating the purchase of additional wide-bodied jets. My appointment coincides with a very exciting time in the history of Nigeria Airways."

Nigeria-UK air cargo link

A joint marketing agreement has been signed between Nigeria Airways and Tradewinds Airways. The agreement which commences on April 15, 1981, will provide for the two airlines to promote and develop the operation of cargo services between the UK and Nigeria, to their mutual benefit.

Tradewinds will provide a Boeing 707-320C aircraft for the all-cargo flights to Nigeria. The airline will be responsible for ramp handling at Gatwick, and Nigeria Airways at Heathrow and in Nigeria.

A Boeing 747 combi aircraft will be introduced on the London-Lagos route, and Nigeria Airways and Tradewinds will be discussing the joint marketing operation for the aircraft in the new future.

Tradewinds will be solely responsible for marketing at least one-third of the cargo capacity in this aircraft and the same amount of bellyhold capacity in the Nigeria Airways DC10 aircraft on the UK-Nigeria route. Tradewinds will also be responsible for the operation of supplemental freighter services to Nigeria as required.

IATA rate increases

Gatwick-based Pelican Cargo which operates Boeing 707-320C jet freighters to regular and *ad hoc* destinations in Africa and the Middle East, last month issued the following statement:

"IATA carriers will be increasing their freight rates from April 1 – but these could be undermined if the non-IATA carriers do not make similar increases.

"Pelican Cargo and Tradewinds Airways advise that they expect to increase their freight rates proportionally in line with the IATA increases. This should encourage IATA carriers to sustain their new rates which are an overdue requirement to cover increased fuel and other costs not properly recovered in the past 12 months."

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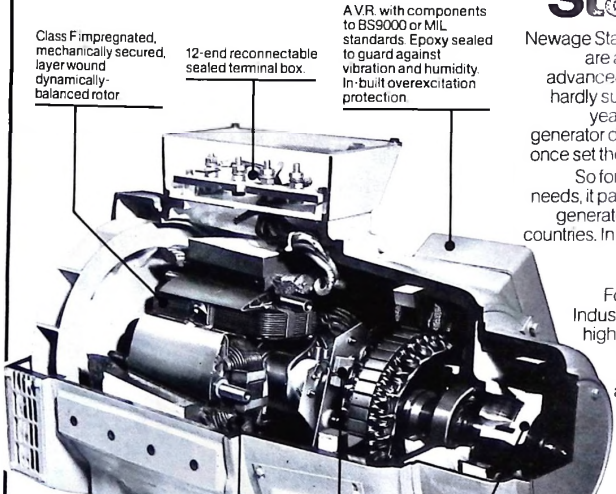

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NAWAL addition

North American West African Line (NAWAL) announces the addition of the sixth roro vessel, the MV Seki Cedar, to the NAWAL fleet. NAWAL operates these six roro vessels from the US Gulf and East coast of North America including Canada, to the West African ports within the Dakar-Luanda range, and is the only roro carrier serving West Africa from North America.

The MV Seki Cedar is 121m long, operates at a service speed of 16 knots, has a starboard angled stern ramp with a capacity of 80 tons, and is capable of carrying 400 teus. This vessel is completely self-sustaining in West Africa, having on board all necessary cargo-handling equipment to discharge the cargoes in a fast, safe, professional and damage-free manner. The Seki Cedar joins the existing roro vessels, the Seki Rokako, Seki Rokel, Kaduna, Blue Nagoya, and the Blue Akeishi.

All roro, container, project, and break bulk cargoes can be carried on their vessels, and with this flexibility, NAWAL is in the best position to serve the West African shippers and forwarders. The Seki Cedar will sail on her maiden voyage at the beginning of April.

Conservation for W.A. Coast

A treaty creating a three-year, £1.8 million coastal conservation project was signed recently by twenty West African nations. Responding to instigations by the UN's Regional Seas Programme, the countries met in Abidjan and agreed to a scheme designed to preserve the West African coastline.

The plan involves the investigation of many areas of environmental concern: pollutants such as waste oil from ships in the offshore corridor from the Indian Ocean to Europe; sewage and industrial effluents, and agricultural run-off, particularly pesticides and fertilisers. Coastal erosion due to building, land reclamation and sand and gravel extraction will also need to be examined.

Priorities under the scheme will include legislation on waste control, training in coastal management, and devising effective methods of inspecting oil tankers before deballasting.

Readers' letters

Do you feel strongly about any aspect of business life in West Africa? Do you have any handy tips for ensuring greater efficiency in your company?
We welcome readers' letters. Write to:
Personel opinion,
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Office management for co-operatives

This book is a self-teaching text about the organisation and practice of a co-operatives office. It demonstrates that efficient management can only function if there is an effective office which provides a good service to a manager. It is this service which enables him to run his co-operative efficiently.

The book looks at the principles of office management, the subjects of staffing and control, and the details of the essential records, correspondence and accommodation that are required to provide that service to the manager.

This publication should prove useful to the managers of both large and small co-operatives, as well as to a co-operative which only employs a part-time secretary.

The author of the publication, John Launder, is a tutor at the International Training Centre, Loughborough, UK. Previously he worked with co-operatives in Tonga in the South Pacific. The text was prepared with the co-operation of the Co-operatives Panel of the Intermediate Technology Development Group, of which he is a member.

Sanitation

The French Ministry of Cooperation continues its sanitary programmes in Africa with an increased budget for 1981. The programmes, announced at the Third Commission held in Paris between France and Guinea Bissau, have been allocated 238 million francs, representing five per cent of the Co-operation's budget.

Three main objectives form the basis of the programmes: priority for preventive medicine, expansion and improvement of existing medical establishments, and multilateral projects. The scheme provides for technical and medical assistance now amounting to over 1,000 workers (French) of which 613 are doctors. Two of the tasks of the programme will be to form medical teams and to carry out emergency operations.

Some programmes of the Ministry of Cooperation are being carried out under the general programmes of the WHO, such as the vaccination scheme in Senegal. Due to the success of this programme, much larger scale vaccinations are planned by France together with other western aid projects.

New drug

A new drug to cure schistosomiasis is about to be launched by the Swiss company, Bayer. According to a report in the New Scientist, the drug, called Praziquantel, kills the worm responsible for the disease with a single pill. This one pill also appears to be effective against all three different forms of schistosomiasis.

On the basis of these findings, the World Health Organisation is to begin a new strategy to eradicate schistosomiasis by treating special groups with Praziquantel. However, the success of any further treatment programme will largely be related to the cost of the drug. $7 a dose it will probably be expensive for most countries.

Although exactly how Praziquantel works is not yet known, it is thought that the drug attacks the muscle wall of the worm so that it can no longer contract. Until now, control of schistosomiasis has been limited to chemical warfare against snails that harbour the disease-carrying worms in canals and irrigation ditches.

Recording studio

Neve Electronics International of the UK has won a turnkey installation contract for a major new music recording studio complex to be built in Lagos, Nigeria.

The contract, worth more than ₦317,500, has been placed by Decca West Africa as part of a major planned expansion programme which will result in Nigeria having extremely modern and comprehensive music recording facilities.

Neve will supply their latest mixing console, the microprocessor controlled 8108 model complete with a NECAM computer-assisted automation system. Neve are also supplying all the auxiliary studio equipment as well as carrying out all the system engineering, cabling, installation and commissioning work.

Diesel alternator sets

Glaxo Production and Engineering Services Ltd, of the UK, has placed an order worth ₦889,000 with the Amalgamated Power Engineering Limited company, APE-Allen Limited, Bedford, for three 920kW diesel-driven alternator sets. These units will provide electricity for a new factory at Agbara currently being built for Glaxo Nigeria Limited.

The 1,300bhp 600r/min Allen type 6S37-E diesel engines will each be directly coupled to a 1,150kVA 11,000-volt alternator and the units will be baseplate mounted. Cooling of water, lubricating oil and charge air will be by three-section horizontal air-blast radiators.

For the Cadbury factory at Ikeja, Nigeria, where over half the world's output of Bournville is produced, Cadbury Overseas Limited, Bournville, has placed a second repeat order worth ₦381,000 with APE-Allen Limited for a fourth 1,000kW diesel alternator set and associated engineering.

The engines are 600r/min Allen type 6S37-E units driving Brush alternators and are in almost continuous service throughout the factory's three-shift, six-days a week operation. The sets are carried on resiliently mounted steel baseplates and are arranged for automatic starting.

Tool factory

The P-E Consulting Group have been appointed as consultants to assist the Federal Ministry of Industries, Nigeria, with project planning and management for a new machine tool factory to be built by the Nigerian Machine Tool Company (NMT).

P-E's role, in collaboration with their local associates, is initially to review NMT's plans for product manufacture, layouts, materials, methods, machinery, buildings and manpower. Subsequently their role will cover all aspects of implementation, including the construction of buildings and the installation and commissioning of machinery and plant. The total project cost is estimated to be ₦42 million and P-E's assignment is expected to last four or five years.

Rural electrification

Mains electricity is to be brought for the first time to 53 villages in Oyo State, Western Nigeria, in a ₦12 million contract signed with **Hawker Siddeley Power Engineering Ltd.**

The company's contract is with the Ministry of Works and Transport of Oyo State and includes survey, detailed design, procurement of equipment and erection and commissioning and will take about three years to complete. The project is partly financed by Lloyds Bank, backed by the Export Credits Guarantee Department.

The overhead transmission and distribution system will include the building of some 80 electrical substations using transformers from 100 to 500kVA in size.

See page 29 for more news.

Rural sanitation: planning and appraisal

Wherever there are problems of bad sanitation in rural areas, with all the sickness and disease that results, one may be tempted to assume that improved technology is the answer, and that new latrines will provide the necessary "technological fix". But technology by itself does not solve anything, and in rural areas of developing countries it is often found that latrines, when built, are not fully used, and, when used, do not always banish the diseases of bad sanitation. The essential point is that good sanitation depends primarily on people, and on how they organise hygiene-related activities.

Although the term "sanitation" can, strictly speaking, cover water supply as well as excreta disposal, it has been assumed here that sanitation is not concerned with major improvements to village water supplies. It might, however, deal with the smaller improvements that an individual householder may make. Therefore, this booklet does include brief notes on household water supplies, mentioning backyard wells, small water filters, and in particular, rainwater storage tanks. However, these subjects are considered from the standpoint of planning, not technology.

The book has been written mainly for hospital staff and community development workers in Third World countries who may be planning programmes to improve sanitation or hygiene in the rural areas. The author, Arnold Pacey, is a writer on technical subjects who has worked for OXFAM, the UK-based charitable organisation working for the Third World. His previous publications have mainly been concerned with water supply in developing countries and the history of technology.

COMMERCIAL REVIEW

Oil news

Nigeria reaches settlement with BP

BRITISH PETROLEUM and the Nigerian Government have agreed on compensation terms for the nationalisation of BP's oil producing and refined-product marketing assets – one of the last moves of the military government in August 1979, which was claimed to be in retaliation for BP's alleged (but denied) supply of oil to South Africa. BP will receive ₦60.32 million for its 50 per cent holding in the former Shell-BP Petroleum Development Company, which gave it a 20 per cent share in the Shell-BP-Nigerian National Petroleum Corporation production venture, together with ₦11.02 million for its 60 per cent holding in the BP Nigeria marketing company (now called African Petroleum).

Compensation will be paid in crude oil, with the volume to be received (about 3.35 million barrels, on the basis of the current $40.02/barrel price for Bonny Light) thus depending on currency fluctuations as well as prevailing oil prices. For Nigeria, the settlement has the advantage of involving no foreign exchange payments – and, with a developing surplus of crude on world markets, will also enable NNPC to dispose of crude which might otherwise be left unlifted.

It certainly seems that BP has made considerable concessions in its negotiations with the government, as the sum agreed appears fairly small in relation to its loss of some 280,000b/d of equity crude (at the level of production prior to nationalisation), together with the loss of a further 100,000b/d of buy-back oil. It seems that compensation has been based on the written-down book value of BP's assets (given in 1978 accounts as about £80 million), without allowance for loss of lifting rights.

It has been mooted that, with compensation agreed and with UK-Nigerian relations now looking up (as evidenced by President Shagari's March visit to London), BP might be able to resume purchases of Nigerian oil. But, although viewed as crude-short, BP asserts that no associated supply deal has been signed and that there are no discussions at present towards such an agreement. Although showing a preference for small-volume deals with state oil companies, a long-term sales agreement would also bring benefits to NNPC, which has been unable to sell its full entitlement of oil in times of surplus, over the past few years.

Oil revenues up

Nigeria's oil earnings last year rose to ₦13,140 million ($24,625 million), according to government figures – an increase of 31 per cent over the ₦10,022 million of 1979. The government's figure for 1980 production is 753.98 million barrels, of which 724.38 million barrels was exported. Production thus averaged 2.060 million b/d – a decline of 10.6 per cent from the 1979 average of 2.304 million b/d, and well below the 2.4 million b/d or so of which Nigeria's fields are capable of flowing. But, as shown by the figures, price increases have more than compensated for the fall in production.

Government figures for first-half 1980 show an increase of 26.6 per cent (compared with first-half 1979) in NNPC's seismic work, with 7,816 line-km recorded in January-June last year. On a party-months basis, seismic activity declined from 62 to 41 party-months, with the increase in line-km shot being attributable to a higher percentage of offshore work (which is much quicker than seismic work onshore).

Gas export plan

Companies participating with the government in the plan to export Nigeria's mainly-flared natural gas in liquefied form (LNG) have put up a proposal which could allow the project to go ahead as scheduled. As government spending constraints in the 1981–5 development plan were the reason cited for the delay (see previous issue for details), the oil companies have suggested that their share of the project's equity should be increased and the government's decreased accordingly, to enable construction work to go ahead as scheduled. The companies point out that overseas financing on a loan basis could be arranged, so that the government's share of spending in the plan period might not be much more than $500 million. Go-ahead as planned will enable Nigeria to participate in the expected boom in LNG demand in the mid/late 1980s.

Cost of the entire project is now put at $14,000 million, of which the liquefaction plant itself is estimated to account for nearly $8,000 million. The 14 LNK tankships will cost over $3,500 million, while the gas-gathering pipeline system is likely to cost $2,000 million.

Pipeline alternative?

Elf, a participant in the Bonny LNG venture, has proposed a pipeline to flow Nigerian gas across the Sahara desert as an alternative to the liquefaction project, envisaging tying-in the Nigerian pipeline to the Algeria-Italy pipeline which is due to start up in 1982. (From Italy gas can be supplied to the West European consuming grid.) Reaction to the idea has been cool however; costs and technical difficulties are cited.

France's Elf says that it has completed 16,000 line-km of seismic work and has drilled three wells, all within one year, on the three offshore blocks it was awarded in late-1979. It claims this as a record work-programme in Nigeria.

Cameroun

Final decisions are to be taken late this year on the proposal to export gas found offshore in liquefied form, with a view to start-up in 1985–6. Initial capacity of the plant is likely to be 5,000 million cu.m/year. Cameroun's gas reserves are now put at between 150,000 and 180,000 million cu.m – up by more than one-fifth as a result of the recent Gulf Oil find offshore Douala. (Gulf is about to drill a second well to assess the extent of its field.) Companies involved in the project are now discussing tax arrangements for the gas, as well as appraising finds and planning production facilities.

Cameroun's first oil refinery, a 24,000b/d unit being built by France's Procon near Victoria, is due for start-up in the near future. Although small, the plant will meet Cameroun's refined-product needs and give a small surplus of heavy fuel oils for export.

France's Bouygues Offshore (65 per cent) and the government of Cameroun (35 per cent) have formed a joint company to specialise in oil and gas construction projects. The new company – Boscam – will be "concerned with the production, transformation, transport, distribution and storage of hydrocarbon products of all kinds," the government said. The company is expected to bid for construction projects arising from the gas liquefaction and export project, on which it hopes that work will begin in 1983.

Gabon

Crude oil production in 1980 ran at an average of 175,056b/d according to the government – a fall of 14.4 per cent from the previous year's figure. But the value of crude oil exports increased 48.5 per cent to reach $1,900 million in 1980, according to provisional figures given in a report by the three banks (Loeb Lehman Brothers, Maison Lazard and S. G. Warburg) appointed by the government to advise on economic affairs.

Ghana

The government announced that Texas Pacific is to survey the Keta basin lagoon, with a view to drilling this year. A "fair and favourable" climate for oil companies was promised, in the hope of extending exploration work to onshore areas.

Ivory Coast

A British trade delegation visited Ivory Coast in March in the hope of winning oil, industrial and civil engineering contracts. The country's economy is expected to be boosted by its two offshore oil finds, now under appraisal, which – according to the UK Department of Trade – could give Ivory Coast a "substantial" surplus of oil for export.

Packing contract

The British company, **Contractors Export Services Ltd**, have recently been awarded the contract for the supply of the total electrical package of materials including generators, transformers, switchgear and miscellaneous equipment for the "Broking House – Ibadan" project for Femi Johnson Company, an insurance organisation in Nigeria.

The contract, worth around ₦317,000, is the fifth project of this value undertaken by Contractors Export Service Ltd who specialise in bulking electrical installation materials for contractors working overseas. This involves very close liaison with the contractor from the time the specifications are drawn up right through to the programmed delivery of the goods. All the materials for this and other contracts are manufactured in the UK.

On the rails

Kaduna Railway Construction, in association with Roderland International (UK), have placed orders with British railway equipment manufacturers totalling nearly £1.6 million BSC Track Products received the largest order, worth just over £1 million.

Two other British companies are to be involved in the Kaduna project, which has been commissioned by the Nigerian Railway Corporation to link the Kaduna oil refinery to the country's main railway network. RMP (Railway, Mine and Plantation) will supply turnouts and fish-bolts to the value of £325,000, and Pandrol have received an order totalling £132,000 for rail-clips and screw spikes.

Multi-purpose cargoship from Korea

A 16,000dwt multi-purpose cargoship River Ngada, the last of the eleven series vessels ordered by the Nigerian National Shipping Line (NNSL) from Korea's **Hyundai** shipyard in 1977, was delivered to her owner at the Ulsan shipyard.

Since the first vessel River Jimini, a 12,000dwt MPC, was delivered in April 1979, Hyundai has made the successful delivery of all of the eleven vessels consisting of nine 12,000dwt and two 16,000dwt multi-purpose cargoships. Besides these vessels, Hyundai built and delivered four 16,000dwt MPC's to the Black Star Line (BSL) of Ghana.

● The Hyundai Corporation turned out to be the lowest bidder in an international tender conducted by the National Electric Power Authority of Nigeria, in which 17 competitors took part. The tender involved the supply of $US32 million worth of transformers.

Meanwhile, the Korean company already received the fourth purchase order for two 138kV generator transformers from the National Electric Power Authority. Thus, the total contracted value amounted to $US7 million.

Tractors for Africa

Massey-Ferguson, producers of tractors, have secured orders in Nigeria and Sudan. More than ₦2.54 worth of tractors, planting and cultivating equipment is being supplied to Nigeria. Included in the order are 120 Coventry-built tractors – all powered by Perkins diesel engines – together with disc ploughs, trailers, harrows and drills.

In the Sudan, 200 tractors – the majority from MF's Coventry tractor plant – are being delivered for work on sugar cane estates.

Iron ore from Liberia

A contract has been ratified by the Nigerian government for the delivery of 4.5 million tonnes of iron ore to the Delta Steel Plant in Warri state. The steel is coming from the LAMCO plant in Liberia and shipment will start in June 1981, and will be carried out over a period of four years, after which the contract could be prolonged by one year provided written agreement has been reached two years prior to the date of expiration of the existing agreement.

This is LAMCO's first venture in Nigeria, although Granges, the Swedish expatriate participants in LAMCO, have been equipping and servicing Nigerian National Petroleum Corporation depots for three years now. As far as the possibility of sales to Ajaokuta steel plant is concerned Granges, who acts as sales agent and manager for LAMCO, remains cautious, at present had access to the steel plant put the company off, but it has not totally excluded the possibility of supplying the Ajaokuta plant.

ECA mining conference

The Chairman of the 400-delegate conference on Africa's mineral resources which was held in Arusha, Tanzania, in February called for a new relationship between African governments and foreign-owned companies. The conference set out to assess activities in the areas of exploration and exploitation, and concluded that foreign control should be phased out and replaced by inter-african co-operation in the all the stages of mining, from exploration to marketing.

It was felt that until African countries gained full control over their own mineral resources their economic potential could not be fulfilled. The conference was organised by United Nations Economic Commision for Africa.

Diamonds of the word

The demand for industrial diamonds is expected to increase from the 1978 base at an annual rate of about 4.8 per cent through to 1990. Due to the competition from synthetic diamonds prices for smaller stones have dropped, but prices for the larger stones which are scarcer, have increased.

Ghana is the sixth biggest producer of diamonds in the world with a base reserve of 50 million carats; in 1979 Ghana produced 2.8 million carats of diamonds and 2.9 million carats in 1980.

Iron ore for Delta

The American company, Utah Minerals, has been awarded a contract to supply 850,000 tonnes of SAMARCO iron ore pellet feed. The feed, which comes from Brazil via Utah Minerals' Brazilian agent and partner, Sumarco Minerarco SA, will be supplied over a period of three years to the Delta steel plant in Warri State, Nigeria, commencing in June 1981. The contract is renewable after three and a half years. This is Utah Minerals first venture in West Africa. The Delta steel plant is planned to go into operation by the end of 1982.

For more mining news turn to page 109.

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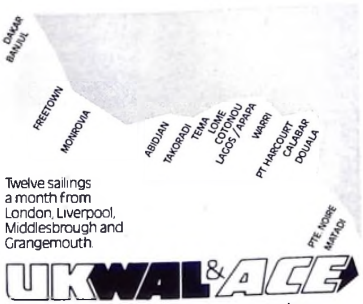

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Africa's yawning sugar gap

A handful of African countries – Zimbabwe, South Africa, Swaziland, Mauritius and Reunion – have been able to participate in the sugar boom which last autumn took the commodity to a five-year high of ₦520 per tonne. The rest of Africa, however, has to import sugar in large quantities, and although the price has fallen sharply in the last six months this remains an expensive operation which non-oil-producing countries can ill afford.

Africa does have the potential to grow much more of its own sugar but for various reasons the sugar industry in the continent has been ignored by successive governments who are anxious to cultivate either more exotic cash crops or more obvious basic foodstuffs such as grains and rice.

Consumption

This has led to a widening sugar deficit in Africa as a whole with production falling far behind consumption which has been fuelled both by population growth and the introduction of Westernised eating habits. Analysts now believe that unless fundamental policy changes are made Africa will have to increase its imports by about a million tonnes during the next five years, from 2.2 million in 1979–80 to 3.2 million in 1984–5. At today's prices this would cost around ₦1.2 billion a year.

The most significant area of increasing consumption over production is West Africa. The following table shows sugar consumption (in tonnes) for selected West African countries and projections for consumption in 1985:

	1980	1985
Angola	100,000	130,000
Cameroun	67,000	90,000
Congo	23,000	30,000
Ghana	58,000	70,000
Ivory Coast	75,000	200,000
Nigeria	550,000	800,000
Senegal	90,000	120,000
TOTAL AFRICA:	5,600,000	7,300,000

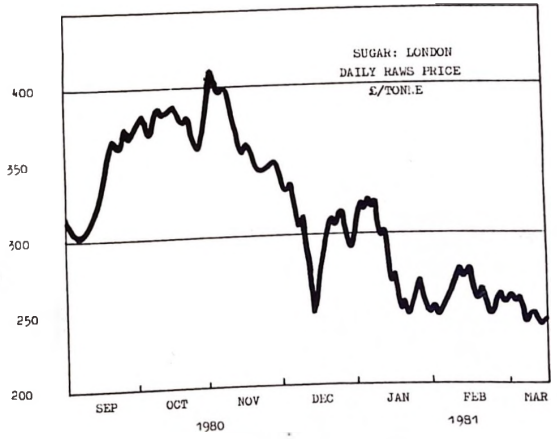
Demand for sugar in Nigeria, with its massive population far exceeds that of the rest of West Africa put together in the 1985 projection. Unfortunately, there is scant evidence to suggest that Nigerian farmers will be able to meet this demand by the middle of the 1980s any better than they can now. While the neighbouring Ivory Coast has seen an impressive increase in sugar production over the last ten years the record in Nigeria, and to a lesser extent Ghana, has been dismal.

Some of the reasons for this failure to improve production in line with consumption can be seen through a comparison of the Kenyan and Nigerian sugar economies. Although Kenya still requires small imports it has boosted domestic production from under 100,000 tonnes in 1972 to well over 400,000 tonnes in the present season and everybody is confident that output will increase further to at least 500,000 tonnes by 1983 or 1984. Nigeria, meanwhile, is producing under 50,000 tonnes a year despite extensive investment in the sugar industry.

Nigeria

Nigeria has chosen to tackle its sugar problem through the establishment of a small number of very large estates. The first mill was built 15 years ago and it is still the nation's only consistent producer. Since the 1960s efforts have concentrated to two big projects – the Savannah and Sunni Estates, each with an annual production capacity of 100,000 tonnes of raw sugar. The Savannah plantation is only now beginning to come on-stream while the debate continues over the organisation of the Sunni Estate. In the long-run these mammoth estates may bear fruit but at the present time it is estimated to be no cheaper for Nigeria to grow its own sugar than to import it. Independent observers assess the cost of producing one tonne of sugar in Nigeria at $700 – about $100 more than the free market price for the commodity.

The case of Kenya, meanwhile, shows the success of an entirely different approach to the sugar question. This country is one of the major exceptions to the plantation system of cultivation which is favoured by so many governments and multi-national companies in agribusiness. Instead of relying on mill-owned planta-



tion sugar cane, Kenya has established small-scale units throughout the country which serve as an example and source of technical advice for the smallholder or peasant farmer. In the present season these small "nucleus estates" are expected to account for 35 per cent of the 4 million tonnes of cane which will be crushed while independent peasant producers will account for nearly half of all cane production. The farmers receive a fair price for their produce and industry as a whole avoids the technical, managerial and capitalisation problems which characterise Nigeria's plantation-based sugar sector.

Sugar prices decline

Sugar, arguably the speculator's most popular commodity in 1980, has fallen from grace with a bump in the first quarter of 1981. Before Christmas the market "bulls" were talking of a possible run-up to £600 (₦762) per tonne or more in the New Year, but in the event this rally failed to materialise. A number of factors con-

continued

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commodity report continued from page

tributed to the fall in prices.

Perhaps the most important single consideration was the discovery that sugar demand worldwide is considerably more elastic than had previously been supposed. In the past it was assumed that people would always eat sugar no matter what the cost. On a national scale this has proved to be incorrect. Both Poland and Iran, faced with severe financial problems, announced strict rationing last autumn and a number of poorer Third World countries have simply stopped buying in view of the high price.

Falling consumption coincided with better prospects for the 1981–2 global harvest to shake sugar confidence. In both 1979–80 and 1980–81 sugar consumption has outstripped production leading to a run down of stocks – and this has been the main factor behind the higher prices. Now, however, a number of analysts believe that the 1981–2 season, which starts this spring, will see a much better crop in all the world's biggest producing areas – Europe, Brazil, Cuba, India, Australia and Asia in general. At the same time increasing substitution of sugar with high fructose corn sweeteners in the US and Japan will reduce one important segment of the world sugar market.

In the future it seems fair to assume that prices will remain below last year's highs and that producers of the commodity will turn increasingly to developing countries such as West Africa, Mexico and Indonesia to secure a market for their sugar.

Hauler costs reviewed

FOR MANY years, buyers of off-highway haulers have generally used haul studies or purchase price as their principal criteria in buying decisions. Inflation, however, has reduced the value of this simple approach and brought a need for a more sophisticated approach. While inflation looks like the principal culprit, increased governmental regulation and soaring interest rates have also been contributors. All in all, these considerations force a new approach to answering the question "Are you buying off-highway haulers wisely?"

Computerisation

Several hauler manufacturers have computerised production and cost estimating to provide cost per ton analysis of fleet haulage. This is the traditional haul study. It is useful in evaluating hauler alternatives, removes much of the emotional involvement in selection and provides an objective, systems approach for equipment justification prior to purchase.

The shortcoming in haul studies is that they represent just an instant in time and this is why a longer view of costs is so important. The longer view is represented by "present value cash flow" analysis (PVCF), a technique used by Euclid, Inc. to evaluate the total cost of a hauler.

Present value, cash flow, picks up where the haul study stops. It takes the production and cost data and projects it over the life of the haulers. It is a tool of financial analysis that reveals important facts about owning and operating a hauler.

Best size

The most common uses for a haul study are to determine the best size hauler for the job, the number of haulers required and the cost per ton. In a simple example the choice may be between a 35-ton and 50-ton hauler. Given the required production of 200 tons per hour, it can be shown that a basic fleet of two 35-tonners, plus one spare will be 4.2 per cent more economical on a cost-per-ton basis than two 50-tonners. All this represents, however, is that right now that's the best choice. It does not consider hauler life or the cost over that lifetime.

The present value cash flow system reinforces the findings of the haul study, but also shows the relative impact of other cost components comprising the owning and operating costs of the fleet. With soaring fuel costs and steadily increasing operating costs, the PVCF approach brings into focus the relative unimportance of initial cost and the overshadowing role of operating costs in lifetime hauler economics.

Going back to the haul study results cited, which shows the two 35-ton haulers and one 50 to be the best buy, and applying the PVCF approach, the results become quite different. The conclusion is: choosing the onetime savings of initial investment is not a savings at all. The present value cash flow analysis shows the initial savings being absorbed and then some by the operating costs over the life of the fleet, resulting in a loss of $61,489 ($1,239,172-$1,177,683) expressed in current dollars. It's easy to see that the haul study plus the present value cash flow analysis provides a far more realistic approach to buying the right haulers.

	Fleets	
	Two 35's + 1 spare	*Two 50's + no spare*
Initial investment	$710,838	$640,080
Lifetime Total Fleet costs in current dollars	$1,177,683	$1,239,172

Costs can be cut and efficiency improved if the right truck is chosen for the right job.

The right costing for the right business

IN MY last article we discussed the uses of budgeting. Budgets as we know are the compilation of costs from all the different parts of the business. I now want to talk about the more common ways that costs are put together in Nigerian industry. Three types of costing have been selected as being most typical. They are:

A. Contract
B. Transport
C. Process

Contract costing

Contract costing is the term applied to the system adopted by those companies which carry out substantial building or construction contracts. As the greater part of the work is carried out at the site itself, practically the whole of the expenditure can be charged directly to the appropriate contract.

There is no reason why contract cost accounts should not form part of the ordinary financial books. Each contract will form a unit of cost as the directors will wish to know the profit or loss that has been made. The comparatively small number of contracts will allow an account being opened in the general ledger; the profit or loss being transferred to the profit and loss account at the end of period.

Because of the size of many contracts, like roads and bridges, it may be convenient to analyse the expenditure on each contract over the type of work to be carried out, e.g. surveying, site preparation, foundations, building work and services, so that the cost of each stage can be continuously compared with the amounts allowed for in the estimates.

Sometimes it is very difficult to estimate some costs ahead as such a provisional sum for such work may be allowed in the contract. These provisional amounts will be replaced by the actual costs of labour, materials and overheads when they have been ascertained.

Immediately any expense is incurred on behalf of the contract the amount should be debited to the contract account. Of course any modifications or additions must be separately charged.

When a large number of contracts are in existence it may be wise to have a self-balancing contract ledger.

Profit on uncompleted contracts

Large contracts sometimes take years to complete and profit cannot be accurately worked out until the construction is finished. Sometimes therefore it will be necessary to bring work-in-progress into the balance sheet at the end of the period. Also to make sure that the accounts are covered, profit or loss may need to be calculated, but remember that if the contract has only just started, no credit for profit should be taken. If it is reasonably advanced, say 60 per cent, some profit may be included.

Transport costing

As we know, many things in Nigeria have to be transported by road; and some of the big companies have hundreds of trucks and petrol tankers travelling all over the Federation at any one time. Transport costing must therefore be considered from three points of view:

(i) vehicles must be deployed so that "light" running and short journeys are reduced to a minimum;
(ii) running costs like fuel and tyres should be controlled;
(iii) vehicles must be properly maintained and driven so as to comply with traffic regulations and minimum breakdowns.

All costs are divided between fixed (standing charges) and running charges. Hence, total cost = standing charges + running expenses.

Standing charges are made up as follows: licence duty and insurance; garage costs and administration; drivers wages; depreciation.

Running costs are: fuel and lubricants; tyres; repairs and maintenance.

It is usual to maintain a file for each vehicle in which are kept details of all costs incurred on it. If you keep your costs divided over the above headings it will be quite easy to prepare the following:

1. For rate fixing and accounting
(a) The standing charges per vehicle for each working day.
(b) The running cost per kilometre.

2. For control purposes in respect of each vehicle
(a) Distance travelled.
(b) Fuel and lubricants used.
(c) An analysis of the working days between:
– running under payload
– under repair
– losses through abnormal causes – the absence of a driver and breakdowns.

The percentage of running to total days should be worked out as this provides an excellent way of measuring the efficiency of the fleet.

It is important to remember that the operation of transporting goods takes place outside the company and therefore outside the direct supervision of management. Therefore, control of all activities is very important.

Process costing

Many companies in Nigeria produce a product that passes through several distinct stages of manufacture. These are called processes. From the costing point of view the fundamental principle involved in process cost amounts is not very difficult. A separate account is opened for each process or distinct operation to which all expenditure is charged. When the process or operation has been completed the partially worked product is passed into the next process. Process industries have the following characteristics:

1. Because of the continuous nature of the process and the standard output, it is very difficult to identify a particular unit of output with a time of manufacture. The cost of any unit must be the average cost of manufacture.
2. In the manufacture of the main product quantities of byproducts may arise. This by-product may be the main product of another firm.
3. Wastage may arise due to chemical erosion or evaporation.

Because of this process costing is used to keep track of the following:

Process losses and wastage: Where there is chemical change or evaporation it is imperative that records be kept to disclose these losses so that inefficient or careless systems of processing are remedied.

By-products: In petrol refining, such as takes place at Port Harcourt, valuable by-products arise due to the refining. These products are very valuable and they must be accounted for. If by-products are not in a saleable condition and require additional work on them, then accurate cost records must be kept.

Inter process profits: It is sometimes the practice to charge the output on one process to the next at a price greater than cost. The profit or loss made is revealed on the process account and the final figures are not distorted; in fact each process stands by itself. This is very important where there

continued

is a possibility that some processes could be performed more cheaply by outside firms. The advantage or disadvantage of performing such operations within the factory must be clearly shown.

Benefits from costing

As we have discussed there are very obvious benefits to be derived from having a costing system, but like many other things in business life it requires industry and application to maintain these successfully.

The author of this article, Edward McNairn, works for Spicer and Pegler Management Consultants the consulting arm of Chartered Accountants Spicer and Pegler. They have long standing connections in Nigeria through their close connection with Egunjobi, Solanon Consultants Limited who are based in Kano.

German-Nigerian co-operation

Technical cooperation between Nigeria and the Federal Republic of Germany was pledged last month in Lagos. An agreement was signed by the Nigerian Federal Minister of National Planning, Mrs Adenike Ebun Oyagbola and the German Ambassador, Mr Bernard Oldenkott, to bring more German experts into the country.

Mrs Oyagbola promoted the agreement as a further demonstration of the two countries' desire to cement friendly relations. The incoming experts are to work in technical manpower training and assist in a variety of fields, including urban and transport development, sports education, land survey and tropical agriculture.

Indian trade initiative

India is stepping up its trade initiatives in Nigeria. In an interview with the Indian High Commissioner, Mr K. Srinivasan, the Business Times were informed of new joint projects between the two countries. Expected to begin operation soon, the projects are in the fields of industrial gases, pharmaceuticals manufacture and PVC conductors and cables. This is in addition to several other joint projects between Nigeria and India now functioning in 14 sectors of the Nigerian economy.

India's balance of payments deficit, due to her import of 10,000 barrels of oil per day from Nigeria, is seen as a factor in the current trade endeavours. Mr Srinivasan suggested that Indian experience could be useful to Nigeria in a variety of fields, including iron and steel development, cement manufacture, development of inland waterways and training of personnel. He also indicated that India would attempt to export a number of goods and services which might be of benefit.

Helicopters in Plateau

The Plateau State Transport Corporation (PTC) plans to diversify its activities over the next four years. According to the general manager, the diversification programme is the outcome of the discovery that passenger traffic alone was not a profitable venture.

Initial plans are for a commercial helicopter service, to be established by 1983. During the same period about ₦18m. is to be channelled into the corporation's vehicle hire service, and ₦ 3 million into the construction of an office block in Kaduna. Other projects include a smaller office block in Jos, residential quarters for staff, and a long term plan for a commercial housing project in Plateau State.

SNT meeting

Telecommunications Journal reports a recent meeting of the constituent assembly of the Societe Nigerienne de Television in Niamey. At the meeting the SNT, which was created to handle the supply, installations and maintenance of community television, set up a Board of Directors to appoint company officials.

PRODUCT DIGEST

From Kathmandu to Kumasi

A government department of the mountainous Asian country Nepal, is co-operating with an organisation in Ghana to transfer Nepali broadloom weaving techniques to weavers in the Ashanti region. The aim of this unusual exercise in technical co-operation among developing countries is to increase the income of the weavers who are renowned for their production of the famous Kente cloth. John Madeley reports.

THE VENTURE is being jointly carried out between the Nepal Government's Department of Village and Cottage Industries, based in the Nepal capital city Kathmandu, and the Ghanaian Technology Consultancy Centre, which is based at Kumasi in the Ashanti region.

The Kente cloth produced by the Ashanti weavers, consists of brightly coloured geometric strips woven on narrow looms 4–7ins wide. In order to produce large pieces of cloth, the strips must be pieced together. The end result is a unique but expensive item and the cloth is purchased primarily by upper income groups in Ghana for decorative purposes.

Despite the popularity of Kente cloth, the people who actually weave it, fare rather badly from it. With existing techniques, the productivity of the weavers is low and their incomes are correspondingly low.

Nepali girls weaving on pedal-operated broadlooms. These looms could enable Ashanti weavers to weave cloth in one piece.

Low incomes

Most of the weavers are engaged in subsidence agriculture and the incomes they receive from weaving cloth is too low to be an adequate supplement to their farming activities and not enough to enable them to provide a decent standard of life for their families.

In a previous effort to introduce a new technology to the Ashanti region to increase the income of the weavers, the Kumasi Technology Consultancy Centre established a handweaving unit to promote a 40in English loom. Despite comparability of the cloth, productivity did not however increase significantly.

The Director of the Centre, Mr John Powell, took the view as far back as 1977 that Nepali broadloom weaving techniques might be suitable for weavers in Ashanti region. However although the Nepal techniques seemed to Mr Powell to hold out promise of greater productivity and higher incomes for the weavers, finance was not available at that time to carry out further investigations.

Developing technologies

A British organisation known as Intermediate Technology Industrial Services, which is based in the English Midlands town of Rugby, then became aware of Kumasi's interest in Nepali weaving techniques and decided to make funding available. ITIS was set up in 1978 by its parent organisation the Intermediate Technology Development Group, which was formed by Dr Schumacher in 1965. ITIS's task is to develop, test and help to introduce appropriate manufacturing technologies in developing countries and help countries to transfer technologies between themselves. Some twenty engineers make up its staff and between them they deal with around a thousand enquiries a year.

Three types of Nepali broadlooms – hand, pedal and electric power operated – are being considered for transfer to Ghana. Each type offers dramatic productivity gains because the Ashanti weavers would be able to produce their cloth all in one piece.

In the case of the handloom, one operator can produce a seamless width of cloth over 50ins wide. The pedal-powered version is operated by two treadles, and output can reach 1¼m of plain cloth (20s count) per hour, many times that of an Ashanti weaver using traditional techniques. The semi-automatic power loom is driven by a ½hp motor and can produce over two metres per hour; one person can operate three looms. Cost of the electric-powered loom is around £180, pedal loom £150 and hand loom £30.

The project itself is being carried out in three phases. It began with a visit to Nepal by a Ghanaian textile technologist, Stephen Adjare. His stay, which was facilitated by the British Council in Kathmandu, gave him the opportunity to evaluate matters such as loom operation, weave designs and fabrication requirements. Visits to cottage industry workshops acquainted him with loom construction techniques.

Adjare's report recommended the transfer of Nepal weaving techniques to the Ashanti weavers and it noted that the use of broadlooms, in addition to promoting the traditional craft industry, would enable weavers to produce less expensive cloth for everyday uses, i.e. school uniforms and shirting etc. This would enable the weavers to diversify from Kente cloth to other types of cloth and so should help them to increase their incomes.

Mr Adjare also recommended setting up Beaming Centres where weavers could

continued

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obtain previously prepared beam warps. These centres, essential for proper weaving preparation, would also generate income and incentive to buy more Nepali looms produced in Ghana.

Phase two of the project involved the preparation of working drawings of the looms. These have been sent from Nepal to Ghana where local manufacture of three prototypes have commenced at the Kumasi Technology Consultancy Centre.

Operation and design

In phase three, a small team of Nepali textile specialists will travel to Ghana to advise on loom operation and fabric design, and assist in the exercise of testing and evaluating the suitability of the looms under Ghanaian conditions.

It is also the aim of the Technology Consultancy Centre in Kumasi to encourage private firms to produce the looms for sale to Ghanaian weavers.

Mr Manohar Lal Shrestha, a textile expert in the industrial section of the Nepal Government Department of Cottage and Village Industries, says the project may well extend beyond straight transfer of technology, and result in Ghana buying at least some of its parts for the looms from Nepal. Mr Shrestha also says that other countries, including Australia, have expressed interests in using Nepali techniques.

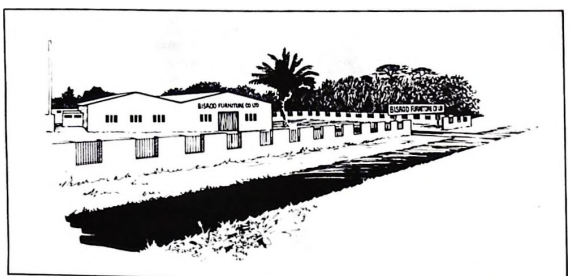
Sharing technology

The Kathmandu-Kumasi transfer of technology is another example of a trend which seems to be growing – the tendency of developing countries to look more to each other for their technology, rather than to Western countries. It is often the case that one developing country has faced and overcome a technological problem that is facing another developing country. The transfer of the successful technology from one country to another therefore makes a great deal of sense.

Although Nepal is fairly new to joint ventures with other African countries, neighbouring India has 42 such ventures with eight African countries, 13 of them with Nigeria. TCDC – technical co-operation among developing countries – appears very definitely to have moved beyond the stage of rhetoric and is more and more showing that it actually works in practice. ●

New furniture factory for Nigeria

Bisrod Furniture Co. Ltd are soon to open a new factory. We look at the background to this and focus on the equipment which makes production possible.



Artist's impression of the factory.

SHORTLY TO be officially opened, the new 60,000sq.ft factory and office complex of the Bisrod Furniture Co. Ltd at Ijari, Ijebu-Ode, in Ogun State has been designed to produce a range of high-quality office furniture for the fast-expanding Nigerian business world. The company's first factory, which was set up by chairman and managing director Bisi Rodipe at Ibadan in December 1974, will continue to manufacture a variety of domestic furniture, including upholstered suites.

The desks and other office furniture to be made at the Ijari plant will be based on the advanced Hamilton-Lines system, which features a square section tubular steel frame and attractive chipboard infill panels laminated with vinyl veneer. This production concept was originally conceived by the founder-director of Hamilton-Lines Ltd, Robin Hamilton, who describes his product as "engineered" furniture.

Although the current technical and commercial agreement between the two companies runs to 20 pages, Mr Rodipe's first contact with Hamilton-Lines arose from a chance remark during a visit to one of his woodworking equipment suppliers in the UK. His first-ever production unit was a home-made sawbench, but in 1976 he invested in a group of woodworking machines manufactured by the British-based firm, Multico Company Ltd. He subsequently purchased further Multico equipment, including a dust extraction unit, all of which has operated without a single breakdown during the past five years. It was while visiting Multico again in 1978 that he admired their new office furniture. Multico's sales director George Bucknell, MBE, who is also that rare commodity, a British chief – the Okakuro of Mosogar, mentioned that he knew the manufacturers and on Mr Rodipe's insistence a visit was quickly arranged to see the Hamilton-Lines factory, which was then at Storrington, Sussex. What he saw there convinced him that this type of office furniture would be entirely suitable for production in his own country.

Parallel operations

Not long after Mr Rodipe's visit, Hamilton-Lines moved to a new 40,000sq.ft plant in the UK, and it was decided to duplicate, as far as possible, this modern operation in Nigeria. Due to Bisrod's rapid expansion and the fact that they were importing some fairly sophisticated machinery for the new factory, the services of Hamilton-Lines' Bob Leaper were obtained under the Nigerian Government's expatriate quota system. Mr Leaper arrived in Ijari last September to take up the position of project manager and has been responsible for commissioning the plant.

One major area in which the Ijari factory differs from its British counterpart, however, is that the application of commercial plastics vinyl veneers to the chipboard substrates is still carried out solely in the UK. Laminated sheets of chipboard are then shipped to Nigeria for sizing on the company's high performance Smid beam saw. Edging strip is applied to the completed panels on a Brandt single-sided edgebander. Lengths of square section steel tube are also shipped out from the UK; it being more economic to adopt this route, particularly as Bisrod can benefit from Hamilton-Lines group purchasing power for these and other components such as drawer profiles, locks and other fittings. The tube is cut and then welded into a frame before passing through a powder coating plant where a tough, durable finish is applied.

Not only are the machines at Ijari the same as those already operating in the UK, but the manufacturing procedures that must be followed are virtually the same as well. This deliberate policy will enable the half-dozen Bisrod employees, who have visited Britain for training, to employ their new skills on the production line without delay.

Future

Future developments being considered by Mr [illegible] include a planned expansion into [illegible]milling, which will not only ensure a reliable source of components for Bisrod's domestic furniture factory, but also allow them to begin producing door and window frames, together with other joinery products, for the building industry. The manufacture of semi-finished hardwood components for the European furniture industry is another activity that the company are extremely well placed to undertake.

Fortunately, the Nigerian Enterprises Promotion Decree classifies furniture as a Schedule 2 industry, which affords it a certain amount of protection from imported goods. This sensible measure, allied with Mr Rodipe's own international contacts – Bisrod are still the only Nigerian member of the Furniture Industry Research Association of Britain – and his undoubted flair for the industry, should enable the company to become an integrated and self-supporting group over the next few years. ●

Retirement of a British chief

George Bucknell, MBE, sales director of the Multico Company Ltd, retired on April 2, but is being retained on a consultancy basis so that his wide experience of the woodworking industry in West Africa will remain at Multico's disposal.

During his 26 years with Multico, George took part in some 200 trade exhibitions around the world and visited most parts of West Africa, particularly Nigeria.

He has always felt that the only way to sell in overseas markets is to spend time with the company's agents – UTC (Nigeria) Ltd of Lagos – and, perhaps more importantly, with the customers. This desire to become involved at all levels in the Nigerian woodworking industry led to him being made a Nigerian tribal chief with the title "Okakuro of Mosogar" in 1976.

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Forklift trucks for roro ships

*Most of the third-generation roro ships now being built in the world carry on board purpose-designed forklift trucks. This article by *Nils-Olof Larsson surveys the trucks' special design features.*

FAST TURN-ROUND in the port – which depends primarily on fast unloading of one cargo and loading of the next – is the essence of profitable roro operations. As port charges rise, any *avoidable* delay not only reduces the time the ship spends at sea earning revenue but represents a substantial self-imposed fine.

With roro traffic the normal clearcut distinction between shipboard and quayside handling equipment is blurred. The handling equipment literally rolls on and off the ship carrying cargo, with no fixed point of transfer. With some types of traffic, even, there may be no suitable shore-based equipment available at the terminal; the ship's own forklifts, travelling with her, must take on the complete task. In other cases, special roro forklifts may be kept at the port and will come aboard to assist the ship's own vehicles.

Essential features

Whether ship-based or shore-based, forklift trucks for use on roro ships must have certain special features not needed on general-purpose dockside forklifts. Two are particularly important. For working efficiently between decks and utilising the available cargo-space to the full, a combination of low overall height and high freelift is essential. And the deck loading applied by the vehicle should be no greater than that needed to carry the cargo anyway, so that no extra reinforcement will be necessary.

It is important to note that none of these special features debars the vehicle from normal dockside use. Accordingly, roro forklifts may travel any required distance away from the ship to collect or deliver cargo. This can often eliminate one transfer operation. Again, trucks kept on shore rather than on the ship may be used for general handling duties when no roro ship is inport.

The converse is not true, however. Most ordinary dockside forklifts cannot work efficiently on roro ships because their height, lifting gear or specific weight rules them out.

Optimisation

Ideally, the design of roro forklifts for a particular ship should be considered when the ship herself is designed. The *total* system should be optimised. This is the common practice with new roro ships of the third generation.

Previously, roro forklifts were normally added afterwards from those commercially available. The author's company, for example, produced its first specially adapted roro forklift over ten years ago, when the whole roro concept was very new. Since then it has delivered more than 300 such special trucks with lifting capacities ranging from five tonnes to 35 tonnes. Today these standard models can be modified at the time of building so that their dimensions and lifting performance match as closely as possible the shape of a particular ship's cargo-space.

The largest models, with lifting capacities of 25, 28 or 35 tonnes, are used almost exclusively to handle standard 20ft, 30ft, 35ft and 40ft containers both between decks and on the weather deck. The middle-sized models (12–15 tonnes capacity) are used to handle empty containers and lightly loaded 20ft containers, as well as flats and general cargo. The smallest trucks (5–7 tonnes capacity) are designed for general cargo handling and for use as service vehicles on board roro ships.

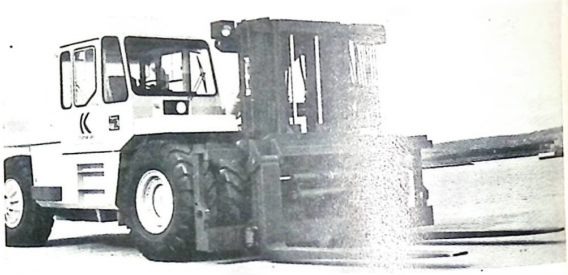

Fig. 1

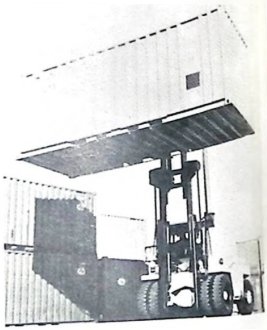

Fig. 3

Fig. 2

continued

*Nils-Olof Larsson is Chief Designer at Kalmar LMV, Ljungby, Sweden.

Good visibility

Every truck, of whatever size, has a duplex or triplex mast which provides both a low maximum height in the "mast lowered" position and a substantial free lift of one half or one third the maximum lift height.

The most compact model available, intended for the restricted conditions of below-deck working, is the Model 25 roro. With the mast lowered it has a maximum height (the same for mast-top and cab roof) of just 2,800mm. Its lifting capacity is 25,000kg at 1,200mm load centre, and it can lift this load to 1,150mm as a free lift without raising the mast, or to 3,300mm with the mast raised to its maximum height of 4,950mm. Maximum lifting and lowering speeds (when laden) are respectively 0.2 and 0.3m/s.

The largest truck in the standard range is the Model 35–1200 [illegible], which can work either below deck or on the weather deck. With a duplex mast it can stack containers three-high, lifting 35,000kg to a maximum of 7,000mm. Free lift is 3,500mm. The duplex mast is 5,825mm high when lowered, 9,325mm when raised. With a triplex mast the same truck can stack containers four high. It can lift 25,000kg to 9,000mm with a free lift of 3,100mm. The triplex mast is 5,525mm high lowered, 11,425mm raised.

Built by Julius Berger Nigeria in 1977, Tin Can Island did a great deal to relieve the queing for berths and lack of storage facilities, characteristic of the early seventies. By the end of the decade, the construction of an ambitious new port complex should be underway.

An important new development is a free-lift mast – available in duplex and triplex versions – which also provides outstanding visibility through the mast. Conventional designs of free-lift mast employ a single large hydraulic cylinder, placed centrally between the mast uprights, which must inevitably obstruct the driver's view.

The new mast replaces this with four slimmer cylinders set at the sides, just inside the uprights. The driver's view out of the cab and through the mast and the fork-carriage has also been comprehensively assessed and optimised by means of computer-aided geometrical calculations.

The improvement in visibility is quite dramatic, and is particularly important in the frequently confined conditions of roro working. The new free-visibility, free-lift mast will be progressively fitted to all the company's roro models.

Spreading the load

Another feature of the largest roro trucks is a patented method of distributing the front-axle load over a larger surface area. In addition to the four driven wheels common to all models, these large trucks have an outer pair of undriven wheels which are automatically loaded hydraulically in proportion to the load on the forks. This six-wheel arrangement also reduces bending stresses on the drive-axle and stabilises the truck for high lifts or lifts on sloping decks.

Most other features of the roro trucks are similar to those of the dockside models and, as with any forklift, are chosen to meet the two prime criteria of fast, fluent handling and high operational availability.

Six-cylinder Volvo diesel engines of proven reliability power all models of 12 tonnes capacity and above, and are normally fitted with exhaust-emission purifiers to reduce dangerous fumes below decks. Transmissions consist of a power-shift gearbox and a torque-converter, the combination providing smooth changes between two or three ratios in each direction of travel. Maximum travel speeds range between 25 and 30km/h. The drive-axle provides two stages of reduction (a differential plus planetary hub-gears) to prevent excessive stress on either.

continued

One of Zaire's major freight forwarders, Amiza, is expanding its fleet of LancerBoss container handling and stuffing trucks. The Amiza container terminal at Kinshasa is shortly to take delivery of a second 25-tonne capacity sidelift container handling truck, model 2500 CH.

Delivered over eight years ago, the first 2500 Series machine has operated satisfactorily but is required to cope with an ever-increasing volume of container traffic. The new machine, fitted with the standard Cummins NH250B six-cylinder engine and gantry-mounted 20ft fixed toplift attachment, will provide the required extra capability on the 8-acre terminal.

Additional LancerBoss equipment in constant use at Kinshasa includes four CD18ECH empty container handling frontlifts and two diesel-powered container stuffers, model PD4CCL. These trucks were all delivered during 1980 and provide Amiza with a well-balanced, integrated fork truck fleet.

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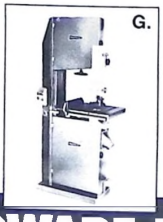
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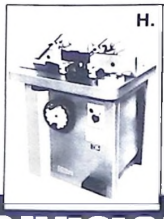
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Keeping the driver fresh

The driver's working conditions are another vital factor affecting the total economy of roro truck operation, and apart from the question of visibility already discussed, the ergonomic design of the cab has been considered in great detail.

The positions of steering-wheel, seat, instruments and controls are all adjustable. Steering, brakes and all hydraulic controls are servo-assisted to reduce fatigue. The cab is fully enclosed and air-conditioned, with an armoured glass window providing safe forward vision. Extremely effective anti-vibration mounting and sound insulation reduce the noise level inside to a maximum of 78dB(A) at full engine-revs.

Finally, the complete driver's-seat can be rotated through 180° to avoid tiring twisting movements when reversing over any distance. In some models the complete control-and-instrument console rotates with the seat; in others the console is duplicated.

Full and empty containers

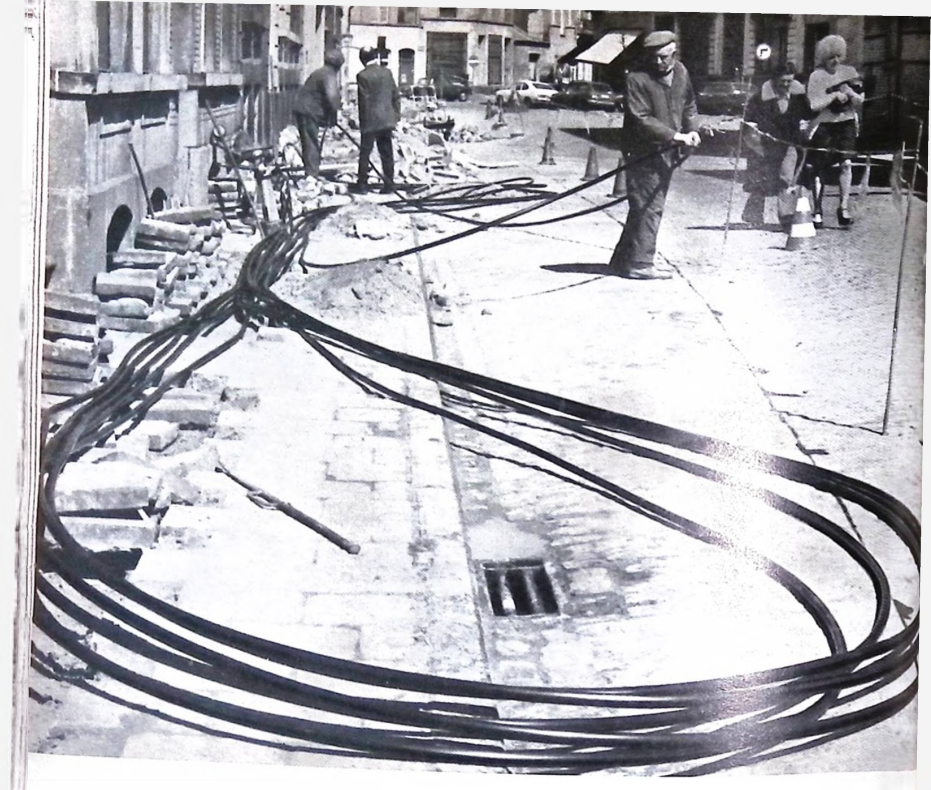
The standard fork-carriage has the forks mounted on rollers with a pair of slim but

Fig. 4

efficient hydraulic cylinders to provide fork-spreading and side-shift functions. On the larger models, alternatively, a more powerful 'pin'-type design may be employed, with the forks mounted on thick axles of high-tensile chrome/nickel steel.

Forks of standard and inverted type are available, which can be fitted with various top-lift frames and spreaders for handling containers of all standard sizes. Some of these frames are of fixed lengths; others can be adjusted hydraulically to a length of 20ft, 30ft, 35ft or 40ft. Most can also be swivelled hydraulically through ±3° to simplify lining-up. Safe lifting is then ensured by a system of indicating-lamps which show first that each twist-lock on the frame has entered the corresponding hole on the container and then that each remotely-initiated hydraulic locking operation has been properly accomplished.

Other attachments available include 20ft side-lift frames for handling loaded containers and fixed and adjustable side-lift frames for handling empty containers. There are also special clamps and grabs for paper rolls, pulp bales, timber and steel products. *Circle No. 30*



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One of these optical systems is installed along a 10.5-Km route between Brussels and Vilvoorde, for Belgium Regie de Telegraphes et Telephones.

GTE, a world leader in fiber optic communications systems, provided the Belgian installation. Multiplexers and optical signal regenerators were manufactured by GTE Telecomunicazioni S.p.A., Milan. Optical transmitters and receivers are from GTE Laboratories, USA. Installation was coordinated by GTE ATEA, Belgium.

Another GTE development that seems far

and makes a telephone that's simply fun to use?

less sophisticated is the Flip-Phone telephone developed by GTE Communications Products, USA. Though it includes all equipment for a fully-functioning telephone, the entire product weighs less than a conventional handset, and is only slightly larger than a deck of cards.

Space-age electronic memory circuits convert push-button signals to dial pulses, so Flip-Phone can be used on any residential line. When its folding mouthpiece is closed, it shuts off automatically. Lifting it makes it ready for use.

Whether it's optical communications, the transmission system of the future, or an innovative telephone set for business or pleasure, GTE has the experience, the products and the capability to supply it. For any telecommunications requirements, contact Marketing Services, GTE Communications Products, One Stamford Forum, Stamford, Connecticut 06904, USA. Telex 965821

GTE **Communications Products**

Circle No. 263 on enquiry card

Air conditioner maintenance

Nigel Hall takes a rigorous look at how to maintain air-conditioning systems properly and calls for more trained personnel. Repairing is always preferable to replacement, but a run-down air-conditioner should not be kept waiting.

IT IS NOW widely accepted that air conditioning in West Africa is essential for efficient functioning of industrial plant in many industries and for the comfort and well-being of staff in commercial premises and of people in the home. Few items of domestic equipment are as widely misunderstood, few services for the hotel guest or office worker cause as much difficulty as failing air condition and in the factory there is nothing causes so much lost production and inefficiency without being immediately obvious as an inefficient or inoperative air conditioning system.

When a production machine breaks down or develops a serious fault it is immediately obvious and should not be long before it is repaired; production falls in the most obvious manner and even the most untrained staff can report the fault to the appropriate supervisor. In the case of air conditioning failure the problem is less tangible and the faults first have to be identified before they can be acted upon. Except the case of total breakdown air conditioning plant performance will usually fall off fairly slowly as filters become choked and refrigeration systems become inefficient.

An air conditioning plant can therefore be working in a half-hearted manner for long periods without anyone noticing, and only when it finally breaks down completely is it fully apparent. By this time so much work is usually required to repair it that it can go beyond economic repair. The workforce can adapt to a wide range of working conditions over a period without the change becoming immediately obvious.

Monitoring systems

Where the air conditioning is required primarily for the efficient functioning of industrial equipment the fall-off in efficiency cannot be compensated for by the production equipment and quite long periods can elapse before proper controlled environmental conditions can be re-established. Few organisations have a sufficiently sophisticated monitoring system to be able to identify air conditioning failure or inefficiency as a principal factor in lack of productivity and yet if the real cost of breakdown and inefficiency can be established it is found that they are very substantial indeed.

In the more climate-sensitive industries such as textile production it is found that the climatic conditions are closely monitored, but regretfully the skills are not always available to remedy problems which eventually show up as bad working conditions for machines and personnel. In the home or commercial premises, because air conditioning equipment is much simpler, the problems frequently arise in the form of a total breakdown. This is immediately apparent to customers and occupants of buildings and usually results in an immediate clamour for action. This frequently causes serious problems for the management or householder who must obtain proper service at a reasonable price for his equipment.

It is as well to consider on initial purchase the effects of breakdown and overhaul costs and the availability of servicing. A wide range of domestic products are available most of which are variations on a similar theme. It is usually wise to purchase well-established makes of equipment for which the local representatives are not just agents but fully accredited teams of service engineers and with backup service. If equipment is to be purchased purely on price, which may well be a sensible economic consideration, it only makes sense to give the equipment a short working life and to be prepared to replace it completely on serious breakdown. This option should not be open to the commercial and industrial user, although experience has shown that in practice poor maintenance and usage has resulted in early replacement.

Frequently whole installations are changed when proper maintenance would have extended their life by many times. In the commercial premises the options are usually between rival makes of similar equipment and once more the well established equipment with good backup facilities score here. The industrial user has the same option as the commercial user in consideration of the type of system to be used, whether a central system or units. In the case of a large number of small self contained units there is an element of stand-by availability whereby only a percentage of the available air conditioning is likely to breakdown at any one time, and a certain buffer is therefore available to allow time for repair – provided this is promptly carried out.

Central station plant

Central station plant is usually custom made for factory applications and tends to have a longer life expectancy. Because of the essential nature of this equipment it is important that it is considered in exactly the same way that production machinery is assessed, and that similar arrangements be made for staff training and specialist servicing. A full understanding of the equipment is very important and, lamentably, often missing. Frequently staff of too low a grade are given the task of being responsible for the equipment and being asked to understand what can be fairly complex mechanisms particularly with regard to refrigeration and automatic control.

It is important that a member of the organisation of sufficiently high rank is given responsibility and accountability for the proper working of the air conditioning so that proper monitoring of its performance can be undertaken and proper authority issued for maintenance and remedial action. On initial purchase of this capital intensive equipment it is valuable to ensure that the supplier can provide staff training to a high level. It is usually useful if the staff who are going to look after the equipment work closely with installation engineers on fitting and commissioning of the equipment, but this alone will not be sufficient to ensure that they are able adequately to maintain it. Proper servicing manuals are essential and their understanding a prerequisite for proper operation.

The choice of automatic control systems for central station plant in particular should be viewed not merely from a first cost stand point but from the amount of maintenance required and the difficulty of understanding it. In some concerns the electrical expertise available makes it a sensible option to use electrical systems which can easily be understood by existing skilled personnel. On the other hand, pneumatic systems are possibly more easily appreciated by the non-electrical engineer, especially when clear diagrams and drawings of operation are available.

It is frequently a feature of factories that

continued

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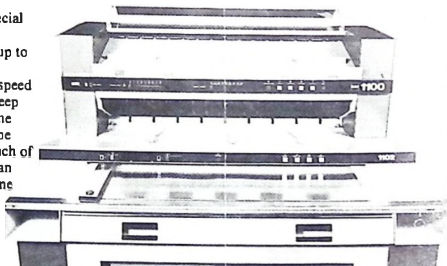

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Circle No. 298 on enquiry card

although production equipment is fairly regularly replaced as new technology becomes available, existing air conditioning systems are required to cope with changing power loadings and climatic requirements. It should be considered at the installation stage that the write-off period for air conditioning plants should not exceed that of the production machinery as it is frequently the case that the air conditioning plant remains in service much longer than its normal life expectancy. At this stage excessive maintenance is required and greatly falling efficiencies can be expected. The risk of fluent breakdown increases and where new production machinery is installed frequently more sensitive to climatic conditions so that the problem becomes worse from two directions.

It is worth noticing at the design stage that a degree of alternative and standby facilities can be a very useful stop gap measure in the event of air conditioning breakdown and that providing the equipment is capable of providing ventilation alone this will frequently be a help during the period that is required to repair the cooling or humidification features of the air system.

This kind of flexibility is an economic decision which must be considered against initial cost along with other factors, including that of provision of spares, trained personnel and the possibility of installing standby equipment such as starting gear, pumps and electric motors. These can be duplicated in situ rather than just being held as spares. In the case of unitary systems, with many smaller plants, such duplication is not viable economically but is compensated for by the degree of partial standby in having other units still working.

At the same time it may be said that the chances of one or more units being out of action at any one time are considerably increased with this system and the amount of maintenance, particularly in the industrial field, required by a large number of units is substantially higher than that for a central plant. The central station air conditioning plant lends itself very favourably to good and easy maintenance and is well worth consideration on these grounds.

This kind of equipment, handling much larger volumes of air and cooling medium, is more robustly constructed and usually better built in the first instance. Large plant rooms are no longer necessary as equipment is increasingly available in packages which can be fully self contained for roof mounting or other space saving locations. It is worth considering the effects of such situations however, which can also be "out of sight, out of mind". If space can be allocated at ground level with easy access, then proper operation of the plant is more likely to result.

There is an old tradition in the British Services that officers in charge of maintenance order "if it moves – oil it, if it doesn't – paint it" and this is peculiarly appropriate to care of industrial air conditioning plant. The equipment is exposed more than most plant to water, whether as a cooling and humidifying medium, as condensation or the effects of seasonal rain and high outside humidity. Deterioration due to rust is very prevalent and regular descaling and anti-rust painting is an essential programme.

This weaving shed in a textile mill is served by a unitary air conditioning system, where individual self-contained plants are supplemented by direct injection of moisture vapour by compressed air and water sprays. The service pipework and spray heads for this equipment can be seen above the looms. This shed is maintained at 80 per cent relative humidity.

Ducting and casings exposed to water can effectively be dealt with by coating with epoxy resin and glass fibre which seals leaks and greatly extends the metal life. Flexible connections are often still supplied in fabrics and can usefully be replaced in neoprene, as leaking flexible connections are frequently responsible for air losses of up to 20 per cent.

Filters

The other main aspect of deterioration affecting air handling equipment is the accumulation of dirt. Nearly all plant includes filters of differing kinds, in some cases high efficiency filters for special applications such as hospitals and clean rooms. Where the main air delivery fan is situated governs the negative and positive pressure in the system. Dirt will be sucked in through any gaps in the plant before the fan and air will be lost by blowing out through gaps in the ductwork after it.

All flanges and gaps should be sealed with mastic to prevent this loss, and to avoid air and dirt by-passing the filters. The aspect of filtration is a most important one in general maintenance. Frequently filters are allowed to become choked and delivery of air from the plant is proportionately reduced – in extreme cases by over half of the designed volume. This is probably the single most important cause of poor air conditioning performance. The more quickly a set of filters become loaded with dirt, the more effectively they are performing, and the larger the dirt problem they are dealing with.

This is obvious, yet many examples have been noted by service engineers of filters being taken out altogether to restore full air volumes for cooling. This has a disastrous effect on the plant, and deposits the offending dirt all over the factory or building. If filter life is uneconomically short, various options are open to improve the position. Most small plants have "Throwaway" filters needing complete replacement regularly which can be expensive. More expensive in prime cost but with a much longer life are synthetic foam filters which can be washed or vacuumed clean as appropriate, and one spare set can always be cleaned ready for changing in rotation. Some care in the cleaning method is called for, as some dusts will go hard and set in the filter if wet – cotton fibres will totally clog and make the filter useless unless vacuumed.

continu

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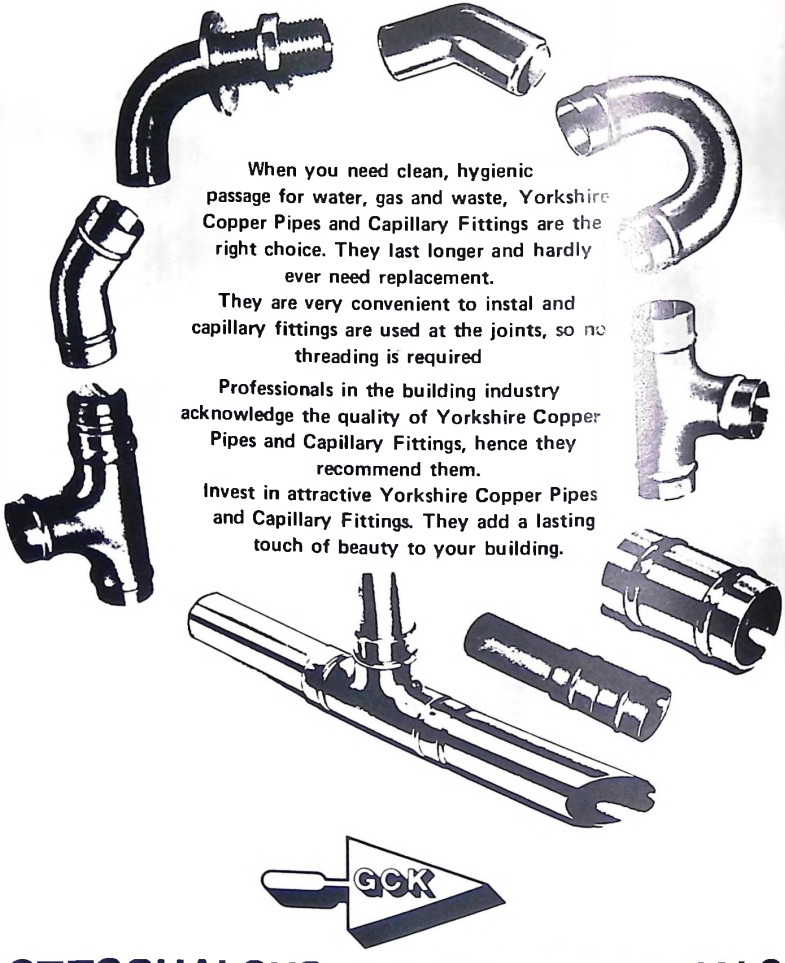

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Circle No. 265 on enquiry card

Larger filter banks can be protected by one or more prefilters of coarse mesh which is easy to brush down and will greatly extend the filter life. Adjustment of the fan power must be available to overcome the extra resistance to airflow – this is best allowed for at the design stage. There is no point in having more efficient filters than are really necessary for the application, since to the cost of the filters must be added the extra power required to pull the air through their extra resistance. An examination of the requirement with the filter supplier may effect savings here.

The quality of service to air conditioning plant is a major area where problems occur. An electrical supply which cannot fully be relied upon is a prime cause of expensive breakdowns in large refrigeration plant. Plant managers who have their own headaches with this long standing problem, and the provision of generators to augment or replace supply is an obvious boon, but one which is subject to problems of bureaucracy and installation. Any economically viable power supply improvement equipment which can be proposed by the electrical engineer is money well spent.

The water supply is less obvious area for concern but one which causes long term corrosion and fouling problems. Water chillers are selected and installed with allowance made for a chosen fouling factor for heat exchanger tubes. This allows a designed-in spare capacity to cope with a diminishing of tube heat exchange efficiency with time and use. The extent of this fouling depends on the quality of the water, and treatment should be applied to the water supply as an essential service. In most cases suppliers of new chillers will wish to see a proposal for the water treatment before tendering, just as the boiler manufacturers regard treatment as essential. It would be as well to check the water being used in this plant, as poor water will cost huge amounts of money in the long run for tube de-scaling.

The maintenance aspect of refrigeration units is specialised, and the domestic and commercial user cannot really avoid employing a specialist contractor for a maintenance and breakdown service. The industrial user of water chillers will have staff specifically for the job, and the extent of their ability and training will govern the life of the machinery. Apart from power supply fluctuations already mentioned, the danger to reliable running of refrigeration equipment is the leakage of the refrigerant gases and the entry of contaminants – air, water, corrosive fluids. An installation which is properly piped, purged and charged has a long operating life without attention, but contamination or leakage of the refrigerant gas will cause serious problems.

Systems in popular use are direct expansion of refrigerant gas into an air cooling coil, and water chilling by a centrifugal compressor which is then used in an air spraying chamber or an air cooling coil. The direct expansion packaged unit is in general use due to low first cost and flexibility, but the water chiller is more economical for larger installations. It is inherently more reliable, but is a sophisticated and expensive machine requiring trained staff to maintain it on a day-to-day basis.

From these comments it will be seen that the maintenance of the refrigeration side of air conditioning is really a specialist job, and the ordinary maintenance of the plant should take in rigorous cleaning and corrosion prevention, and avoiding and guarding against mechanical damage from any outside source. These plants are rather vulnerable to leakages caused by knocks to the pipework and controls, so the installation should be protected and particularly not tampered with by the unauthorised. It is worth shielding all controls and sensing instruments to avoid their use by people who do not understand them.

In the factory, supervision should be of such a level that defects are very quickly shown up and acted upon so that it is not necessary to await a change in the weather to notice that the automatic controls are no longer capable of adjusting to climatic variations. Above all, in refrigeration systems, when a breakdown occurs, it is quite likely to be due to gas pressure problems and if not fixed very quickly the contamination of the system will soon result in a major overhaul or replacement. With air conditioning equipment it is important to be aware of its design capabilities and to take quick action if it fails to perform as usual. ●

Roller bearing protection

Hans Blomqvist of the Swedish engineering company, SKF, considers how roller bearings can best be protected in transit and in storage, drawing on the experience of his company.

THE NUMBER of bearings damaged in transit or in storage prior to the opening of the packing is very small. The climatic conditions prevailing in individual countries naturally have a great influence on the level of protection required by the bearings.

Cleaning

Rolling bearings are made of alloy steels. Free water can cause rust damage if these materials are left entirely unprotected for as little as five to ten minutes. When an unprotected bearing is handled sweat may be quite sufficient to cause rust to form. For this reason bearings have to be washed before being covered with the rust preventive; otherwise they can be damaged by rust despite the slushing. Consequently it is necessary to observe stringent rules concerning the handling of bearings in the factory prior to the slushing and packing.

In order to protect large bearings against corrosion they are immersed in a vaseline product, containing a rust inhibiting additive, when both the bearing and the bath have been heated to about 70°C. Small bearings are dipped at room temperature in a cold rust inhibiting oil.

The rust inhibiting oil has to meet stringent requirements. A normal, non-drying, rust inhibiting oil runs off smooth surfaces with ease. However, the thixotropic* oils used by SKF provide a stable film which covers all the surfaces of the bearing and remains unimpaired after several years' storage.

Irrespective of whether a vaseline product or an oil is used, it is essential that the bearing can be put into service without washing the preservative off first. For this reason the preservative must have lubricating properties and give the bearing the minimum possible starting friction. Consequently the preservative must not show any tendency to dry. It also has to be miscible with various lubricants without impairing their lubricating properties of affecting their consistency.

Starting friction

With thixotropic rust inhibiting oils the starting friction is higher than with non-thixotropic or non-drying oils. The difference, however, is small enough to be of no practical significance and indeed the starting friction is even higher when a heated rust preventive has been applied. In a bearing treated with thixotropic preservative the friction during rotation is considerably lower than at the start as the preservative becomes fluid when the bearing rotates.

Nevertheless, certain bearings have to be washed before being put into service. These include instrument bearings that have to run easily at low temperatures and bearings that are to operate at such high temperatures that the rust preventive oxidizes and this impairs the lubricant's corrosion inhibiting and lubricating properties.

The number of bearings damaged in transit is very small, but climatic conditions can have a great influence on the level of protection needed.

Packing

The bearings are wrapped in rust inhibiting paper or plastic sheeting. The external packing consists of paper, cardboard or plastic. The moisture content in the packing rises during transoceanic voyages. Owing to the climatic conditions prevailing at the destination this high moisture content may be retained. This makes exacting demands on the rust preventative. The preservatives used by SKF have proved to be capable of maintaining the bearings in good condition.

Storage

Bearings are generally stored in their original packing until just before they are to be used. However, if the bearings are kept as spares the storage period may extend to several years. The longer the storage period, the greater the need for suitable storage conditions. The storeroom should be clean, dry and have an equable temperature. Draughts from, for instance, open windows should be avoided and the room should also be free from vibrations.

The recommended maximum storage periods for cold slushed bearings are listed below. These periods vary according to the relative humidity of the air.

With 50 per cent rel. humidity – 15 years

With 60 per cent rel. humidity – 20–25°C, 10 years

With 75 per cent rel. humidity – 20–25°C, 5 years

With 75 per cent rel. humidity – 35–40°C, 3 years

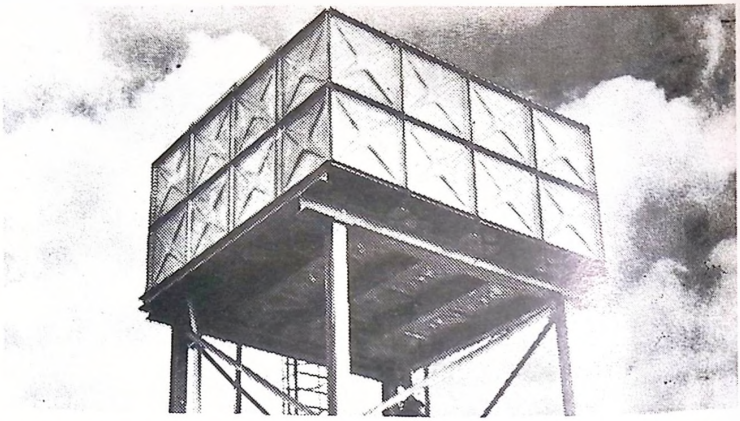
The temperature in a storeroom must never be allowed to fluctuate to any great extent. If a cold package is exposed to a warm, humid atmosphere condensation forms on the outside of the package.

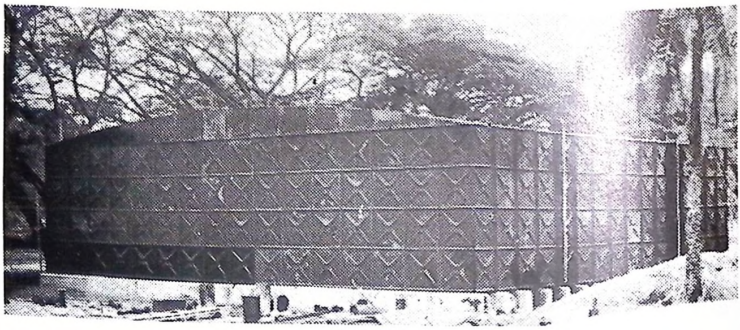
The moisture content of the packing paper and cardboard normally accounts for eight to 12 per cent of the total weight of the packing material. Under unfavourable conditions, however, the packing material can absorb even more moisture and this is subsequently exhaled in the form of vapour with a resultant rise in the humidity of the air inside the packing. This effect is obtained, for example, when bearings that have got cold during transportation in winter are transferred directly into warm, damp premises.

Handling

When the cartons are being stacked in the storeroom it is important to ensure that they are not piled up too high. Otherwise the cartons can easily get damaged. Certain types of medium-sized and large rolling bearings have to be protected against damage caused by vibration in transit. According to the size of the bearing, plastic sheeting, waxed paper or oil-impegnated cloth is packed between the rolling elements and the inner or outer ring. One must ensure that all this packing is removed before the bearing is mounted. This applies in particular to the plastic sheeting as this can easily be overlooked. In the case of certain cylindrical roller bearings the rings are packed in separate containers to avoid damage during transportation. ●

**High viscosity at low stress, but a decreased viscosity when an increased stress is applied.*





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Focus on SIERRA LEONE

Diamond mining

– history and development of the National Diamond Mining Company

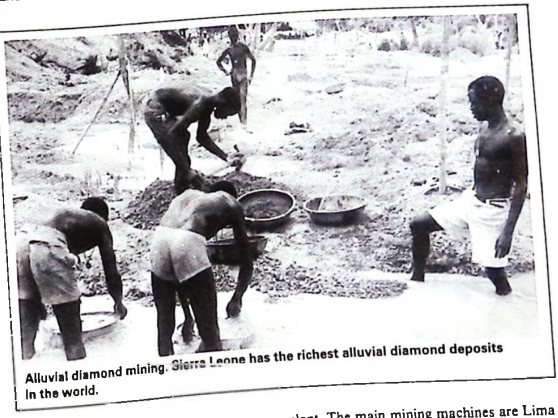
DIAMONDS WERE first discovered in 1930 during routine geological survey work at Futingaiya in the Nimini Chiefdom, Kono District, notably the Gbobora River. From this chance discovery, the mining group, CAST, which were then mining diamonds in Ghana became interested and followed up the report, confirming the discovery a year later. A scramble for claims ensued, but CAST were able to secure a 99-year agreement, giving them the exclusive licence to prospect, mine and market diamonds throughout the country.

A new wholly owned company, SLST Limited, was incorporated by CAST in 1934 to carry out the Sierra Leone operations. The 99-year agreement was terminated in 1955 and a new agreement made between government and SLST Limited whereby SLST Limited relinquished its monopoly and was granted two leases, one in Yengema covering 229.65 sq miles and one in Tongo covering 78.39 sq miles, both covering a period of 33 years. These leases have been reduced and are currently 158.18 sq miles in Yengema and 75.98 sq miles in Tongo.

Geology

The two lease areas are underlain by Pre-cambrain basement rocks, mainly granodiorite gneiss. In the west and to the south of the Yengema lease lies the greenstone belt of the Nimini Hills which carry primary gold deposits. Kimberlite was emplaced as dykes and pipes into the granitic basement rocks 92 million years ago, towards the end of the Cretaceous period. Three small pipes and several zones of dykes have been recognised in the area. In the Tongo lease only a small "blow" has been recognised along one of the four known Kimberlite dyke zones.

By far the most economically important deposits of diamonds are the secondary deposits which have arisen from the denudation of the primary source, the Kimberlite pipes and dykes. These secondary deposits occur in diverse geomorphic environments across valleys and interfluves. Indeed over 40 years of mining these deposits have shown them to be about the richest alluvial diamond deposits in the world, having produced a diamond which was the fourth largest rough diamond and the largest alluvial diamond ever recovered. In these deposits the diamonds are recovered from gravels which have been deposited on soft bedrock and overlain by an overburden of clay, sand, or various mixtures of clay and sand.



Alluvial diamond mining. Sierra Leone has the richest alluvial diamond deposits in the world.

Mining

Production is mainly from valley flat deposits which have been delineated by the prospecting department. Only a small proportion is currently mined from high terraces but this proportion will increase after certain plant treatment modifications have taken place. Preparation of the mining sites is expensive as involves river diversions, clearing of vegetation and filling and levelling the site to a high standard, to enable the heavy machines to operate without getting bogged down in the soft waterlogged ground. The completed site or mining block is normally about 2,000ft in length, the width depending on the width of the river flat.

The method of mining proceeds by digging successive longitudinal trenches, working from the downstream end of the block to facilitate drainage, and working from one side of the valley to the other as dictated by the reserve block boundaries. The overburden is stripped by draglines which are also used to mine the gravel. Gravel is stacked to one side to allow draining before it is loaded into dump trucks for transportation to the treatment plant. The main mining machines are Lima 2400 draglines with 7cu/yd buckets, 71RB with 3cu/yd buckets and 54RB draglines with 2¼cu/yd buckets. The stacked gravel is loaded onto 35-ton dump trucks by 30RB draglines fitted with 1¼cu/yd buckets. Dewatering pumps are employed as necessary to keep the mining cuts dewatered.

Due to the scattered nature of the deposits, two treatment plants are operated within the Yengema Lease to cater for mining sites at distances as great as seven miles from the plants. From three to five mining cuts (sites) are in operation at any one time in each plant area to provide feed to the plant.

A small proportion of production is obtained from what are known as high terrace deposits. These deposits are usually located on high ground with very thin overbuden cover. To summarise the mining

continued

operation, it should be noted that 4 million cubic yards of overburden and 1 million cubic yards of gravel are excavated annually.

Treatment

The heavy media process is employed at the treatment plants. The medium used is a mixture of ferrosilicon and magnetite and the separating vessels are the cone and cyclone.

Drum washers are employed to break up the clay particles in the gravel before it is screened and treated in the heavy media circuit. The heavy medium is made up of a mixture of ferrosilicon and magnetite with water added to give a liquid having the specific gravity required for efficient separation of diamonds and other particles of similar or higher SG, from lighter particles which are rejected to waste.

The concentrate produced at the plants is transported to a sorting plant (the separator house), where final separation of the diamonds is carried out. A sluice box was recently incorporated in the circuit in one of the Yengema plants for recovering gold from the −1.5mm sand tailings. The process in the separator house employs X-ray separators for the larger sizes, i.e. −25mm + 3mm, and grease belts (vanners) for the −3mm + 1.5mm material. The products from these processes are hand-sorted in gloves compartments.

Daily returns of diamond production from each plant are made by the separator house superintendent. Mine production is despatched periodically under armed escort to a sorting office in Freetown where the diamonds are cleaned and graded into parcels for eventual sale to government approved dealers.

Total plant throughput is about 1 million cubic yards per annum, and recovery is currently just below 200,000cts from a peak in 1969–70 of about 944,000cts.

Prospecting

A staff of geologists and prospectors carry out mine and plant control sampling as well as development sampling of potential deposits.

Engineering services

The operations are highly mechanised and consequently require an elaborate engineering department to maintain the equipment. There is a service station at each plant site in the Yengema lease where routine maintenance and minor repairs are carried out. The main workshops are located in the headquarters complex and have facilities for major overhauls and repairs. A large fleet of motor vehicles is maintained for use by engineering and operational staff. Power for the treatment plants, workshops and townships is supplied by a power station located in the headquarters complex. Installed capacity in Yengema is 4.56MW and generates on average 1.42 million kWH monthly. In Tongo the installed capacity is 1.25MW with an average monthly generating figure of 308,000kWH.

A mine store is maintained holding spare parts and materials totalling some Le6.5 million for the day-to-day operations of the mine. Total annual expenditure on fuel and lubricants is currently in the order of Le6.4 million.

Organisation

Mine organisation comprises a mines general manager who is responsible for operations in both the Yengema and Tongo leases. He is assisted by a deputy general manager, an assistant general manager and six heads of departments. Below these are the section heads, supervisors, junior supervisors and foremen. ●

West African
TECHNICAL REVIEW

Focus on the National Trading Company

IN RECOGNISING the need for a quasi-government commercial organisation to curb price rises in basic, essential commodities the National Trading Company was formed in 1972 as a public limited liability company with a share capital of Le½ million to which the government subscribed the majority.

The company was granted absolute monopoly for the importation and distribution of basic essential commodities like onions, butter, sugar, potatoes. Due to the economic/commercial inadequacy of this arrangement, the government took away the monopoly hitherto granted to the company.

In 1976, a commercial arrangement was established with the People's Republic of China whereby the company was awarded the exclusive agency rights for all China imports; this privilege the company continues to enjoy.

In 1977, the government saw the need to float the company with a further injection of Le 2 million. This arrangement transformed to some extent the capital structure of the company and necessitated a change in its status. However, anticipating its new legal status, National Trading Company continues as a public limited liability company.

It is noteworthy that the company has since abandoned its role as main provider of only the nation's basic essential commodities; rather, it has tended to enlarge its product range in line with the general requirements of the home consumer. Accordingly, the company now deals in provisions, sundry items, hardware, textiles, hifi components, domestic electrical equipment and school equipment.

More so, the company's new trade posture is rationalised by the generally low margins on provisions against the rapid inflationary trends in overheads and other costs. With a cost spread on more lucrative range of merchandise, the company can continually survive under the circumstances.

Suppliers

Although for obvious reasons the company obtains its imports mainly from the People's Republic of China, it also deals to a fairly satisfactory extent with suppliers from Europe (Britain, France, Germany, Italy, Holland), Japan, Russia and, to a lesser extent, with the Americas.

Given the current national foreign exchange constraints and the rigid payment terms, that is, confirmed irrevocable letters of credit, preferred by all suppliers except China, the company's normal imports are being maintained with China whilst for other countries, the company has tended to rely on agencies with foreign exchange facilities for the procurement of its merchandise. It is for this reason that merchandise of origin other than that of China, are expensive and tend to exacerbate the course of inflation.

Company expansion

Being a national trading company, the company views its role in national commerce to be pervasive and infinite in merchandise procurement and distribution. But due to the limitations of capital and the burden of control on rapid expansion, the company adopts only a piecemeal expansion programme with priority on a specific range of merchandise and its distribution.

It is envisaged, however, that the range of merchandise should be gradually enlarged in line with increasing consumer demand based on an ever-changing lifestyle; whilst new outlets in accessible and strategic townships should be established. Arrangements are now in hand to establish outlets in Port Loko and Kabala.

Sierra Leone Produce Marketing Board

– helping crops grow at home, exporting abroad

THE MARKETING Board is descended from the West African Produce Control Board, which was formed in 1942 to handle and control the export produce of the former British West African colonies. The Sierra Leone Produce Marketing Board (SLPMB) now enjoys the reputation of playing a vital role in the country's economy. Established in 1949, it exists for the efficient purchase and marketing of various items of Sierra Leone produce. The Board also assists in the development of the agriculture of Sierra Leone, benefiting farmers in a practical way.

It aims to provide fair prices to the growers, while supplying sprays and fertilisers to increase yields and an extension staff to assist and instruct farmers in the modern farming methods (particularly in coffee and cocoa cultivation). In line with these aims, the Board has promoted the formation of two companies.

Cocoa and coffee

The first company is SLAPCO, the Sierra Leone Agricultural Produce Company, a private company whose shareholders include SLPMB, the Bank of Sierra Leone, the Sierra Leone Commercial Bank, a foreign partner, Berisford Commodities Ltd., farmers and the general public. The company is currently setting up 3,000 acre estates of coffee and cocoa, providing demonstration centres and facilities for the cleaning of coffee.

The second company, NAPCO, is a wholly owned subsidiary company established for the production of groundnuts, chillies and ginger. NAPCO buys from the farmers and also provides free seed, credit and advice. It is hoped that by 1983/84 Sierra Leone will be in a position to export groundnuts.

The Sierra Leone Produce Marketing Board has holdings in the National Development Bank to provide capital to the farmers. Smallholders can obtain credit until their trees yield. T Despite the recent rice shortage the Board is working towards self-sufficiency within the next few years. It provides the farmers with machinery, fertiliser, and seed rice at subsidised rates and encourages increased production by offering realistic prices for the crop. A tractor workshop helps to maintain equipment and efforts are being concentrated to overcome problems with milling, transportation and storage. The nee

SIERRA LEONE

crash programme is being supported by the Food Agricultural Organisation, the IMF and the World Bank. There are no water shortages in Sierra Leone except at the height of the dry season. With irrigation and water storage it is possible to produce two or three crops per year.

Palm oil

The SLPMB owns a palm kernel mill which refines palm oil. Crude oil is exported for further refining. In March 1981 the first locally refined oil came onto the market and it is anticipated that Sierra Leone will be exporting cooking oil to Liberia and Guinea in the near future.

The palm oil kernel mill showed a trade profit in 1978/79 and there are plans to increase the capacity of the mill for crushing palm kernels and other oil seeds such as groundnuts. The exports of SLPMB are generally sold in small lots to the highest bidder on cif terms. European countries, China and Russia are the main markets for cocoa; USA, UK and European countries are the main markets for coffee; and the British and Dutch are the biggest buyers of palm kernels.

In 1978/79 turnover of the Board rose by 14 per cent and trading profits increased by 31 per cent despite the low price of coffee on the world market. Sales of coffee and cocoa accounted for 95 per cent of the total sales.

Focus on the National Development Bank

– boosting the private sector

THE NATIONAL Development Bank Limited was established in 1968 under the auspices of the Sierra Leone Government with advice from the World Bank and the African Development Bank. As a prelude to its establishment, a mission mounted by the World Bank and its affiliate, the International Finance Corporation, visited Sierra Leone in 1965 with the following terms of reference: To study the demand for long-term funds for the industrial and related sectors; the availability of long-term funds; and the need for, and the feasibility of, a development finance institution to assist medium and large scale enterprises.

In July 1966 the Sierra Leone Government set up a Steering Committee of high ranking Government officials with terms of reference intended to include all aspects – financial, organisational, managerial and legal – of the establishment of the proposed development finance company. At the request of the Government, the African Development Bank (ADB) provided, under technical assistance, a Consultant who was appointed Chairman of the Steering Committee.

As a result of the deliberations of the Steering Committee, the National Development Bank Limited was incorporated on 9th March, 1968 as a public limited liability company under the Companies Act of Sierra Leone. It was not set up on the lines of a statutory corporation but on sound business lines which attracted international regional financial institutions and other foreign and local investors to subscribe to its share capital.

Objects of the bank

The primary business of NDB is to provide medium and long-term finance to enterprises which are owned and managed predominantly by private interests and which appear on careful investigation to be commercially viable and likely to make significant contributions to the economic development of Sierra Leone.

NDB will however invest in government projects, for example, the development of medium and large scale agriculture (whether corporate or individually sponsored), ranching, forestry and fishing, the development of manufacturing, assembly and processing industries including industries engaged in the processing of

products of agriculture, forestry and fishing, i.e. agro-based industries; and the development of engineering, construction, transport, tourist and mining industries. The bank will also provide technical assistance and advice for the purpose of promoting agricultural and industrial development; and administer special funds.

General policy

NDB encourages the flow of foreign capital to Sierra Leone and will seek to widen the base of private participation in Sierra Leonean industry by encouraging and promoting Sierra Leonean enterprises. It will not only invest in such enterprises but will also encourage others to do so.

NDB assists clients to obtain necessary advice in carrying out the feasibility studies and financial planning which have to proceed actual investment. It will also assist in locating technical partners and advise on management for worthwhile projects.

NDB provides ancillary services (accounting, auditing and managerial) to its clients in continuity as going concerns even after the Bank's loans have been fully amortised. Clients are encouraged to take advantage of these services for a small negotiable fee.

All applications for NDB assistance must be formally submitted to the Bank in writing through the applicants' Board of Directors, where applicable. All applications must be addressed to:

The Secretary, National Development Bank Limited, Leone House (6th Floor), 21–23 Siaka Stevens Street, Private Mail Bag, Freetown, Sierra Leone.

NDB invests in viable projects in a variety of ways. Financial assistance is flexible and can take the form of direct subscriptions or underwriting of equity, preference stock or debentures, medium- or long-term loans, guaranteeing of debts, long term instruments with convertible features, or any combination of these. NDB will recoup its cash in future years by selling out its portfolio to the public. The Bank's policy in taking equity participation in enterprises is to underwrite ultimately the sale of such shares to Sierra Leonean investors. This objective is to broaden the distribution of ownership so that small Sierra Leonean investors may participate in the ownership of many of the country's enterprises. It is envisaged that this objective will help establish the basis for a future stock market.

NDB's financial assistance from its ordinary resources will not normally amount to less then Le5,000. However, NDB will be prepared to consider requests for financing of projects which, although requiring smaller amounts, nevertheless present definite economic interest.

NDB tries to diversify its portfolio in order to maintain a reasonable level of risk. In this respect and as a general rule NDB will not normally finance more then 50 per cent of the cost of a project but in exceptional cases a figure of 75 per cent shall be an acceptable target.

NDB does not seek, by the making of equity investments, to obtain a controlling interest in a project or enterprise. It will also generally avoid assuming management responsibilities in such projects or enterprises. This will not, however, preclude NDB from requiring membership on the Board of Directors of any or all enterprises in which it has outstanding loans or guarantee agreements or in which it has equity participation.

When deciding upon the amount and the form of financial assistance it will provide, NDB will take into account all the financial requirements of the project and the general financial situation of the borrowers in question.

In accordance with normal banking practices, NDB will require its borrowers to provide and to maintain adequate security, to keep records and accounts in accordance with sound accounting practices and to furnish whatever information on their operations and accounts NDB deems desirable. The Bank will have the right to inspect the enterprises it finances as well as their operations and accounts.

Tourism expanding

Mammy Yoko hotel shortly after construction was completed.

THE GOVERNMENT of Sierra Leone has so far been the greatest investor in the development of tourism and hotel infrastructure in this country and wants to develop tourism as an economic viable industry. In this connection, the government welcomes private investment in the development of hotel infrastructure from would-be investors and is also prepared to participate in joint venture with international tour operators, international hotel chains and the private sector at large.

At present, there are two international hotel management chains operating two of the largest hotels in Sierra Leone. They are, the UTH Sofitel French Group and the (CHM) Caledonian Hotel Management Group, running and managing the Mammy Yoko and Bintumani Hotels respectively. Possible investment incentives include repatriation of capital and profit; duty free concession on the purchase of foodstuff and beverages; tax free holidays; general assistance on the part of Government in providing the necessary building site, and essential facilities, such as electricity and water; possibility of free hold ownership of land if purchased from the private sector; and the possibility of a minimum lease of government land not less than 20 years with option for renewal.

Land Tour Operation Programmes and Tourist Circuits are developed and carried out by the following Agencies:–

The Yazbeck Travel Agencies
Kontiki Tours
The Ministry of Tourism & Cultural Affairs
The Freetown Travel Agencies
The Aureol Travel Agencies

Tourists come mainly from Great Britain, France, the US, USSR, Italy. It is not really surprising that Sierra Leone is so popular with British tourists in view of colonial ties.

The main tour operators who have been bringing tourists to Sierra Leone are Blue Sky, Thomas Cook, Kuoni Tours, Thompson Tours, and Tropical Tour of France to name a few. The Government wants to establish contact with tour operators like Mecaman, Tour Europa etc. from West Germany and other European countries.

continued

The Board of Directors, Management and Staff

OF

Sierra Fishing Company Ltd.

Fish Industries Sierra Leone Ltd.

FIL

SHRIMPEX

SIERRA LEONE LIMITED

1978

Sierra Leone Shrimp Export Co. Ltd.

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DR. SIAKA P. STEVENS

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Air link

Sierra Leone is nearer to Europe and America than many other African countries because of its strategic location on the West Coast of Africa. Freetown International Airport is just six hours away from Great Britain, New York and West Germany on a direct flight. The following airlines now operate flights in and out of Sierra Leone: UTA, French Airline, British Caledonian Airline, the KLM, The Czechoslovak Airline Air Afrique, Nigerian Airways and Ghana Airways. Aeroflot, the Russian airline will start services to Sierra Leone in the near future.

The Government of Sierra Leone places no restriction on the arrival and departure of chartered flights from any European country.

Visas

The Government of Sierra Leone grants free visas to citizens of Commonwealth Countries, ECOWAS, The Mano River Union, and other States that have mutual bilateral agreements with Sierra Leone. It is also worth noting that bonafide tourists, especially tourists travelling by package tour can come to Sierra Leone without obtaining a visa beforehand. Visas are automatically granted on arrival at the Lungi International Airport. Missions and Embassies abroad can also grant visas with minimum delay.

It is anticipated that before long, ways and means will be devised to cut down to the barest minimum the time spent in transferring tourists from the airport to their respective hotels. Plans are also afoot to provide more and varied amenities and entertainment for tourists, including a project to construct a cultural complex at Aberdeen. This will be part of a 'cultural Village' and will include a theatre, an amphitheatre, a mosque, and shops selling local arts and crafts.

Hotels reviewed

Paramount – central, pleasant, reasonably priced, good restaurant & bar.

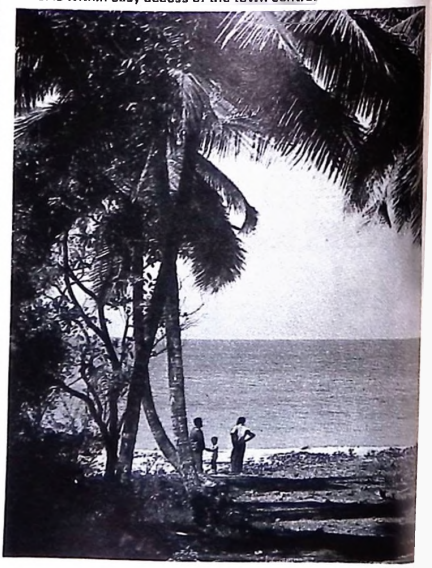
Brookfields – little out of way, recently decorated, very good.

Cape Sierra – reasonably priced, good hotel, located by the sea (Lumley beach)

Bintumani – near the beach at Aberdeen. Equipped with conference centre which can hold 1,000 delegates, and three committee rooms, two of which can hold 100 people and one of which can hold 60 people. All facilities equipped with refreshment bars and translation system (English/French) and full air-conditioning. Hotel has 200-rooms, including 25 suites, all fully air-conditioned and with balconies. Besides the main restaurant serving African and European dishes, there are snack bars and grills. Discotheque every night (November to March), local band plays twice a week, national dance troop once a week. Also tennis court, large pool and children's pool. Excursions run by tour operators: Yasbeck & Kontiki Tours.

Mammy Yoko – Freetown's newest hotel, no conference centre, but delegates can use Bintumani facilities. 200 double rooms with TV, video & radio. Two restaurants & coffee shop. Food served on private beach or by pool. Regular performances of bands and national dance troop. Large pool and children's pool, tennis courts. Bars, night club to open soon.

View of Lumley Beach from Cape Sierras Hotel. The hotel is situated on the beach and offers deep-sea fishing and surfing. The hotel is within easy access of the town centre.



Focus on Sierra Fishing Company Ltd

Fishing and processing

The harbour at Freetown.

SIERRA FISHING Company Limited was incorporated in September 1976. Sierra Fishing Company Limited is the parent company of a group of three companies. Its two subsidiaries are Fish Industries Limited and Sierra Leone Shrimp Export Company Limited. A fourth associate company, Shrimpex (SL) Limited, 1978, is a joint venture between Sierra Fishing Company (51 per cent shareholding) and Mesurado Fishing Company of Liberia (49 per cent shareholding).

Sierra Fishing Company Limited's shares are subscribed as follows:

Sierra Leone Government – 25 per cent
National Development Bank of Sierra Leone – 25 per cent
Fransov (foreign interest) – 20 per cent
Private Sierra Leoneans (individuals) – 45 per cent

Sierra Fishing Company Limited (SFC Ltd) is a fish distribution and marketing company. Fish Industries (Sierra Leone) Limited (FIL) is a cold storage and ice manufacturing company. Sierra Leone Shrimp Export Company Limited is a shrimp processing company, owning a shrimp processing plant and two plate freezers, which are now on lease to Shrimpex (SL) Limited (1978).

Shrimpex (SL) Limited (1978) is a shrimp fishing, processing and marketing company. Soon after its establishment, Sierra Fishing Company Limited acquired its present subsidiary companies and their assets, much of which were obsolete, especially the refrigeration machinery and equipment of Fish Industries Limited. The management of Sierra Fishing Company Limited realised at the onset that the future development of its activities required the formulation of a comprehensive development programme, based on its short- and long-term priorities.

The following phased development programme was adopted and is now in an advanced stage of implementation including:

Phase 1 – Development of modern fisheries infrastructure including refrigeration and cold storage facilities, jetties and distribution depots and fishshops.

Phase 2 – Development of a fishing fleet and facilities for local manufacture of fishing gears.

Phase 3 – Establishment of local training facilities for national in modern fisheries.

Phase 4 – Development of secondary fish processing facilities such as canning, meal, oil production and fish smoking.

By the end of 1980, the company had completed the installation of its modern refrigeration machinery and had commissioned a new cold stores with a total capacity of 1,500 tons cold storage space. A new 75m jetty, capable of berthing from two to six vessels commissioned in 1980 and the company bought five 21m shrimp trawlers to start its fishing fleet from America.

The company's Marine Training School for training young Sierra Leoneans in the techniques of modern industrial fisheries, was also officially opened by President Stevens in September 1980. The total amount invested so far on these projects is Le11 million. In January 1981, the company put into operation a smoking plant complex at Murray Town and commissioned a shore freezing tunnel, capable of freezing up to ten tons of fresh fish per day.

Prawn processing.

In what has been described as the largest

continued

takeover in the fishing history of West Africa, Sierra Fishing Company Limited took over in January this year the West African subsidiaries of Continental Seafood Incorporated of New York viz Continental Seafood Limited of Liberia and Société Ivoirienne de Crustacés. The company is finalising negotiations for the construction of a Syncrolift ship-lift and marine workshop for the repair and maintenance of its fishing vessels and the establishment of a net-making factory.

These projects are scheduled for completion in 1982. Sierra Fishing Company Limited has as its primary aim satisfying local demand for fish through a nationwide fish distribution network of wholesale frozen fish depots and a chain of fresh fish retail shops. Another important activity of the company is the export of shrimps to Europe and Japan. Total annual turnover from domestic and export sales of fish and shrimp in 1980 exceeded Le17 million.

Sierra Fishing Company Limited has placed emphasis on its export trade as a means of earning foreign exchange and with the intention of making the fishing industry a major exchange earner in Sierra Leone. Whereas in 1977, the company paid out Le1.3 million more in foreign exchange than it earned from export, in 1978, a surplus of Le0.5 million was achieved. The surpluses in succeeding years have been Le1.1 million in 1979 and Le3 million in 1980.

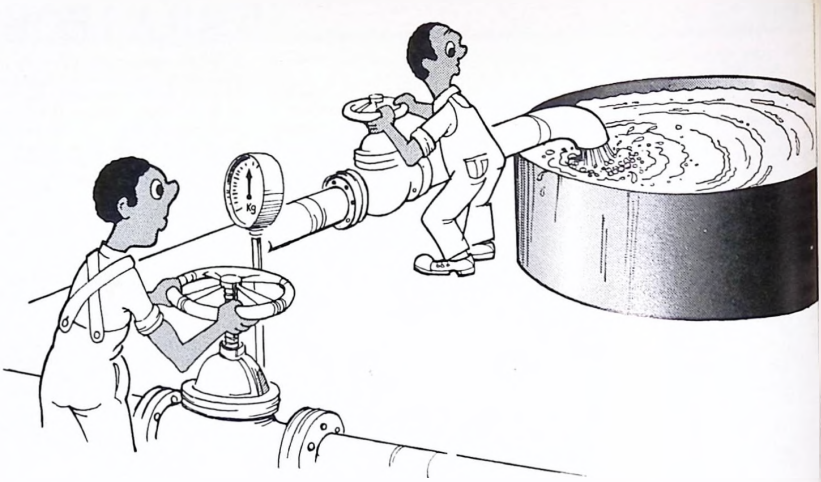
With the acquisition of 22 additional shrimp trawlers, whose products will be mainly for export, the foreign exchange earnings of the company are projected to reach Le12 million per annum.

In other areas as well, Sierra Fishing Company Limited has succeeded in making a substantial contribution to the country's economic progress.

From a modest total employment figure of 82 persons at the start of business in December 1976, the staff of the company has grown to the present total of over 1,100 men and women. Other contributions to the Sierra Leone economy have also shown an upward trend. These are in the form of taxes, licences and royalty fees, dividends paid out every year to its investors and furthermore the tonnage of fish distributed in the country has increased from 200 tons per month in 1976 to over 1,200 per month in 1980. It exports fish to the Ivory Coast and Nigeria; processed shrimps go to France, UK, Japan and Belgium, and possibly America.

Sierra Fishing Company Limited is managed by a board of directors drawn from the government, the National Development Bank, Ministry of Natural Resources, senior management personnel of the company and private shareholders. The company secretary is also secretary to the board. Day-to-day management of the group of companies is collectively executed by a senior management committee headed by the managing director and comprising a general manager and financial controller in addition to the company secretary.

The company is divided into ten departments and include refrigeration engineering, marketing, operations, accounts, personnel, public relations, production and research, fleet, stores and marine engineering.



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Kaduna International Trade Fair

Business beginning to boom

A wide range of products and services were exhibited by a broad cross-section of Nigerian and international dealers and manufacturers at the Kaduna International Trade Fair. Although some companies took exhibiting space purely for the prestige and publicity, others were exhibiting with the clear intention of doing firm business, and a good deal of negotiating took place. West African Technical Review's Editor, Fiona Ledger, was at the Fair and talked to some of the exhibitors about their products and market plans.

FOLLOWING CLOSELY behind the Kaduna Agricultural Fair (April 17–22), and the Argungu Fishing Festival, the Kaduna International Trade Fair was a bustling but well-organised affair, reflecting a keen interest in both construction and agricultural sectors.

Amongst the agricultural exhibitors Steyr Nigeria had the largest stand. Steyr, which started production in July 1979 manufacturing trucks as well as tractors, has recently increased its production output from 2,000 to 3,500 tractors per annum and owing to the backstill at NTM in Kano is the only tractor manufacturer operating in Nigeria at the moment. The company has recently brought onto the market a 110hp agricultural tractor, the 8120, equipped with an economic six-cylinder engine with direct injection and exhaust-turbo supercharger and reverse transmission. The company not only manufacturers but also runs a big training scheme and a pilot farm for equipment demonstration.

Leading suppliers of tractor attachments to Steyr is the company, **Indequip West Africa Ltd.** The Bamlett ploughs and harrows which Indequip sells team up very successfully with Steyr tractors – so much so in fact, that a factory has been set up under the name of **Farm Machineries West Africa Ltd (FMWA)** to manufacture implements and attachments. Located strategically near to Steyr's plant in Bauchi, the plant will open in October of this year. Once production is under way, Indequip says it has plans to open another plant in Minna State. EMWA's production programme will run at 2,000 units per annum to match Steyr's production programme.

Limani UK Ltd. aims to provide equipment for the manufacturing sector.

Cocoa processing equipment from the French group EMC.

Poultry game

Egg and poultry meat consumption has risen steadily over the past decade in Nigeria. Exhibitors associated with poultry breeding drew big crowds at the fair. Among the British exhibitors was **Salopian Industries (Metals) Ltd**, known as Salmet, and **Poultry and Animal Products Ltd (PAP)**. In terms of equipment the two companies are in competition with each other, both offering Californian cages, but in the case of PAP the cages are part of turnkey services.

Salmet sells the Salmet Californian cage which incorporates interlocking components. Cages are constructed in a stepped pyramid with a shaft at the centre, down which the droppings fall from the tiers above. No clips, nuts, bolts or wire ties are used. The smallest unit accommodates 48 birds, but Salmet has supplied units accommodating 10,000 birds.

Poultry and Animal Products Ltd is a British company with a particularly ambitious marketing programme. In association with the Nigerian television star turned businessman, Femi Asekun, the company is planning to promote the concept of the high-density, environmentally controlled poultry house equipped with reverseway cage. The basic feature consists of an inversion of the convection principle with electrically-operated fans extracting air from the inside of the house, keeping the temperature down. In addition to this, a humidifier ensures that the environment guarantees optimum egg-laying conditions.

The second design aspect of the house, new for Nigeria, is the deep pit waste disposal system. With this, dung from the birds on the first floor level drops to floor level and accumulates below, becoming

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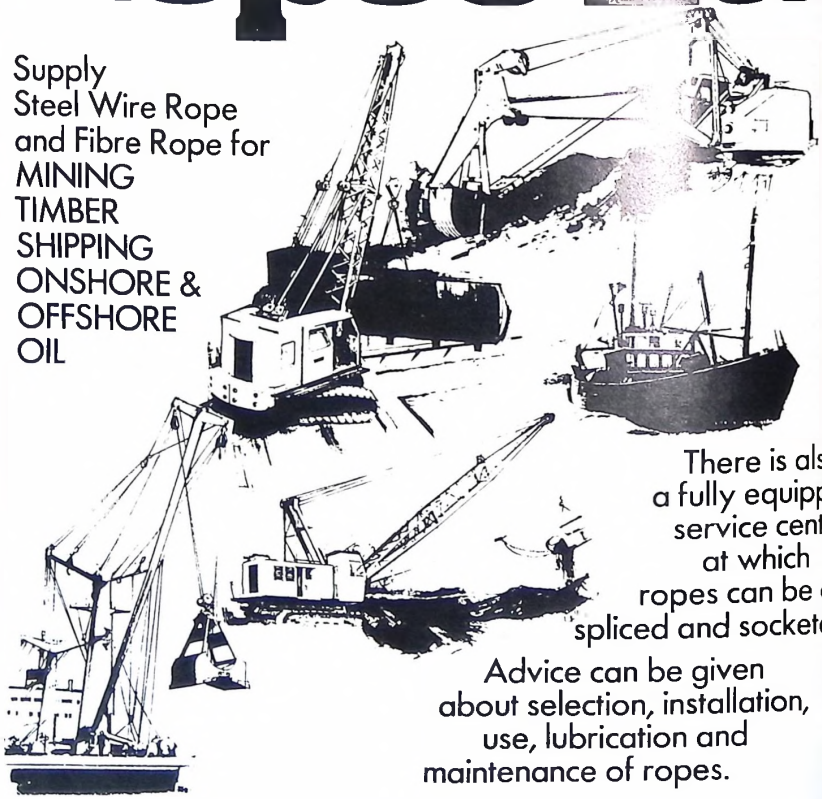

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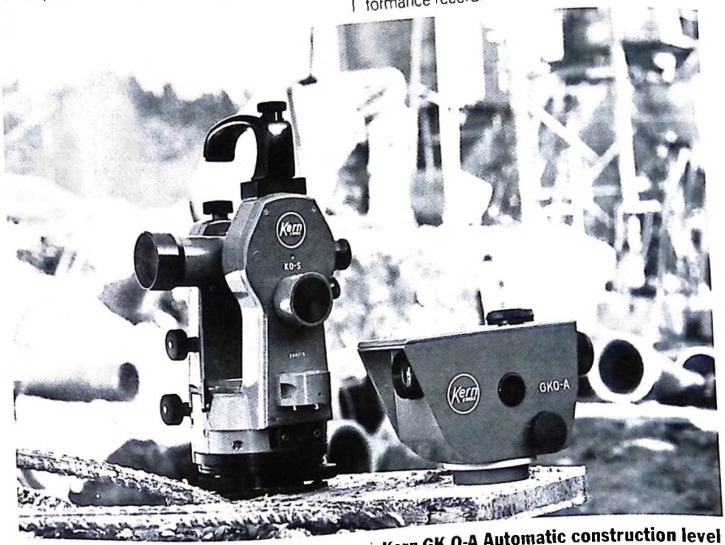

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dehydrated and gradually rendered bacteriologically harmless as it is exposed to the constant air current created by the fans. The dung is cleaned out once a year; a house with 20,000 birds in it can create 300 tonnes of ready-to-use fertiliser.

Fighting the cowboys

Again in the consultancy line, is the company **Agrapol (Nigeria) Ltd**. Run by K. A. O. Williams, a graduate in poultry science, as well as a keen businessman, Agrapol is a new company which has been operating just under six months. K. A. O. Williams, however, has been running the family-owned K-Farms for over 12 years, and has, therefore, a broad practical as well as theoretical knowledge of the whole business of rearing poultry.

Agropol's main suppliers are Dutch companies, in particular Rensen and Holland Chemicals (the Dutch connection stems from K. A. O. Williams' student days). Rensen is the largest livestock producer in Holland, supplying hatching chicks and day-old chicks – broilers and layers. Holland Chemicals sells, in association with Gist Brocades, a wide range of vaccines, antibiotics and vitamins.

As far as consultancy services are concerned, Agropol's biggest customers are in the private sector, although K. A. O. Williams said that there is a big demand for drugs and vaccines from the state agricultural programmes. The company has representatives in Kwara, Kaduna and Kano states, but Mr Williams hopes to have representatives all over Nigeria by the end of the year and aims, eventually, to extend the veterinary services offered by his company to include other types of livestock besides poultry.

Emphasis on edibles

There were four national stands at the fair. The French national stand had a particularly strong agricultural theme, with the emphasis on edibles. This was largely through the contribution of the members of the Rennes Chamber of Commerce whose stand was organised by R. Tordjman of the Bureau d'Information des Exportateurs Francais (BIEF). There were eight member companies exhibiting; four of them are involved in exporting poultry, both fresh and frozen, namely the **Sociétés Comptoir de Viande Armoriquaine, Doux, Lerial** and **Seproval**. The Sociétés **Cedix** and **Sill** specialise in milk products, while the Société **Arôme de Bretagne** markets fruit juices in concentrate or powder form and the processing technology behind them. The Société **Vidamer** specialises in mineral additives to livestock feedstuffs. Most of these companies have had experience in francophone West Africa, but all of them were making their debut in Nigeria at the fair and are looking for representation.

Not an extra-terrestial being, but part of **Stronghold's** range of firefighting products.

Leyland Nigeria sold all its exhibits by the end of the fair.

Shopping for construction machinery

The proximity of the Federal Capital Territory to Kaduna – an hour and a half's drive on the new highway – meant that there were quite a few contractors shopping for plant, particularly cranes and the full range of equipment associated with concrete: crushing, screening and batching plant. Concrete shortages at Abuja are setting contractors' schedules back.

NMI, the CFAO subsidiary, report that business is brisk. Equipment of most of the nine principals of NMI was exhibited on the NMI stand, with **Poclain's** tracked 75 model with underwater grab dominating the stand. NMI had already, at the time of the fair, sold six excavators to Dumez at Abuja, four 75's and two 160's. Manufactured in Germany and therefore unaffected by extensive strikes in the USA, the **International Harvester** loader is doing well in Nigeria, according to NMI, who claim that IH has ten per cent of the construction machinery market. NMI recently sold ten dozen TD25 and TD20 loaders to the Ministry of Works and Housing, Yola State. NMI were particularly pleased to have sold one large Potain 427 tower crane at the fair. Other equipment exhibited on the NMI stand included a grader by the American company **Galion,** a generating set by **Peter**, and a pump by **Pompes** [illegible].

Next to NMI, strategically enough placed to keep an eye on the competition, was the T & E stand. T & E, who have become almost synonymous with **Caterpillar** in Nigeria, gave their main principal plenty of exposure; on show were a gen set, an engine, excavator and a tractor, all by Caterpillar, also a deadweight roller compactor by **Albaret.** T & E is anxious this year to promote Caterpillar engines, particularly in association with irrigation pumps, and the company is looking for a pump manufacturer to team up with in Nigeria.

Abuja buyers

Afrotec had an impressive stand. As dealers in construction equipment, Afrotec representatives have been experiencing an increase in orders from Abuja contractors, so much so, in fact, that the company is opening a branch there this year. On show for the first time at the fair was the 175L mixer by **Frederick Parker**; a model was sold in Nigeria six weeks prior to the show. Also on show was one of Frederick Parker's standard lines, the 1301 Crush Ranger crushing and screening plant, specifically designed for African conditions, with 25 to 35t/hr capacity. Afrotec had already sold two by the third day of the fair, both destined for Abuja. The company will soon be launching continuous concrete batching plant in Nigeria, and a small-scale builder's elevator. At the time of the fair Afrotec had already shipped ₦3.1 million worth of Frederick Parker equipment for 1981.

Dawson Keith, British generator set manufacturer, exhibited 500kVA generators. Spokesmen for both Dawson Keith and RTD Swan (another British gen set manufacturer, represented by Lanre Bhadmus in Nigeria) were cautiously optimistic about the market. Business had picked up in the last two months as supplies of spare parts held by private owners have gradually been depleted and owners have turned to dealers for replacement stock.

continued

A spokesman for one of the two companies felt hopeful that the 50 per cent import duties on gen sets would soon be reduced to five per cent.

The Swedish company Volvo, another well-known principal of Afrotec, exhibited both an 861 dumptruck and a 4500 loader with 2.6m³ bucket. This year the company will launch, through Afrotec, a BM646 excavator loader and a BM3500 motor grader. Abuja contractors from the UK, Kingston Minerals, have already bought dump trucks and loaders.

American trade mission

Challenging the French and English lead in construction machinery the Americans, while they did not take a national stand, sent a construction machinery trade mission to visit Kaduna. Eight Manufacturers and export houses visited Nigeria for the first time, offering a wide range of equipment including concrete pumps, also crushing and screening plant and off-highway trucks. All of the eight were looking for representation all over Nigeria. At present Nigeria has a $10 billion trade deficit with Nigeria. Seven American trade missions are planned for Nigeria this year, including a mining mission in May and a railway mission in June.

The Austrians had the biggest national stand, with a total of 20 exhibitors. The emphasis was on machine tools and industrial materials. **Ludwig Engel** exhibited automatic die-casting machines for processing thermoplastics, duromers and elastomers; **Carl Walter** exhibited automotive and hand tools; **Krammer Gesellschaft GmbH** specialises in gate valves, house connection slide valves, throttle valves and ball valves. Consultancy as well as contracting is carried out by **Austro Plan GmbH** who were more than willing to discuss construction of metal and mineral processing plant, polymer plant, hospitals, on a turnkey basis.

German newcomers

As the world's second biggest exporter to Nigeria (the UK still dominates the market) it was surprising that so few of the well-known names exhibited. There were 11 German firms exhibiting within the areas of the German national stand, many of them newcomers to the Nigerian scene. They were accompanied by the **Association of Baden Württemberg Chambers of Industry and Commerce.** A very wide range of goods and services were offered by the German exhibitors, including packaging machinery by **Ganzhorn & Stirn GmbH**, decoration and reliefs by **Prägeanstalt Karl Eckert**, irrigation consultancy services by **Perrot-Regnerbau GmbH & Co.** and dry-cleaning machines by **SECO Maschinenbau GmbH & Co. KG. Gerhard Buchmann KG** is a company specialising in hospital equipment.

Also active in Ghana, the company has been doing business with Nigeria for five years now and has established a Nigerian affiliated company, **Buchmann Nigeria Ltd,** with a head office in Ibadan and branches in Kaduna and Kano.

Last year the company was particularly active in Sokoto state, totally equipping two 100-bed hospitals. The company is in the process of equipping a 100-bed hospital in Bauchi. Buchmann will supply free after-sales service for all projects for up to one year after completion of installation. Training programmes are regularly held in Germany for its clients. As far as the future is concerned the company plans to open a technical office in Sokoto and is anxious to penetrate the east Nigerian market.

Flying high

A well-known name in the aviation market is **Dornier,** Equipped with scaled-down model planes their stand drew admiring crowds. Until three years ago, Dornier planes were exclusively used by the militia, but now the civilian market is playing an increasingly important role in the company's sales drive. The 128-2 Dornier Skyservant with Lycoming piston engine has proved to be the most popular model in Nigeria; this year it will be joined by the 200 model which is to be launched in

Afrotec's stand had many inquiries and sales from Abuja contractors.

Nigeria in June. Both models have the advantage of requiring only a short unprepared runway (400–500 yards) and are ideal for short hauls (1,900km) at a cruising speed of 642km with a 15-passenger capacity.

Nigerian pilots and mechanics are regularly trained in Munich and the company has its own office in Victoria Island, Lagos. Last year the company sold five aircraft to civilians in Nigeria, with air travel becoming an attractive way of communicating with the branch offices which any successful company in Nigeria is eventually obliged to open. At the time of the trade fair the company already had six aircraft on its order book. These are not just used for commuting businessmen – Dornier spokesmen said that there is increased interest in modifying the aircraft for spraying pesticides on large estates. So far Dornier has sold seven aircraft for this purpose. The company aims, over the next three years, to sell 50–80 aircraft to the civilian sector.

Brits!

The British stand showed both manufacturing machinery as well as products. **The British United Shoe Machinery Co. Ltd (BUSM)** generated a lot of inquiries and interest with demonstration of all the

continued

Members of the Rennes Chamber of Commerce used the fair to make their first contact with Nigeria.

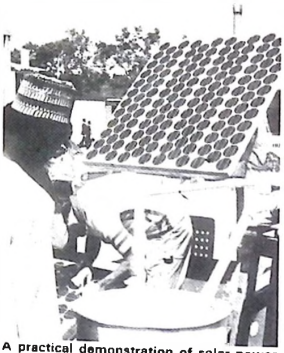
different stages of manufacturing. In 1977 BUSM equipped a government factory in Owerri State, but for the last two years the shoe manufacturing market has been slack and seasonal. Like textile manufacturers, shoe manufacturers in Nigeria are finding their trade damaged by black market shoes, and many factories are working well below capacity. But BUSM feel confident that indigenous manufacturing is commercially viable in Nigeria and are finishing a feasibility study of the factories manufacturing at the moment with a view to formulating a sales strategy.

Limani UK Ltd is an exporting house with a policy of exporting a wide range of manufacturing equipment. The company took two stands: the outside stand was taken up by a complete tile-making system, with mixer, vibratory feed table and moulds. The system is easy to maintain and operate and three or four men can turn out about 1,000 high-quality cement tiles a day. Inside the stand Limani handled inquiries concerning manufacture of packaging components, such as crown bottle tops, using hydraulic presses and canning machines. Hydraulic presses can also make razor blades; as yet there is no manufacture of razor blades in Nigeria, but there is enormous scope for an aspiring manufacturer. Given Nigerian market conditions, it would take two years to recoup investment on one hydraulic press.

The use of plasticiser in concrete is widely accepted by about 50 per cent of international contractors working in Nigeria. But only ten per cent of all contractors, Nigerian and foreign, use plasticiser. **Joseph Crossfield** is a British company which aims to change this situation and introduce the concept of plasticiser as a means of retarding drying and giving concrete more durability and strength to Nigerian contractors. The company has appointed Bewac in Apapa as its agents, but a spokesman for Cormix said that the 33 per cent chemical duty which has to be paid by any importer of the plasticiser is prohibitive. It has resulted in international contractors buying off-shore; contractors involved in big projects are exempt from duty. Nigerian contractors will be an important sales target, if the company is to increase sales in Nigeria. At present George Wimpey (Nigeria) Ltd are using 50 tonnes of the Cormix P4 plasticiser at the Oyan River Dam. The company believes that in the future Abuja will be an important outlet for its marketing strategy.

Sintacel is a British company specialising in complete laboratory systems for all scientific subjects from secondary school to university. **Metriscope Nigeria Ltd** is exclusive agent for Sintacel. Sintacel equipment has been sold in Nigeria for three years now. The company is just finishing equipping the faculty of medicine at Ahmadu Bello University.

Not far from the British stand **Leyland Nigeria** had an impressive display of commercial vehicles, Range-Rovers and a good line in disco music. Whether funky music is good for business is hard to say, but Leyland must have been one of the most successful exhibitors at the fair – it managed to sell every single exhibit, including a Range-Rover to an important head of state!



A practical demonstration of solar power by Arco Inc.

Leman Industries (Kaduna) Ltd (LIK) is a Nigerian-Brazilian concern bridging a significant gap in Nigerian industry. It is the only fastener factory in Nigeria, manufacturing a wide range of nuts, bolts and nails. LIK sells to the car, building industries and general engineering sectors. Galvanising plant has recently been installed and customers will be able to specify zinc and cadmium plate. The factory will be expanding its range of bolts and screws for the roofing industry in June of this year. In 1982 LIK will be supplying one of the vehicle manufacturers with bumpers and window frames.

Although the potential for fasteners is enormous in Nigeria, expansion of existing manufacturing facilities will be circumscribed as long as duty on imported raw materials remains at its present level and the Nigerian steel industry is still at the construction stage.

Dala Security Co. Ltd is a company specialising in security fire fighting equipment. Supplied by a British company, Kaytal Global, Dala exhibited upright safes, fire-proof filing cabinets, fire extinguishing equipment, 6×4 Range-Rover Rapid Intervention vehicle and Sherpa Fire Sprite Fire Engineer.

Power from the sun

Despite Nigeria's oil wealth 90 per cent of the population use wood for fuel. This does suggest that development of alternative energy sources could substantially benefit the people. **Arco Solar Inc.** is a subsidiary of the American oil conglomerate Atlantic Richfield. In line with all the major oil companies Atlantic Richfield is, through ARCO Solar, broadening its energy strategy and investing substantially in solar engineering. On show at Arco's stand was a 180hp water pump powered by a photovoltaic panel which attracted enormous attention from the crowds.

Solar energy is a new concept to most Nigerians but it is one which Arco feel could be made practicable and commercially viable in Nigeria. As an indication of the company's determination to penetrate the Nigerian market it is forming a joint venture with two Nigerian engineers. The uses of solar energy as conceived by Arco are numerous including navigational aids, railroad crossing and cathodic protection (that is, electrification of pipeline in order to stop corrosion). In Nigeria Arco is particularly interested in replacing diesel generating sets with solar units. In terms of maintenance, a solar unit makes no demands, having no moving parts; energy costs are, of course, non-existent. The basic stumbling block is high investment costs – silicon processing is still very expensive. Arco plans, if all goes well on the sales side, to set up an assembly plant in Nigeria.

The Kaduna Trade Fair registered a significant rise in the level of activity in trade and manufacturing sectors, especially on the agricultural and construction side, after a period of depression and uncertainty. This can largely be attributed to relaxing of import controls last year and this year, as well as announcements of money allocated to the Fourth National Development. A mood of optimism was felt by both Nigerian and national exhibitors, and the sales actually made at the fair certainly warranted this.

Peugeot was one of the four vehicle manufacturers exhibiting at the fiar. The Peugeot factory is situated conveniently in Kaduna.

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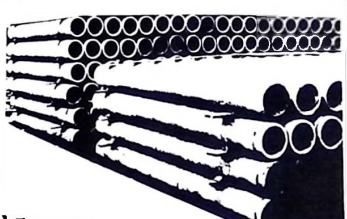

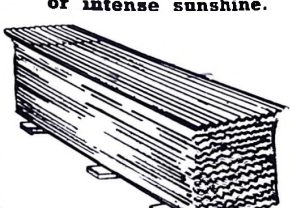

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West African CONSTRUCTION

Caterpillar 1980 results

Caterpillar has announced that sales for 1980 were $8.60 billion, a 12.9 per cent increase over the $7.61 billion in 1979. The increase resulted from higher prices implemented to offset the effects of inflation on costs for labour, materials, and services.

Physical sales volume was approximately the same for both years. In 1979, however, physical sales volume was reduced by the fourth-quarter UAW strike, which also caused some sales to be transferred from 1979 to 1980.

Sales outside the United States totalled $4.91 billion, a 19.8 per cent rise over the $4.10 billion in 1979. More than 57 per cent of the company's consolidated sales were outside the United States – the largest percentage since 1976.

The company continues to be cautious about the outlook for 1981, particularly the first half. Economic recovery in the United States is expected to be slow and most industrialised countries are experiencing recessions or significant economic slowdowns. While demand for some of the company's products such as large engines is expected to remain strong, demand for other products is anticipated to be soft.

As 1980 began, nearly three-fourths of all machine models were on allocation to assure equitable distribution to dealers. In addition, orders for several models of engines exceeded the company's ability to supply them.

By mid-year, dealer machine inventories had been replenished, and only three models remained on allocation. During the second half, however, a few additional models were placed on allocation, leaving seven machines on allocation at year-end.

Sales in the United States were $3.69 billion, compared with $3.51 billion in 1979, an increase of 4.9 per cent. Physical volume, however, declined 7 per cent from the strike-affected 1979 level.

The sharp downturn in economic activity and record-high interest rates significantly impacted US sales of most of the company's products.

Consolidated profit for 1980 was $564.8 million, an increase of $73.2 million from the $491.6 million earned in 1979.

Mali road maintenance

The International Development Association (IDA) has approved a credit of SDR 13.4 million ($17 million) for a road maintenance project in Mali. The project has a total estimated cost of $43.3 million and is designed to protect the physical and institutional gains made to date in the highway sector under three previous IDA credits.

Over the two-and-a-half-year life of the project a programme of routine maintenance, covering about 6,600km of national, regional, and feeder roads, will be undertaken, and periodic maintenance will be carried out on 680km of paved roads and 220km of gravel roads.

The project will include institution-building components aimed at strengthening the equipment service and training centre of the Ministry of Transport and Public Works. It will also finance the establishment of a transport data collection unit in the National Transport Office and provision of four portable weighing-scales to start random axle-load control on a regular basis.

The project will reduce the backlog in road maintenance. The resulting substantial reduction in transport costs will slow tariff increases to the benefit of both producers and consumers. The Government of Switzerland and of Mali will contribute $10 million and $16.3 million, respectively, towards the cost of the project.

The IDA credit is for 50 years including ten years of grace. It carries no interest but will bear a service charge of $\frac{1}{4}$ of one per cent per annum to cover IDA's administrative expenses.

Harbour work

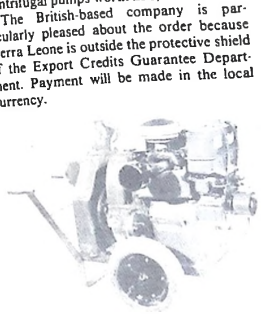
The Nigerian Ministry of Transport has awarded a $196 million contract to Hollandsche Betongroep (HBG), the Dutch contractor, to carry out harbour works involved in the construction of three ship repair yards. HBG's contract represents 80 per cent of the repair yard commission, which it shares with Navimor of Gdansk, Poland.

Working in a consortium, HGB and Navimor will build several docks and quays at Burutu, Lagos and Port Harcourt. A dock capable of handling vessels of up to 150,000 tonnes is planned at Burutu, and at Lagos one for receiving up to 25,000 tonnes. Floating docks for vessels of 25,000 tonnes and 15,000 tonnes are to be built at Burutu and Port Harcourt respectively. Repair quays will be constructed at all the ports, as well as one maintenance quay at Burutu.

Pumps to Sierra Leone

Goodenough Pumps recently sent out the final batch on an order from Sierra Leone for a total of 92 4in self-priming centrifugal pumps worth £56,000.

The British-based company is particularly pleased about the order because Sierra Leone is outside the protective shield of the Export Credits Guarantee Department. Payment will be made in the local currency.



92 Goodenough pump.

The order was placed by Goodenough's local agent Michael's Stores based at Bo in the heart of the country's mining region. As well as mining duties, the pumps will be used for agricultural purposes and on construction sites.

Of the 92 pumps, 30 are fitted with Lister ST2 diesel engines, 26 with Lister ST1 diesel engines and the balance with Honda petrol engines.

Dam contract

A ₦31 million contract has been awarded to **Stirling International Civil Engineering Ltd's** Nigerian company for the construction of the Dadin Kowa Dam on the Gongola River in the northern part of Nigeria. Preliminary work has already commenced and the contract will take three years to complete.

The work consists of an earth and rock-fill dam with a height of 42m and crest length of 500m, a spillway, diversion conduct, power intake, penstocks, power house, switchyard, transmission lines and irrigation release facilities. As well as providing great agricultural benefit, the Dadin Kowa Dam will also supply electric power to the local industry.

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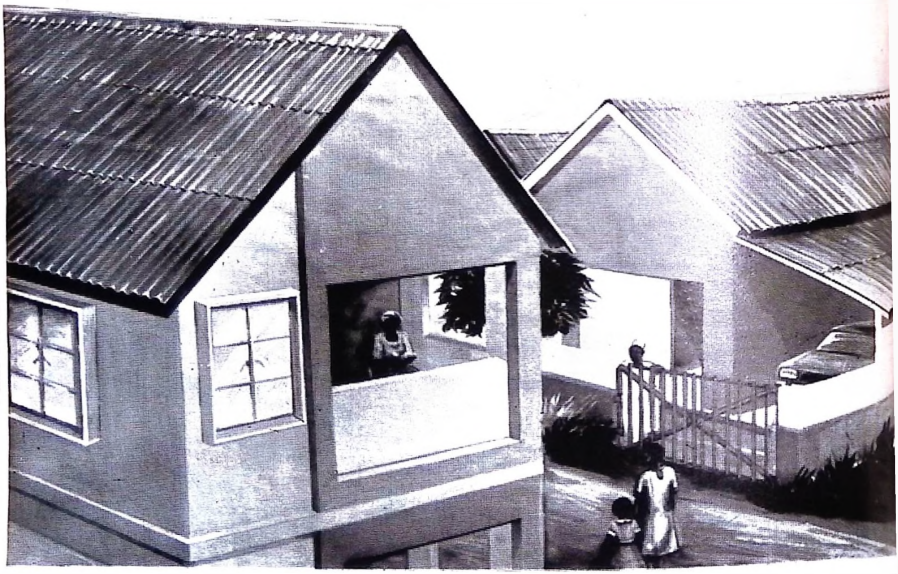

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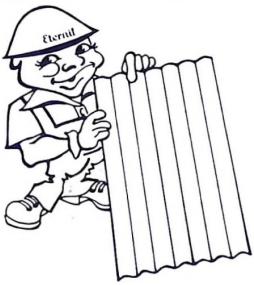

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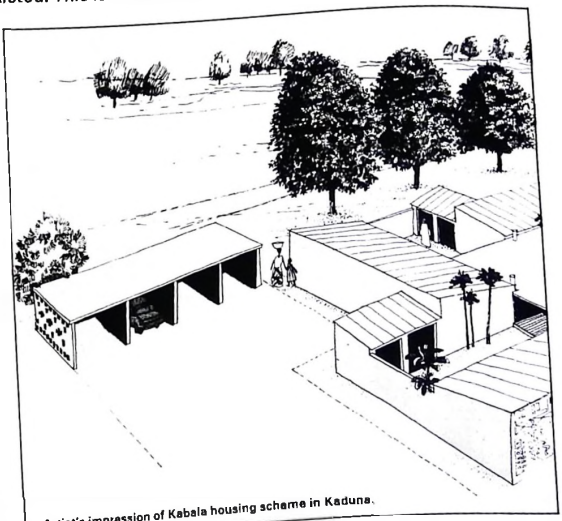
Designing successfully for the third world

Recently a small group of students met, at a north American university, to discuss the problems of third world countries, as they appeared to them. They wanted to examine the nature of these problems – their differences as well as their similarities – and to find out if a common ground existed. This is an edited report of their discussion.

THE STUDENTS involved in the discussions were: from Nigeria Ikechukwu Sylvester Ofudu (Ike) and Ebenezer Olufemi Olarewaju (Femi); from Iran, Mohammad Nourani and Mustafa Ahanchi; from Saudi Arabia Nawaf Attar and Fahad Al-Kowsi; from Brazil, Lilia Duarte.

Femi: The so-called "third world" faces today an ever-increasing barrage of problems. Famine, poverty, political instability and a chronic shortage of skilled labour are some of the problems, to name a few. Although they have a lot of things in common, due to their under-development, each country has, I believe, its own unique features and circumstances. The term "third world" itself is too broad a description for the developing nations of Latin America, Africa and Asia. Most developing countries are in a hurry to develop. They want all the modern comforts and luxuries of the western world. Some of these nations, particularly those who are OPEC members, could probably afford to import western goods to "boost" their standard of living but the majority are too poor to do so. For instance, a careful study of Nigeria's third "national development plan" would reveal that it was nothing more than a "shopping list", rather than a genuine development effort.

Ike: That's a bit hard on our government, isn't it? But I think I know what you mean. I think progress and development in any field can only come through appropriate research and a lot of third world nations seem to have omitted research from their development plans. While the omission may not be deliberate or engineered from any quarters, the persistence of this error can be linked to the false standards which western nations and the mass media have set for these nations. When engaged in design work for the third world, western architects often have little or no resource material on the appropriate socio-cultural characteristics of their client. Many of these architects working in West Africa do their own mini-research before beginning work, but the scope of such studies is often inadequate for the magnitude of design work undertaken. This shows, I think, that there exists a need for an in-depth study of the important parameters of third world design.



Artist's impression of Kabala housing scheme in Kaduna.

Femi: Yes, Ike, you're absolutely right and the fact that broad generalisation and recommendations have been made in most of the limited studies done on third world design problems is, I'm sure, responsible for the small success of western architects in helping developing nations. Western assumptions about building should be challenged in the third world. The design professions as a whole, it seems to me, have been remarkably ignorant about the real needs of our countries. Instead of viewing designs as hypotheses based on more or less explicit criteria and the best available knowledge – or even assumptions – and then evaluated to see whether they performed as expected and feedback, they tend to drop each project when completed. That is, they don't seem to learn from experience.

I'm convinced that cumulative research must be conducted into the specific needs of groups in each third world country, before designs can be largely successful. One of the dangers of over-simplification or generalisation is the tendency to employ a single concept as the major issue in design solutions. Economics is most commonly used as a determinant for third world designs. This needn't be so. For instance, a theory that finds successful application in oil-rich Saudi Arabia may be a total failure in a poor central African republic or in Ecuador, or vice versa. Literature and the work of international agencies often refer to "the urban poor" as the group for whom planning and design are being carried out; this is to me an inadequate definition. Surely economics should be seen as a constraint rather than a determinant. Socio-cultural variables are far more critical

continued

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...ruments of design criteria than econo... technology or construction.

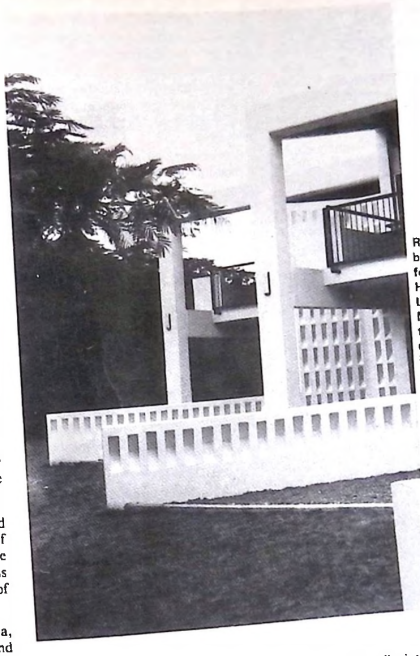
Concern with what has been happening ... built environment in the third world is ... of a wider alarm at the direction of ...gress imposed on the poorer countries ... the industrial countries. Sometimes I ...der if the foreign assistance given by ... industrialised world to developing ...ions is a "curse" or a "blessing". While ...is may have done them some good, the ...ct that cultural variables are often down-...ayed or neglected is cause for a new ...rection. What's good or better shouldn't ...e determined by Western standards and ...ches. Instead life-styles and preferences ...should, in my view, help define this.

Lilia: Yes indeed, I ag... And one country doesn't seem able t... rn from the ...takes of another, which ... pity. Some of our architects in Brazil ...e been put-...g up very expensive, ...eign-looking ...ildings which we don't l... and many people don't want – just b...use Le Cor-...busier built something like ... in France or some American architect ...d it in New York. I think the original ...uildings were also very unpopular in their own countries.

Mohammad: Femi, maybe we should foreign architects who know nothing of our history and little about our culture are building new cities which seem alien to us and totally opposed to our Islamic way of life – and even to our climate.

Fahad: Actually, in Saudi Arabia, extravagantly-designed universities and hospitals, estimated to cost up to 6,000 million dollars, have been planned for construction in one stage, dependent on the most advanced technology. This will mean importing not only all the materials and building equipment but also all the skilled building labour as well. Hence everything has been delayed for eight or nine years. This kind of thing makes me very angry.

Mohammad: Femi, may be we should talk about whether it's possible for each of our countries to develop an indigenous architecture which people can easily relate to, without relying on foreign ideas too much. Do you think Nigeria can do this?



Residential buildings designed for the staff of Hoechst Nigeria in Lagos by Cubitts Nigeria. The aim of the design was to create an impression of space and airiness.

Femi: Yes, I think so; but it's not easy. Some people think we shouldn't even try. But I believe we should and we must. In a developing country where the provision of decent basic housing for the increasingly urban population should be of highest priority, the mere mention of architectural aesthetics may sound like unaffordable luxury. But I don't think this is necessarily so. The lack of identity is known to be a problem in mass public housing. There is no doubt at all that this problem can be reasonably alleviated through appropriate design. I believe there could also arise a sort of "identity crisis" with other building types in third world countries.

Civic buildings, universities, schools, hospitals and other public buildings, designed by foreign architects in Nigeria, might some day become objects of criticism by a more aesthetic-conscious or enlightened public. Already there is an increasing interest among Nigerians in national pride and cultural identity. The recent decision of the Nigerian government to discontinue using our old national anthem composed by a Briton in favour of a Nigerian-composed one is part of a revolutionary trend sweeping across the nation. This happened despite the fact that the old anthem was selected as the best entry in a nationwide competition two decades ago.

While it can be argued that most Nigerians may never reject foreign-architect-designed buildings, the growing nationalistic, cultural and social pride must not be ignored. Hence the search for a Nigerian architecture should be taken seriously.

Nawaf: This is very interesting to me, Femi. Could you give us a few examples of what you would regard as appropriate buildings, in Nigeria?

Femi: Yes, I know a few. There is at present an increasing interest among

continued

Designs for developed countries sometimes fail to meet the needs of an African community.

certain artists and sculptors to create a "Nigerian architecture", using modern materials and techniques. This may be a difficult thing to do, but I don't think it's impossible. Many Japanese architects, after all, have been able to create a "modern Japanese architecture" using modern materials and techniques. Demas Nwoko, a Nigerian artist without formal architectural training, has made some notable attempts to create "Nigerian architecture". I like especially a church in Ibadan which he designed for the Dominican Fathers. The priests built it themselves. It's rugged and rough, but there is something strongly Nigerian about it. It combines sculpture and architecture in a way which is really very convincing and seems to me truly Nigerian.

Robin Atkinson, a British architect practising in Lagos, has done some interesting things at Kainji. Do you remember Kainji? There was a dam built across the river Niger and a huge lake was created as part of a government-sponsored electricity generating scheme. 42,000 families were made homeless by the creation of the lake and Atkinson had to provide new villages and towns for them. He did a good job. His aim was that each new community "would adjust easily to its new houses through recognising familiar shadow patterns, colourings, forms, planning arrangements and density." That was how he put it; I memorised his words. The new dwellings had laterite-coloured, sandcrete block walls and curved, asbestos-cement roofs – easily erected by the villagers themselves. Most people seem to have liked the design – the architect claims a 95 per cent acceptance – and the new communities are now well established. The 5 per cent were mostly farmers – the Kamberi, who moved out after a short stay and built themselves old-style houses a few miles away.

There is also Kaduna, of course. A survey of housing conditions there, carried out some years back by students at Ahmadu Bello university in Zaria, was followed by an enlightened strategy for new housing. It's objectives were pretty good.

First: to achieve strong byelaw and building control and yet avoid a stereotyped rigidity.

Second: to eliminate careless, thoughtless and haphazard developments, while preserving flexibility.

Third: to lay down firm environmental standards of layout and detailed design, while leaving room for experiment and sensitive adaptation to each site.

Fourth: to train an efficient team of professionals to urge people to higher standards of self-help.

Nothing came of all this, as far as I know, but it seems to me that this is the kind of thinking which will one day lead to a truly Nigerian architecture.

Ike: Well, Femi, we talked about research earlier in this discussion and I think it's a subject you're rather keen on; as an essential preliminary to action. So what should Nigeria be researching into, would you say?

Femi: Actually, research is the subject of my graduate thesis here. I've set myself seven questions which I'm going to try to answer, through research into existing (and probably new) theories and pragmatic methods. They are:

1. How can a "less-developed", largely non-industrial nation like Nigeria build a modern environment to enhance the ability of its citizens to pursue a better life?
2. How does one define or determine what is the "good" and modern environment for Nigeria?
3. How can the issues arising from the conflict of African and Western cultural values be effectively resolved, as it relates to architecture and urban planning?
4. What roles should expatriate architects play in developing Nigerian architecture?
5. Is a modern Nigerian architecture already in the making?
6. What is the appropriate technology for Nigeria?
7. How can Nigeria deal with slums and unplanned settlements?

I believe that what's needed in the study of third world design is not so much a generation of new theories as it is to effectively transmute and modify existing theories to enhance the formation of a cumulative body of knowledge. How do you like my seven questions?

Lilia: Well, Femi, if you answer those seven questions Nigeria will have a blueprint for success.

From polders to piles

Delft Soil Mechanic Laboratory's work in West Africa

BECAUSE THE Dutch live in a delta-formed country, where the coastal areas are situated some four to six metres below mean sea-level, Dutch civil engineers have always been confronted with the problem how to protect their country against flooding.

Sediments of the rivers Rhine and Maas, deposited in this delta area, consist often of very soft clays, on top of which, centuries ago, rost swamps existed, forming a peaty overburden. The Dutch started to reclaim large flooded areas by creating polders,* where the land was pumped dry with help of windmills.

Foundation problems

Thus the Dutch were already specialists centuries ago in the most difficult foundation problems, building huge protective dikes along the rivers and their coastline, together with all the necessary structures like sluices, weirs, ship-locks, harbours, etc.

The soft sediments in the subsoil also caused many problems in the foundations of ordinary houses and buildings, especially in a big city like Amsterdam, where wooden piles were used for the foundation of almost every structure.

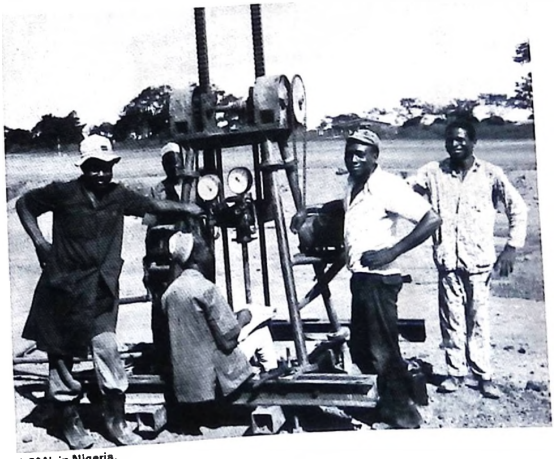
Over the centuries these foundations were built and designed by engineers working from experienced intuition, but gradually the need for scientific design became increasingly important.

The Delft Soil Mechanics Laboratory§ (DSML), founded in 1934, is an independent scientific consulting and research institute in the field of soil mechanics and foundation engineering, with a staff of 300, including 70 specialist engineers with higher university degrees. The famous Dutch Cone Penetration Test has been developed by this institute some 40 years ago and ever since has been improved to a very sensitive *in situ* test, by which strength and friction properties of the subsoil can be measured.

The same hydraulic equipment for driving the cone into the subsoil is also used for many other purposes, amongst others to measure the *in situ* density in the subsoil and to perform continuous borings in cohesive and granular subsoils with continuous samples up to a length of 20m.

** Piece of low-lying land reclaimed from the water.*

§ PO Box 69, 2600 AB DELFT, The Netherlands.



DSML in Nigeria.

The site investigation and consulting services of DSML are worldwide, especially in those countries where soil mechanical problems arise, which resemble the particular soil conditions with which the Dutch familiarised themselves: foundations on soft soils; piling problems; foundation problems for marine structures.

The organisation has carried out a number of projects in West Africa. In Gabon an oil-jetty at Cap Lopez for 250,000-ton tankers was constructed in 1975 on open-end steel tube piles diameter 2.75m for the jetty and diameter 1.067m for the trestle.

In this area the 8m-thick upper sand-layers had a natural density very close to the critical density and therefore, to avoid the risk of sand-liquefaction, 60m-long piles were designed with a penetration depth of 30m below seabed level.

The piles of the breasting dolphins have been driven into the subsoil with steam-block driving equipment, MRB 2500. However, in order to penetrate these piles to the prescribed depth, water jetting combined with air-lifting techniques had to be used, causing an unexpected settlement of 2.2m and a lateral movement of 1.06m of the piles.

At this stage DSML was consulted. In order to avoid stagnation of the work DSML advised the contractor to continue driving the piles down to the prescribed depth. In the meantime DSML started to investigate the subsoil in the area close to the piles with deep Dutch Cone Penetration Tests and simultaneously on a location not influenced by pile-driving for comparison. It was found that the sand-stratum around the piles within an area with a radius 2.5 to 4 times the pile diameter had been disturbed by jetting and air-lifting.

DSML advised to improve the bearing sand-stratum by artificial compaction, by means of vibro-flotation techniques (Rüttel-druckverfahren), for which DSML also prepared the specifications and checked the results, again with Dutch Cone Penetration Tests. DSML also advised for ELF-Gabon new quay-walls at Cap Lopez and Port Gentil and advised on oil-storage tanks.

At Pointe Clairette in Gabon DSML advised in 1976 the foundations for an

continued

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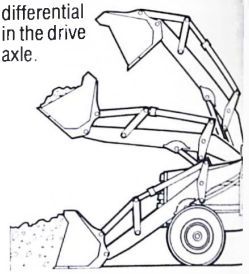

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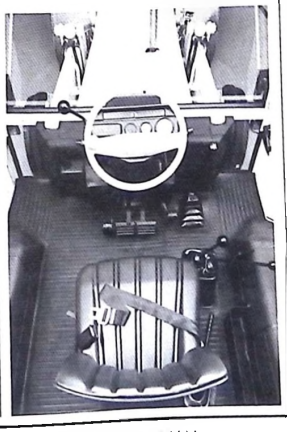

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LOADER SHOVEL CAPACITY	m^3 yd^3	0 9 1 25	1 0 1 375	1 0 1 375
LOADER BREAKOUT FORCE	kgf lbf	5410 11928	5410 11928	5410 11928
LOADOVER HEIGHT	m ft in	3 14 10 3½	3 14 10 3½	3 14 10 3½
EXCAVATOR DIG DEPTH	m ft in	4 28 14 1	4 74 15 7	— —
EXCAVATOR REACH AT GROUND LEVEL	m ft in	5 41 17 9	5 86 19 3	— —
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aluminium-factory including the foundations for storage tanks. For these tanks settlement predictions and stability calculations have been made.

Nigeria

In Nigeria the National Petroleum Corporation appointed DSML as their main foundation engineering consultant, mainly to work on the foundations of tank-farms (tank-depots). These tank-depots consisting of five to 16 tanks with heights up to 16m are located all over the country, in order to distribute oil, petrol and other oil-products throughout Nigeria and are supplied with these products by pipelines. At the moment (1981) consultancy is given about another tank-farm on Bonny Islands, near Lagos. For these projects DSML is assisted for site investigation work by the local firm "Foundation Engineering Ltd" of Lagos.

Other projects in Nigeria include foundation consultancy for quay-walls and dredging advice at Port Harcourt (1978), power-station at Sapele (1975).

In Senegal DSML carried out site investigations and gave foundation advice on a shipyard and dry-dock at Dakar. In Sierra Leone, the group gave advice on the foundation of a sugar factory; and in Angola, it is currently carrying out site investigation and giving foundation advice at the oil terminal at Sojo.

Delft Soil Mechanics Laboratory working in Gabon.

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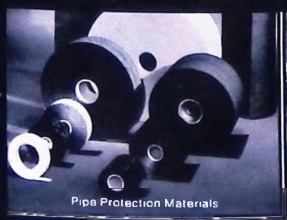
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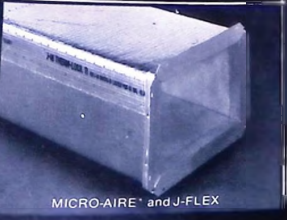
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Repairing cracked concrete

Dr Israel Berkovitch looks at the faults which can arise in hot, arid regions, in the course of mixing and applying concrete. He goes on to consider whether badly damaged concrete can be effectively repaired.

IF CONCRETE cracks or walls can it be readily, reliably repaired? In fact, techniques are now available that are claimed to restore broken concrete to its original strength, although debates continue among experts on the best approaches for long-term durability. But, on the principle that prevention is better than cure, let us first consider the question why should concrete fail in the first place?

In the Reading List, I have given references to a number of valuable guides on causes of such failure and ways of preventing it.[1,2,3,4] A. J. Newman of the Building Research Establishment (BRE) paper summarises the *practical steps* for achieving a concrete of uniformly good quality, as these:

(i) Using good materials;
(ii) proportioning the mix correctly;
(iii) using the correct water-to-cement ratio;
(iv) mixing adequately;
(v) compacting well;
(vi) ensuring proper curing;
(vii) constantly testing the concrete both in the plastic and the hardened state.

In hot climates there are extra difficulties because the concrete sets more quickly so that less time can be allowed between mixing and placing; in addition, the surface dries out, promoting both cracking and drying shrinkage; reinforcing steel may corrode quickly – this temperature effect may be aggravated if there are corrosive salts in the water or in the aggregates; if reinforcing steel is exposed to direct strong sunlight, it may become so hot that it affects the drying and setting of the concrete near the steel.

Good practice

Consequently, making good concrete in a hot country calls for attention to the basics of good practice as set out above, and also extra care to deal with the consequences of the hot conditions. Thus, the surface where the concrete is being laid, the reinforcement (if used), should be shaded and kept as cool as possible. So should the ingredients – by shading the stockpiles of solids, spraying the aggregates if possible, burying pipes, bringing water and screening water tanks.

After the mixed concrete has been placed, it should be covered to prevent it from drying out before curing. Possible methods are covering it with sacks or hessian, or with a polythene sheet, or even spraying on an impervious film. Many of the difficulties can arise from bad local workmanship due to inexperience of men and supervisors. But similar troubles have arisen when experienced companies, usually from Europe, have done the jobs using European techniques not properly adapted to the local conditions. However, contractors have now learnt from these earlier experiences in developing countries with hot climates and this should result in much better concrete structures. What is recognised is that the whole system of working, not only the materials, has to be geared to the local circumstances – paying attention to workers needing training and close, helpful supervision, and also to the special requirements of coping with the hotter ambient conditions.

Repairing faultry reinforced concrete beam by vacuum impregnation, Italy.

Meanwhile there remains a crop of defects from the inexperienced activities of earlier days calling for remedial work. Within the concrete there may be porosity and large voids, with corrosion of reinforcement; some of the faults may be merely unsightly – such as spalling, surface crazing or cracking – but in other cases severe development of faults may threaten structures.

Probably about three-quarters of the faults are on the surface. Yet this does not mean that repairs are simply "cosmetic". A fault may start off as a crack and may then grow or be aggravated by corrosion. So it is important to repair cracks effectively.

Repair techniques

In repairing concrete, the aim is of course to restore the strength of the structure in a durable way for the minimum cost. It was formerly thought that all faulty parts had to be cut away, mechanical bracing used where necessary and new concrete placed and properly bonded to the old. Some authorities continue to hold these views but there are consultants and companies that carry out repairs with minimal removal of old material by using injections of mixtures including resins.

The injection may be based on producing a vacuum inside the cavities to be filled and allowing the resin-mixture to enter due to the effect of atmospheric pressure; or it may be based on pressurised injection. Using the latter method, P. C. Hewlett and colleagues have reported[3] tests on cracked beams repaired by injecting epoxy resin mixtures. Applying vibration tests, deflection tests with repeated load reversal and loading tests with incremental increase in loads, they showed that the repairs restored the structural integrity of badly cracked beams; repaired beams were stiffer and stronger than the original intact beam before cracking.

In techniques of this kind the crack face is sealed over, then a hole made in it so that the resin can be injected. The resin – usually a two-part epoxy or polyester – is mixed immediately before being injected. Extensive trials have covered such important practical matters as how far apart to space the injection points, for different widths and depths of crack. On slightly wider cracks a tube may be inserted to deliver the resin deeper within the cavity;

continued on page 97.

Komatsu Wheel Loaders

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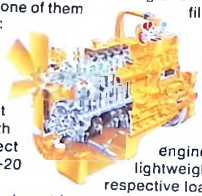

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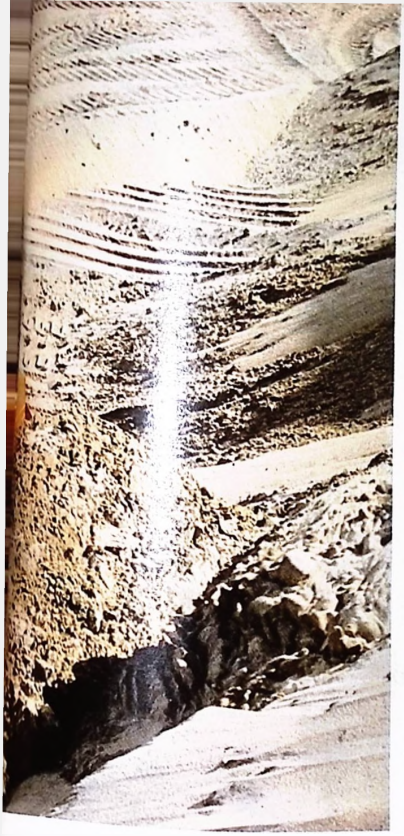

Main Specifications

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Standard bucket capacity ..... 1.4m³ (1.8 cu. yd.)
Operating weight ..... 8,030kg (17,670 lb)

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Flywheel horsepower ..... 105 HP
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Flywheel horsepower ..... 152 HP
Standard bucket capacity ..... 2.3m³ (3.0 cu. yd.)
Operating weight ..... 12,300kg (27,120 lb)

W120
Flywheel horsepower ..... 200 HP)
Standard bucket capacity ..... 3.3m³ (4.3 cu. yd.)
Operating weight ..... 16,330kg (36,000 lb)

W170
Flywheel horsepower ..... 239 HP
Standard bucket capacity ..... 3.5m³ (4.5 cu. yd.)
Operating weight ..... 19,080kg (42,070 lb)

W260
Flywheel horsepower ..... 415 HP
Standard bucket capacity ..... 5.7m³ (7.5 cu. yd.)
Operating weight ..... 34,450 kg (75,950 lb)

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	General Purpose Bucket m³ (cu. yd.)	Spade Nose Bucket m³ (cu. yd.)	Multi-Purpose Bucket m³ (cu. yd.)	Light Material Bucket m³ (cu. yd.)
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W70	1.5 (2.0), 1.7 (2.2)	—	1.4 (1.8)	1.9 (2.5)
W90	2.3 (3.0), 2.1 (2.8)	2.1 (2.8)	1.7 (2.2)	—
W120	3.3 (4.3), 2.9 (3.8)	2.9 (3.8)	—	—
W170	3.9, 3.5, 3.1 (5.0), (4.5), (3.9)	3.5 (4.5)	—	—
W260	5.7 (7.5)	—	—	—

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Systems building
– part 4

In this fourth part of a series on systems building, our Special Correspondent looks at the systems marketed by two companies in West Africa.

PREVIOUS ARTICLES in this series have looked at a number of different building systems which are available to suit the West African market. One system that has been used successfully in West Africa as well as other parts of the world is **International Housing's** Con-Tech system; it has been used in Abidjan for the last four years and in Nigeria for the last 18 months by Kramer-Italo.

Con-Tech is a patented concrete forming system marketed throughout the world by International Housing Limited. With this system, attractive, comfortable, economical and functional buildings can be built by local unskilled workers. An unskilled crew can be trained to produce a basic living unit in as short a time as five working days.

Scope

The system can be used for housing, offices, warehouses, factories, stores, schools or hospitals. The uses are virtually limitless. It utilises modular cast aluminium moulds to form concrete into textured interior and exterior walls.

A typical mould panel 0.61m by 2.44m weighs only 39.5kg. They are easily transported, assembled, erected and disassembled and stored. Moulds are precision engineered to within 0.8mm to eliminate unsightly construction joints and produce a continuous pattern of brick or smooth surfaces. Trouble-free alignment and a freestanding, rigid moulding system consistently produce straight walls of uniform thickness.

A system of steel ties and pins and wedges speeds and simplifies mould assembly and dismantling. The makers claim that the durability of these moulds is such that their life will exceed that of any other known forming system.

An average crew of eight workers can assemble the moulds for a 74m² house and pour the concrete in in less than a day. The moulds for an entire structure are set up so that both interior and exterior walls – using the chosen texture – can be poured simultaneously. Any suitable concrete handling equipment can be used for filling the moulds with an appropriate concrete mix. If equipment is not available, the mould cavities can be filled manually. Walls of up to 3.05m require no outside support.

Easy and quick erection is an attractive aspect of systems building.

The Con-Tech system is inexpensive when compared to total house cost and can represent as little as one per cent of the cost of construction. It is readily expandable at any time should larger or different structures be desired.

The finished building will be fireproof, impervious to rodents, insects, rot and decay as well as being functional and attractive. Furthermore it will be resistant to extremes of climate, such as hurricanes and earthquakes and maintenance is kept to a bare minimum since reinforced concrete requires little care over years of use.

Prior to actual construction, planning and architectural support is available from technical support staff at IHL. Modulated drawings provide a precise mould pattern to determine the exact needs of the client, and for simplified mould erecting sequence on site.

Client's discretion

The client may select different textured panels for outside and inside walls, accent walls, garden walls etc. because the moulds are all mechanically compatible. Intermediate floor and roof concrete slabs can be best accommodated with the Con-Tech smooth pattern moulds used in conjunction with a wide variety of accessories also offered by the company.

Once the reinforcing steel and rough plumbing are fixed in the floor slab and tied into the wall structure, the electrical harness is tied to the reinforcing steel, and the electrical outlet boxes are secured to the inside face of the moulds as they are being erected.

The moulds, when completely erected, form a cavity in which concrete is poured, and the reinforcing steel, plumbing and electrical assemblies become an integral part of the wall structure.

Wall moulds are generally stripped from newly poured walls within 24 hours or less, making way for the intermediate floor slab or roof slab mould erection.

In multi-storey buildings, the sequence is repeated from one floor to the next. Walls formed with the Con-Tech system represent both inside and outside finished surfaces, requiring only a coat of paint as a final step. Clean-up and expensive scrap are minimised, saving the contractor both labour and materials cost.

The system maximises the use of local materials and labour. The training period for unskilled workers rarely exceeds three to four weeks, and IHL staff will assist in training programmes.

Another company with a proven building system is Condor. Condor's International Building System (IBS) is designed to provide a rapid form of construction for single or multi-storey buildings such as offices, schools, hospitals and hotels, etc.

Freedom

The system allows a high degree of architectural freedom and also the use of local materials and constructional re-

continued

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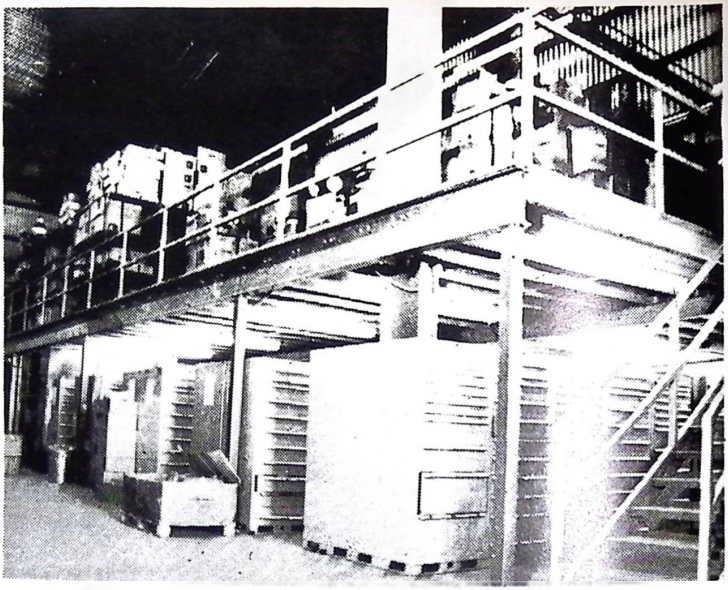

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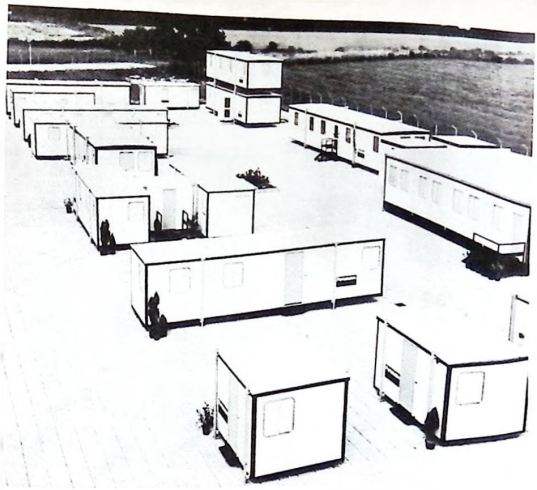

Portakabin units are particularly popular among contractors working in Nigeria.

Roof types

Two basic roof types a... available with ...e system; the first is a o... in 20 shallow ...pitched roof, the other a fl... where regular ...access to the roof is re...ed. The alu- ...minium pitched roof has t...ee projections ...to choose from — 1,500m... at eaves with ...either 1,500mm or 800mm at the gable ...end; 1,300mm where no gutters are re- ...quired, or a nominal 250mm overhang.

Both the flat roof options have a nomi- ...nal pitch of one in 60 to avoid ponding. The built-up flat roof shares the same basic ...specification as the pitched, but has an ...extra layer of felt and either 8mm thick as- ...bestos pr 25mm thick concrete tiles.

Three basic wall cladding treatments are ...available – lightweight (with a variety of ...meeting offered), composite panels offer- ...ing high speed construction, and local block or stonework.

Lightweight claddings consist of a non-load bearing pre-engineered, galvanised steel channel, studding system to which the external and internal claddings are fixed. Claddings include pre-coloured aluminium vertical ribbed sheets, white aluminium shiplap boarding, aggregate faced panels and external quality sprayed rendering finishes. Lining panels are normally plasterboard, but other materials are available for high humidity conditions.

The composite panels offered are pre-finished internally and externally and are simply bolted to the structure at the floor and ceiling. They are usually available in modular widths and a range of thicknesses, according to the 'U' value required. Local blockwork or stonework of up to 300mm thickness including any rendering can be accommodated.

In addition to a standard range of storey height door and window units, certain other types or proprietary units can be used, including timber frames. All units, in either mill finish or clear anodised aluminium, are factory pre-glazed using neoprene gaskets and 'snap in' glazing beads to enable easy maintenance in case of future breakage.

Most proprietary partitioning systems can be incorporated into IBS, using solid, half glazed or fully glazed demountable systems.

Condor Ceiling incorporates built-in trunking for electric wiring and provides support for light fittings and similar equipment, which clip directly to the ceiling framing members. The ceiling will provide up to two hours fire protection and maintains its shape under fire conditions, holding the ceiling boards in place and protecting the steelwork to the floor above. For maximum economy, a simple plasterboard under purlin lining can be used instead of the Condor suspended ceiling.

Lighting circuits are at a high level and run through either concealed or surface mounted ducts according to the standard of finish and economy required. Mains/power and telephone circuits are located within the twin-compartment skirting and can also be incorporated in the trunking grid.

Air conditioning can either be provided by using individual units fixed into the bottom panel of the 1,200mm wide window units, or by a central station with ducting in the floor and roof zones. ●

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ntinued from page 87.

n much wider ones there will be a cemen- sious fill and the tube will be inserted to eliver the resin mixture as a final stage.

To improve the wetting of the concrete urface, the composition may be improved y wetting additives. All the operations are arried out under careful control – meter- g the resin flow, pressures and propor- ions. In field trials repaired parts have een sampled by drilling out cores intact to examine them.

When the vacuum impregnation method s used, the area is shrouded with a flexible membrane, air is extracted by a vacuum pump. When the pump is disconnected, the resin mixture is allowed to flow into cracks, pores and voids by the pressure of the atmosphere. This has been successfully applied[6] in repairing roads, bridges and other structures in many sites in hotter countries. Incidentally this method can also be applied for preserving natural stone, including archaeological treasures that are crumbling.

Though the work calls for experienced concrete consultants and contractors, it is useful also to be aware that there is a UK federation of resin formulators[7] who

specialise in products for civil engineering and building and can help users in choosing the composition most appropriate for a particular application. It should also be noted that sprayed concrete, which I surveyed briefly in WATR in July 1980, p.119, may be used for repairing slab concrete. Possible techniques[8] are as a final stage to form a satisfactory uniform surface after a repair (to "hide" the repair) or for building up and strengthening structures that might appear liable to begin breaking down.

Chloride attack

Where there is clear indication of chloride attack on steel reinforcement, it is essential to hack out covering concrete, and even then anything that is done is only a palliative buying time. Yet the life of the affected structure can successfully be prolonged by exposing the reinforcement, priming the steel with etch primer, phosphating it, and patching it with protective resin and mortar. When there has been sulphate attack, it is better to blanket the whole area with protective resins and also repair by means of sulphate-resisting cements in the mixture applied. Dealing with these issues is a difficult specialist problem since it may be necessary to find ways of preventing primary electrical cells from being set up causing severe continuing corrosion.

Because of the fact that a repair may look satisfactory at the time, but may cause later trouble, it is essential to take care in appointing contractors or consultants. It is safer to seek out and use only those with established names and reputations, who usually have research facilities behind them and to insist on some undertaking in respect of the work. ●

Further Reac

1. *"Problems of concre... action in arid climates." Overseas Building Note No. 139, 1971. Building Research Establishment, Garst... ts, UK.*
2. *"Concreting in hot w... " by D. E. Shirley. Cement and Concrete Association, Slough, UK.*
3. *RILEM. "Concrete ... einforced concrete in hot countries." Proceedings of an international symposium, Haifa, Israel. 1971.*
4. *ACI Committee 305 ... l weather concreting." J. American Concrete Institute. Proceedings, Vol. 74, No. 8, Aug. 1977, pp.317–3...*
5. *"Advances in slab te...logy", edited by R. K. Dhir and J. G. L. Munday. Chapter on "Re-bonding of fractured elements includ...floor slabs," by P. C. Hewlett et al. Pub. by Pergamon Press, UK, 1980.*
6. *Contract Journal, Ma... 8, 1979; Surveyor, Sept. 27, 1979.*
7. *Federation of Epoxy Resin Formulators and Applicators Ltd, 2a High Street, Hythe, Southampton, SO4 6YW, UK.*
8. *Concrete International 80. "Sprayed concrete." Construction Press, London 1980.*

Construction machinery hydraulics

In part two of this series Eric Meadows looked at a few basic definitions and the characteristics of hydraulic oil. We now move on to define the "language" of hydraulics and the simple mathematics necessary to understand what is going on inside the system.

IN LAYMAN'S language, the terms force, work and power often become confused but it is essential to understand their exact meaning quite clearly because the terms appear often in hydraulic engineering.

The scientific definition of force is:–

"That which, when acting on a body which is free to move produces an acceleration measured by the change of momentum."

In more simple terms it means that if a force is applied to something which is not fixed, it will move, providing that the force is great enough to overcome its weight. Until the introduction of SI units of measurement, there was no practical difference between force as the cause of acceleration and force as a weight. The same units, units of weight, were used to measure both because the most simple way of determining a force is to weigh its effect. Engineers just added the symbol f to their lb or kg weight to signify lbf, pounds force, or kgf, kilogrammes force. The SI unit of force is the Newton, symbol N, explained as:–

The force required to impart, to a mass of one kilogramme, an acceleration of one metre per second per second. $1N = 1kg\ m/s^2$)

Relationship of units in current use.
One kilogramme force (1kgf)=
2.2046lbf=9.8066N
One pound force (1lbf)=
0.4536kgf=4.4482N
One Newton (1N)=0.2248lbf=
0.1020kgf

Work

Work is said to be "the manifestation of energy," and means the involvement of mechanical effort, either as the input to, or the output from a piece of machinery. The idea of work expressed as moving a weight through a distance and the unit by which it is measured, is a compound of both the distance and the weight. The standard Imperial unit is the foot pound (ft lb) and the standard metric measure is metre kilogramme (m kg). The SI equivalent is the Joule, symbol J, performed when a force of one Newton moves its point of application through a distance of one metre. As a lifting action against a resistance, work can be described in one of two ways. From the side applying the effort it is termed "exerting energy;" from the resistance side it is called "doing work." In other words, overcoming the resistance an object offers to being moved will require the exertion of energy. On the other hand, the man exerting the energy is said to be doing work.

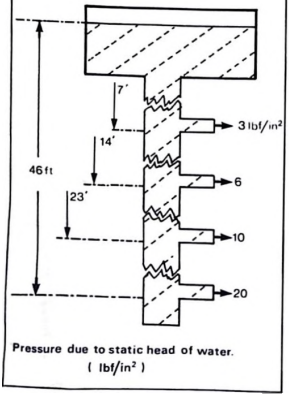
Relationship of units in current use.
One foot pound (1ft lb)=
0.1383m kg force=1.3558J
One metre kilogramme (1m kg)=
7.2330ft lb force=9.8069J
One Joule (1J)=0.7375ft lb force=
0.1020m kg force.

These are the units which are convenient for the calculations involved in hydraulics but any combination of distance and weight, inches ounces, centimetres, grammes, etc., which convey the idea of moving a weight through a distance, can be used where they are applicable.

Power

Power is a word often used out of context to signify almost any form of energy but power is really the rate of doing work and is correctly defined as "work qualified by a time factor." It takes exactly the same amount of energy to lift a 20 kilogramme weight to a height of 5 metres in a time of one minute as it does to lift it in 10 minutes. However, much more power will be required to lift it in the shorter time. Power is measured by the Horsepower, symbol hp, and one hp is equal to 33,000ft lbf of work done in one minute.

Fig 2



Horsepower

The [illegible]power came into being when James [illegible] was developing the steam engine [illegible] required a comparative unit of measure[illegible] of power between one machine [illegible] another. He experimented with [illegible] pulleys and weights and decid[illegible] the work output of a horse was [illegible] lbf per minute. In point of fact, this [illegible] is considerably higher than any horse [illegible] capable of sustaining for any length of time but it provides a convenient unit. Standard metric horsepower is the Cheval Vapeur, symbol CV, which means quite literally "steam horse." It is very nearly the same as the Imperial hp and 1hp=1.0139CV. The continental machinery makers often use the German word for horsepower "Pfedestärke." symbol PS. To make for even more confusion, many continental makers use the French phrase Force de Cheval, symbol CH. However, the value of all three units, CH, CV, PS is the same.

The SI unit of power measurement is the Watt, symbol W, and it is equal to a power output of one Joule per second (1W=1J/s). Watts are used as the units of power measurement irrespective of the type of power, electrical, mechanical or heat.

Relationship of units in current use.
One horsepower (1hp)=
1.0139 CV, CH or PS=745.7W
One metric horsepower (1CV)=
0.9863hp=735.4989W
One Watt (1W)=1.34102×10^{-3} hp=
1.35962×10^{-3}CV

Hydraulic horsepower is a function of the pressure in the system and the rate at which the oil is flowing. It can be readily calculated, either as power output or as the power required to drive a particular system. For purely comparative purposes the losses due to system inefficiency can be disregarded and the following formula will give the answer.

$$\text{Hydraulic horsepower (H hp)} = \frac{P \times V}{K}$$

continued

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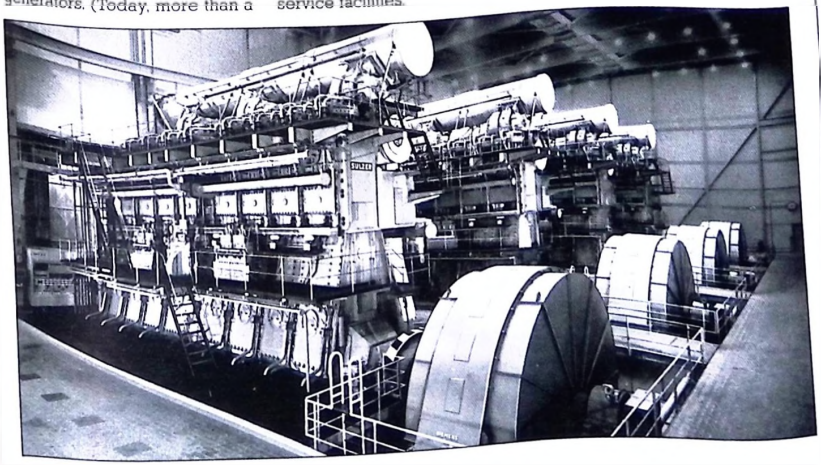

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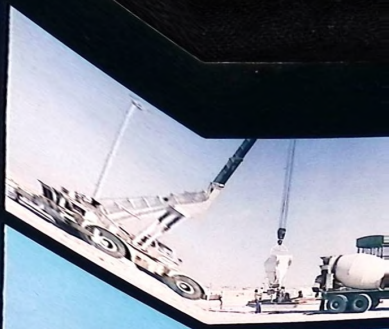

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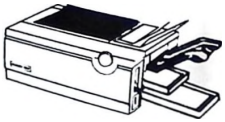

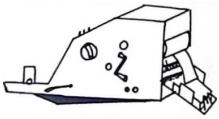

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and V = volume flow in US g/m
$K = 450$ when pressure is in kgf/cm^2
and volume is in l/m

Using the SI:–
Power in Watts = volume of flow in m^3/s x pressure in N/m^2
(Note: the Newton per square metre is sometimes called the Pascal, symbol Pa. The value is the same, expressed as $P = q \times P$.)

One has to be somewhat careful when calculating hydraulic problems involving American comonents or machines because much of the literature and manuals make no mention of the US gallon, which is smaller than the Imperial gallon. It is very easy to make mistakes because the American pint only contains 16 fluid ounces against the Imperial pint of 20 ounces.

Therefore:–
One American gallon (1USg) = 0.8327UKg = 3.7854 litres.
One Imperial gallon (1UKg) = 1.2009USg = 4.5459 litres.
One litre (1 litre) = 0.2200UKg = 0.1832USg.

There are only two energy "elements" present in a hydraulic system, apart from energy losses which manifest themselves as heat. It is essential that these energy forms are not confused because their actions are separate and work in entirely different ways.

Pressure

Pressure is the term used to define how much weight or force is being exerted against a given area. Its measurement has become very complicated in recent years by the introduction of far too many scales of units. The most common way to quote pressure is to state the force as a weight, as pounds force, (lbf) and the area in square inches (in^2). In standard metric this is kilogrammes force (kgf) and square centimetres (cm^2). Europe has used the Atmosphere as a measure of pressure for many years because, for all practical purposes, one Atmosphere is equal to one kilogramme per square centimetre, (1 Atm = 1 kgf/cm^2).

The Bar is another unit in fairly common use and it has almost the same value as the Atmosphere. Care must be taken when using these measures that quantities are quoted in "gauge" rather than "absolute", otherwise discrepancies may arise. The SI unit of pressure is the N/m^2 or the Pa.

Pressure Gauge = Pressure Absolute – 1
Pressure Absolute = Pressure Gauge + 1

As has already been stated, a liquid is incompressible and it is this feature that allows oil to be used in a hydraulic system to transmit power. For example, it will be found impossible to push a cork into a bottle absolutely full of water because, the water being incompressible, there is nowhere for the cork to go. Try driving it in with a hammer and the resulting pressure rise in the water will break the bottle. This proves that when a load is applied to a confined fluid there is an increase of pressure. A gas would change its volume, a liquid will not and this is the 'secret' of how a hydraulic system works.

Flow

Flow is the other energy 'element' present in a hydraulic system and is described as movement in a fluid due to different pressures at two points. The domestic water supply is a good example of this. By storing water in high level tanks a pressure is created in the distribution pipes. The outside of the household tap is at atmospheric pressure so, when the tap is opened there is a pressure difference and the water flows out. Fig 2 In a hydraulic machine, pumps are used to impart a flow to the oil and push it round the circuit. Flow is measured in one of two ways:–

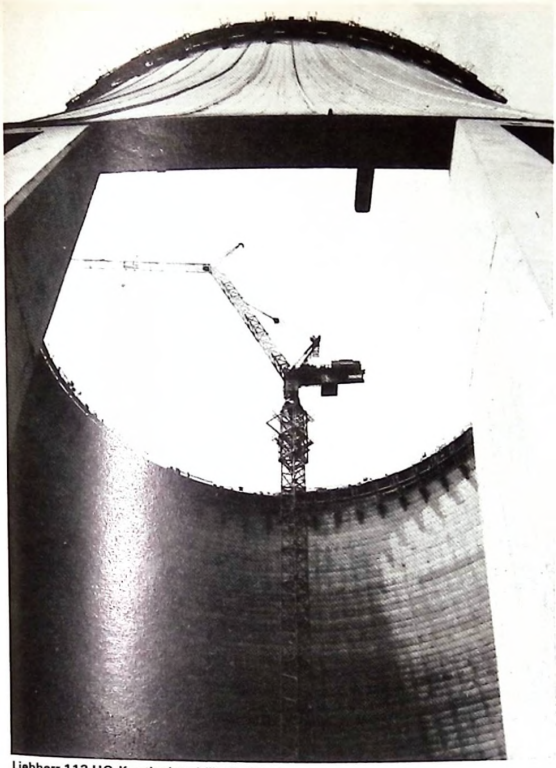
Velocity: the speed of the oil past a fixed point as feet per second or as metres per second.

Rate: a measure of the volume of oil flowing past a fixed point in a certain time. The flow rate is measured in gallons per minute or litres per minute or, in SI units, as m^3/s.

The rate of flow in a hydraulic system determines the speed at which it will work because it is the volumetric displacement which affects the speed of the actuators. The following little jingle will help in remembering the functions of pressure and flow:–

Pressure just **provides the thrust, Adding flow will make it go.**

TOWER CRANES



Liebherr 112 HC-K articulated-jib climbing tower crane.

In about thirty years, tower cranes have become almost indispensible for erection of high-rise buildings and have cut the cost of more simple projects. Eric Meadows looks at some of the features of these machines.

THE TOWER CRANE has many advantages to offer the modern constructor; access to a wide area from one standpoint, fast servicing of a site with materials and supplies, operation from a central storage area, reduction in access scaffolding and the elimination of independent hoists and, perhaps most importantly, low operating costs.

The term tower crane has expanded its meaning since it first appeared in construction machinery terminology as a simple, long reach, fixed position variant of the builder's hoist. Today the tower crane is made in a great many formats and sizes ranging from the small units used for building houses and similar low height structures, to the massive machines capable of overreaching multi-storey erections.

Variants of the tower theme, such as the climbing crane are made to work, not from ground level, but from within the building itself with the tower portion rising with the building, often mounted within a lift shaft. As the height of the building increases, the tower is raised by jacks so that it always overtops the construction and its long jib can take the hook to any part of the work in hand.

The type of mounting for ground-level working cranes is a matter of choice based on the working area to be covered and includes mobiles on railwheels, crawler tracks or pneumatic tyres, or fixed position machines intended to work from one position for some considerable time. Fast travel machines are built and mounted on road vehicles with a system of outrigged jacks to achieve stability in the working position.

The tower crane offers the designer some intriguing problems because its usefulness is based on two irreconcilable factors, outreach and lifting capacity. It is obvious that the further a load is hung from the centreline of rotation of the tower, the greater will be the overturning moments. Unlike a simple jib crane where most of the moments can be resolved within the chord members of the boom, the tower crane has to cope with massive moments of the tower structure imposed by both the weight of a very long jib and the weight on the hook. This is one reason why, despite their massive size, tower cranes have a comparatively small lifting capacity, although the outreach they achieve, especially in terms of overreach/outreach, cannot be matched.

Wind loading, too, assumes serious importance. When the wind speed exceeds a calculated level, work must stop because of the danger of overturning. Most modern tower cranes, especially the tall ones and those designed to work in known areas of high wind, fit an anemometer as standard equipment. When the anemometer reading reaches the danger mark, the jib is left to freewheel in the manner of a weathervane to reduce, as far as possible, the loading on the structure. Despite their flimsy looking structure, there is a large area of metal exposed to wind pressure, especially when the jib is at right angles to the wind direction.

One of the best known tower-crane makers is the French company, Potain, who put its first saddle jib crane on the market in 1953 and since then claims to have supplied 50,000 cranes to all parts of the world and currently hold about 25 per cent of the international tower crane business.

Modular systems

From the original concept of single purpose-made units, design thinking has extended to produce cranes having a large number of common components so that a cranage system can be built up. One of the Potain range, the Topkit, falls into this category. The idea is to produce a series of cranes from standard components so that the user can specify his exact needs and the crane can be assembled by simply adding or removing components. The Topkit range consists of twelve machines which can be assembled to lift up to 20 tonnes and have jib lengths up to 65m. Mounting varies from rail wheels, portal frames or fixed position, with or without portal frames, or they can be arranged as climbing cranes.

The modular system is a feature of the tower cranes made by Linden-Alimak of Sweden, too. Alimak claims that with its standard Modular System 8000 can build 41,272 different cranes with a theoretic

continued

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The drum width of the BW 100 AD is 1,000 mm, that of the BW 120 AD being 1,200 mm. Both machines are equipped with front-drum and rear-drum hydrostatic travelling and vibration drives. This results in a high compaction performance and good traction.

The hydrostatic travelling drives for forward and reverse travel at speeds of 0 – 8 km/h permit smooth starting and braking, the courses to be compacted can be rolled easily and with great accuracy.

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maximum of 8,000m tonnes. Lift capacities range from 1 to 70 tonnes with operating radii from 10 to 100m.

Once a contract has been completed, cranes of the modular type can be dismantled and the components regrouped to form another crane with characteristics exactly matched to the work in hand. This helps to keep lifting costs to a minimum and, at the same time, speeds up construction because there is little or no need to compromise on the crane specification by using an unsuitable machine.

Hook heights are, of course, dependent on mast height and some of the latest machines are capable of working to an incredible 200m plus, although without intermediate support of the mast, the lifting capacities would be extremely small. These machines are really the giants of the tower crane business and although very impressive in both performance and appearance, are the exception rather than the rule. It is the smaller cranes, the ones capable of between one and five tonnes lift capacity with an outreach between 20 and 25m, and a mast height of up to 30m, or less, that form the largest group of tower cranes.

It is very difficult to get a clear picture of a tower crane's capability from a few simple figures because of the massive variations of performance as the load radius changes. For instance, a crane with a free standing mast height of 47m and a jib 40m long, at the maximum radius, will have a lifting capacity of only one tonne; but bring the hook in to 13m and the capacity increases to 4.5 tonnes. This is the maximum capacity, even if the radius is reduced even further, because of the bending moment set up in the mast if this load is exceeded. This is something which needs to be carefully considered when choosing a tower crane because lifting capacity, in isolation, is quite meaningless. Only one tonne, if it has to be picked up at an extended radius and lifted to a great height, will require a very large crane – disproportionate in both size and cost to the work it is doing.

Power and control

By far the largest number of tower cranes are electric powered, drawing current from trailing cables. This is certainly true of the larger machines designed for semipermanent site duty. It means that the operational system can be engineered to provide extremely fine control of all of the crane's motions.

Stepless control of hoist and lowering speed allow loads to be decelerated and stopped within fine limits using electrostatic or electrodynamic braking systems right down to the stop point. The mechanical brake is used only for holding duties. Acceleration of the rising load is smooth up to the maximum line speed so that sudden surges which occur if a load is snatched up, are eliminated. With the massive cantilever of a long jib, smoothness of control is essential if dangerous and unwanted oscillations are to be avoided.

A sudden pull during loading or unloading will make the crane oscillate, as will a sudden gust of wind. The oscillations are comparatively slow – about an eight-second period and about 30 in number before the structure settles down. This applies to all cranes irrespective of make. Linden-Alimak has recognised that this problem detracts from a crane's performance and the Modular 8000 system incorporates an oscillation damper in the structure. A counterweight is freely suspended in a pendant which, in turn, is connected to the structure by shock absorbers. The pendant length is adjusted to the size of the crane and the oscillations are absorbed up to 20 times faster than in undamped structures.

Lorain MC8150 tower crane.

Many of the more mobile cranes use a diesel/ electric power plant. Although this system still has all of the advantages associated with electrical systems, the power is generated on-board for true mobility.

Some types of smaller machines use a diesel/ mechanical system which has, at least, the advantage of a slightly lower cost and, provided height and reach are kept within reasonable limits, these machines operate quite satisfactorily. Brakes are automatically coupled to each motion so that the suspended load is not allowed to run free. One of the difficulties with pure mechanical drives is obtaining automatic control of motion-travel limits. Electric machines are arranged to have switches at the limit of maximum travel which are tripped by, for instance, the rising hook or the jib trolley. These switches will then arrest the motion and automatically apply the holding brake. The control to override these switches is deliberately arranged to make a potentially dangerous situation almost impossible, even with inexperienced operators. Automatic cutouts are fitted to the lift motion so that, in the event of an operator attempting to lift beyond the safe limit or extend the radius by trolleying out, the hoist winch is automatically stopped and the holding brake applied. Many of these load cut-out switches are coupled with a readout of the actual weight on the hook so that the operator may monitor the lift and, by warning bells and lights, be made aware of an approaching overload in time to take corrective measures.

Hydraulic power transfer systems have been used for some time on tower cranes by different makers, although usually in conjunction with electric drives. A hydrodynamic coupling is inserted between the motor and the motion drive shaft. This means that the motor is started not under load conditions and the coupling takes up the drive very gently, matching its speed and torque to the requirements of the motion. This type of drive is especially suited to slewing motion because it offers the smoothest possible acceleration, which is so important when long jibs are being used. Variable displacement hydraulic pumps are being used in some machines where their characteristics of stepless speed/torque variation can be utilised with great advantage in controlling operating speeds and matching power to requirement.

The driving position of the average tower crane is no place for sufferers from vertigo and access to it usually entails a long climb up an open ladder. Having reached the driving position however, modern driving cabs include tinted glass (often double glazed), sound insulation, fully upholstered seats, and controls ergonomically designed.

The list of options offered by almost every maker adapt the cab to a wide range of climatic working conditions with heaters or air conditioners, air filters and even, in one case, full stereo radio. Telephones keep the driver in contact with his colleagues on the ground.

Some of the larger cranes have their cabs arranged to slide up and down the mast, either independently or in sequence with the load. This can be a big advantage when loading or unloading at intermediate points when the view of the landing may be obscured.

Erection

Building up a tower crane ready for work can be a difficult task. Small units are mostly self-erecting; that is, the mast and jib can be put together at ground level and the crane's own winches used to raise them into the working position. The intermediate size of crane may be partly self erecting, requiring the services of a separate mobile crane to raise the mast and/or jib at least part of the way. Very large cranes vary greatly from make to make in the way they are erected. Many have patented systems of self-building masts with special couplings holding the sections together, and raised by means of the crane's winches.

In principle, self-building masts are like an endless telescope. The crane head, complete with jib and drivers' cab, is mounted on its own mast section, which is slightly larger than the main mast. This top section is raised until, while still overlapping the mast at the base, it is high enough for a new mast section to be inserted. Other makers use a system of off-setting the head section on a temporary outrigger while a new section is added to the mast. When this section is in place and secured, the head is raised and moved over into alignment. ●

Paver is a Grabber

The new Model PF-400 Grabber II utility-size, track-mounted paver, which is capable of laying 6 to 19ft of asphaltic or base materials, is announced by Blaw-Knox Construction Equipment Company.

With its pinless rubberised track system, the Grabber II offers increased traction and flotation for general paving. The PF-400 paver accommodates either a standard 10ft screed, optional 8ft screed, or optional 2.5m metric screed to achieve pavement widths of from 6 to 19ft. Depth of pavement range from ¼ to 12ins.

The unit is mounted on military-type tracks with independent hydrostatic drives. Dual control stations provide fingertip control of steering, paving or travel speeds, operating mode selection (automatic or manual) for auger conveyor system, folding hopper, screed lift, screed vibrator drive, and starter.

An 8-ton-capacity hopper includes hydraulic folding sides and two separately operated adjustable flow gates for metering material delivery to the screed. Infinitely variable speed hydrostatic auger and conveyor drive provides optimum auger/conveyor operation throughout the paver's full range of capabilities.

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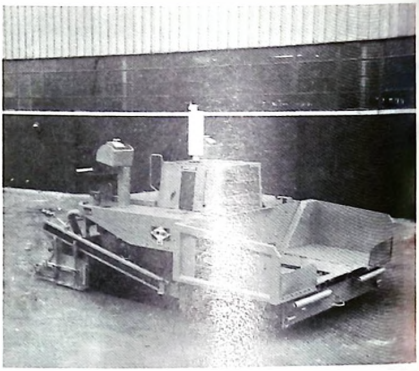
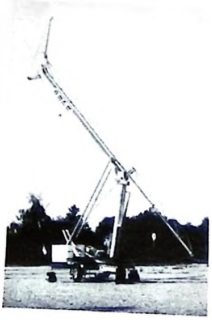


Self-erecting crane

BPR, the French crane manufacturers, have brought out an addition to their range of self-erecting cranes. Called the GA8, the new crane is well suited for jobs requiring a lower capacity than the standard 7 to 30m/t. Good surface treatment is claimed due to **BPR's** technique of constructing the tower from one section of pipe.



Equipped with a 13m jib and a two-speed hoist winch, the GA8 is entirely remote controlled. An automatic levelling system allows it to be placed on jacks or rails without any additional equipment, and the crane is free to turn during transport or erection. Another transport feature is the GA8's ability to be moved with or without ballast.

Standard safety devices are featured on all movable parts. Motors, mechanisms, safety devices and even the cable tension of the trolley are located at the base of the crane.

Circle No. 14 on enquiry card

Space saving valves

A new series of Williams pneumatic directional control valves has been developed by **Dana**. Covering a wide range of applications, the valves feature a space-saving design that allows their installation flat on the dash panel.

Capabilities range from two-position, three-way control design to three position, four-way control models. Each valve in the series features a spring-loaded safety device which automatically locks the valve in position to prevent accidental movement. Also included are models equipped with spring returns which move the valve to the neutral position whenever the operator releases the valve control lever.

Ideally suited to control single- and double-acting cylinders and actuation of power take-off systems, the valves are

specially designed to fit interchangeably with most other air-operated relay valves. Suitable applications include cranes, oil well service rigs, hoists, marine winches and other heavy equipment.

Circle No. 26 on enquiry card

Drilling equipment

The French drilling equipment company Montabert report a 19 per cent rise in turnover for 1980. Montabert manufacture pneumatic and hydraulic drilling equipment, including five different hydraulic rock breakers, pantofores and mini-pantofores. A recent development is the Alpha 20, a rockbreaker suspended on an air-cushion.

The company also produce demolition equipment for use in construction, mines and quarries, in a large range of sizes. Montabert are actively seeking agents in West Africa.

Circle No. 27 on enquiry card

New, small crawler loader

Designer for a variety of light excavating, utility and general construction assignments, Fiat-Allis has brought out a new crawler loader.

The FL7 model is a small, manoeuvrable crawler with a direct injection Fiat 8065 six-cylinder diesel delivering 78fwhp at 2,250rpm. A single stage torque converter reduces the need for frequent shifting.

With a dump height of 8ft 5ins (2,600mm) at 45° and a reach of 37ins (940mm) at 45°, the FL7 can load a wide variety of trucks. Breakout force is 14,000lb (6,350kg). It has a bucket rollback of 44° at ground level.

A three-piece in-line bucket linkage distributes all hydraulic forces evenly along the centre-line of the bucket arms, giving added stability to the loader, and offering operator visibility for excavating and loading.

Circle No. 28 on enquiry card

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Seahorse Gold Nugget near Georgetown, California. 18 × 5.2 × 2.6 cm. (40 oz. Troy) (1.5 Kg.) Photograph courtesy of Dave Wilber

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Mining Developments

Tin production

According to the Standard Chartered Review tin production during the first threequarters of 1980 declined progressively despite the attraction of fairly high prices which averaged about £8,000 per tonne on the London market. Total production of tin ore during the July-September quarter was 487 tonnes, representing shortfalls of 21.1 and 35.2 per cent respectively compared with the outputs of the two earlier quarters.

Columbite production also followed a similar trend when production at 168 tonnes in the first quarter tailed off to 133 tonnes in the third quarter.

Increased bauxite mining

The Frigua aluminium refinery in Guinea has boosted its alumina production from 680,000 to 700,000 tons annually following a $33 million expansion programme. Increased production demands will mean that an extra 40,000 tons of bauxite will be mined in Guinea annually.

● According to a report in the Financial Times (February 10, 1980) lack of foreign exchange in Ghana for machinery and spare parts has resulted in ingenious use of readily available materials. Speaking to the Financial Times' Patti Waldmeir, the Ashanti Goldfield's chief engineer, Mr Peter Settle, described how cannabalised oil drums are used for roofing and lift cages are made out of smelted and recast metal scraps and disused machinery. This situation should improve with the recent awarding of a grant of US$40 million by the United Nations Development Programme, among other international and bilateral loans.

Mineral production in Nigeria

RESEARCH FINDINGS of the Central Bank (published in Developments in the Nigerian Economy in the first half of 1980) show that the index of mineral production (including petroleum production) for the first half of 1980 stood at 118.3 (1972=100), compared with 120.5 and 131.4 in the preceding and corresponding periods of 1979. This decline reflected a lower level of petroleum output during the period under review. Indices of production of gas, cassiterite columbite, coal and limestone rose by 24.0, 45.6, 45.3, 4.2 and 3.0 per cent, respectively, compared with the levels in the second half of 1979.

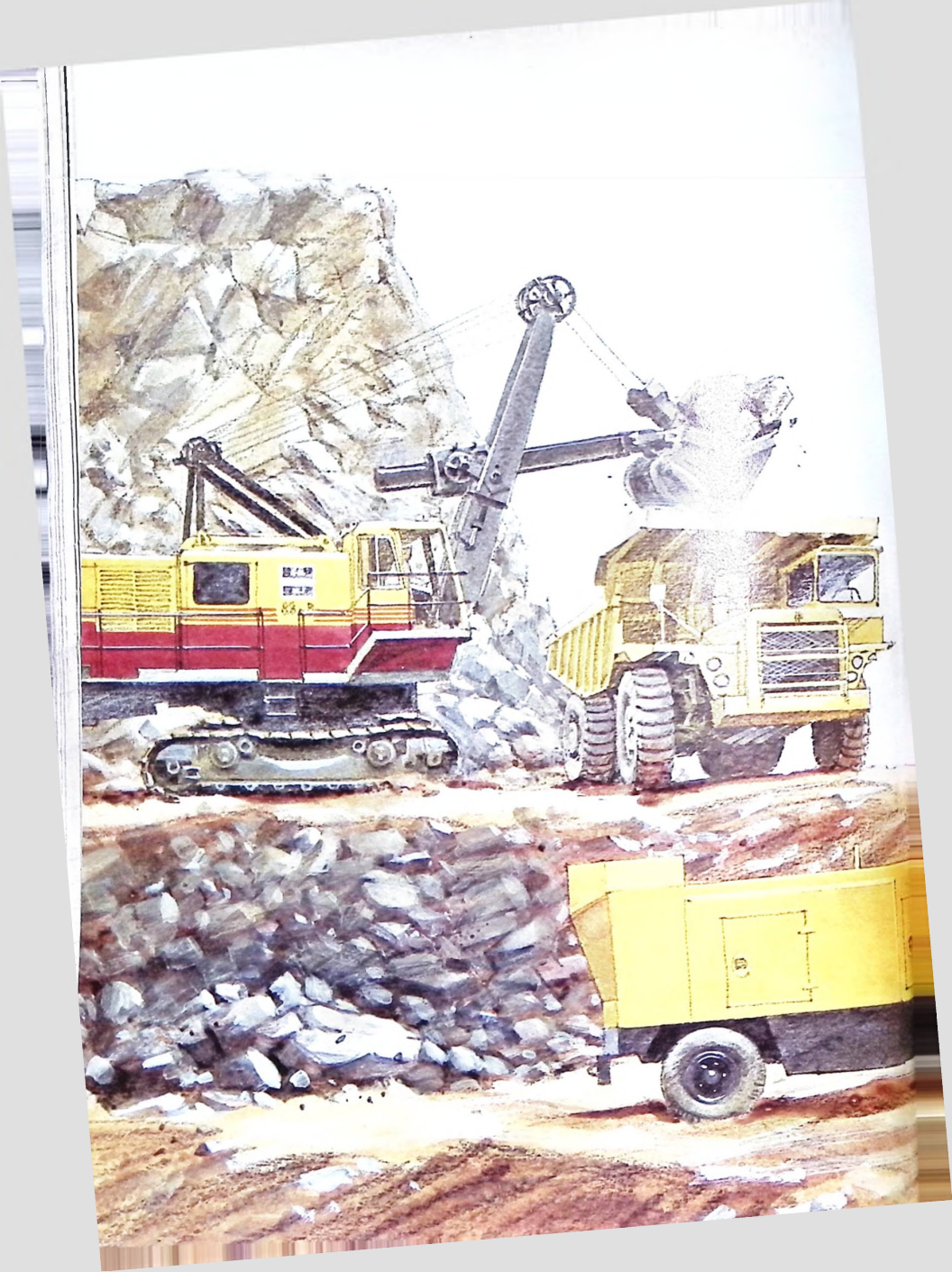
The output of major solid minerals amounted to 1,108,075 tonnes – 58,286 tonnes or 5.0 per cent lower than the figure for the corresponding period of 1979. Cassiterite output declined by 45 tonnes or 2.2 per cent; that of columbite by 3.0 tonnes or 0.9 per cent; that of coal by 15,122 tonnes or 15.9 per cent and that of limestone by 43,116 tonnes or 4.0 per cent. However, compared with the *second* half of 1979 an overall increase in production of 34,330 tonnes or 3.2 per cent was recorded. The respective output of cassiterite, columbite, coal and limestone rose by 174 tonnes or 9.6 per cent; 52 tonnes or 20.4 per cent; 3,426 tonnes or 4.5 per cent and 30,185 tonnes or 3.0 per cent.

At an average of £7,562.3 (₦9,452.9) per tonne, the spot price of tin metal on the London Metal Exchange during the first six months of 1980 was 1.3 and 5.8 per cent higher than in the first and second halves of 1979, respectively.

Mineral production in Nigeria
(In tonnes, unless otherwise stated)

Month	*Cassiterite*	*Columbite*	*Limestone*	*Petroleum (crude barrels)*	*Total metal*
1979					
April	344	50	227,526	72,475,790	282
May	347	34	216,834	74,332,699	287
June	291	51	146,055	72,151,230	127
July	248	27	218,728	73,820,703	349
August	267	40	199,055	67,736,147	12
September	187	34	123,013	63,481,560	371
October	227	37	161,034	66,186,984	n.a.
November	207	36	142,024	64,520,395	n.a.
December	217	37	151,529	66,760,894	n.a.
1980					
January	330	51	234,004	66,923,025	163
February	649	53	219,750	62,323,009	149
March	146	57	208,614	66,819,520	205
April	301	47	140,315	66,676,510	118

Sources: (i) Federal Ministry of Mines and Power, Lagos. (ii) Nigerian National Petroleum Corporation.
n.a. – not available.



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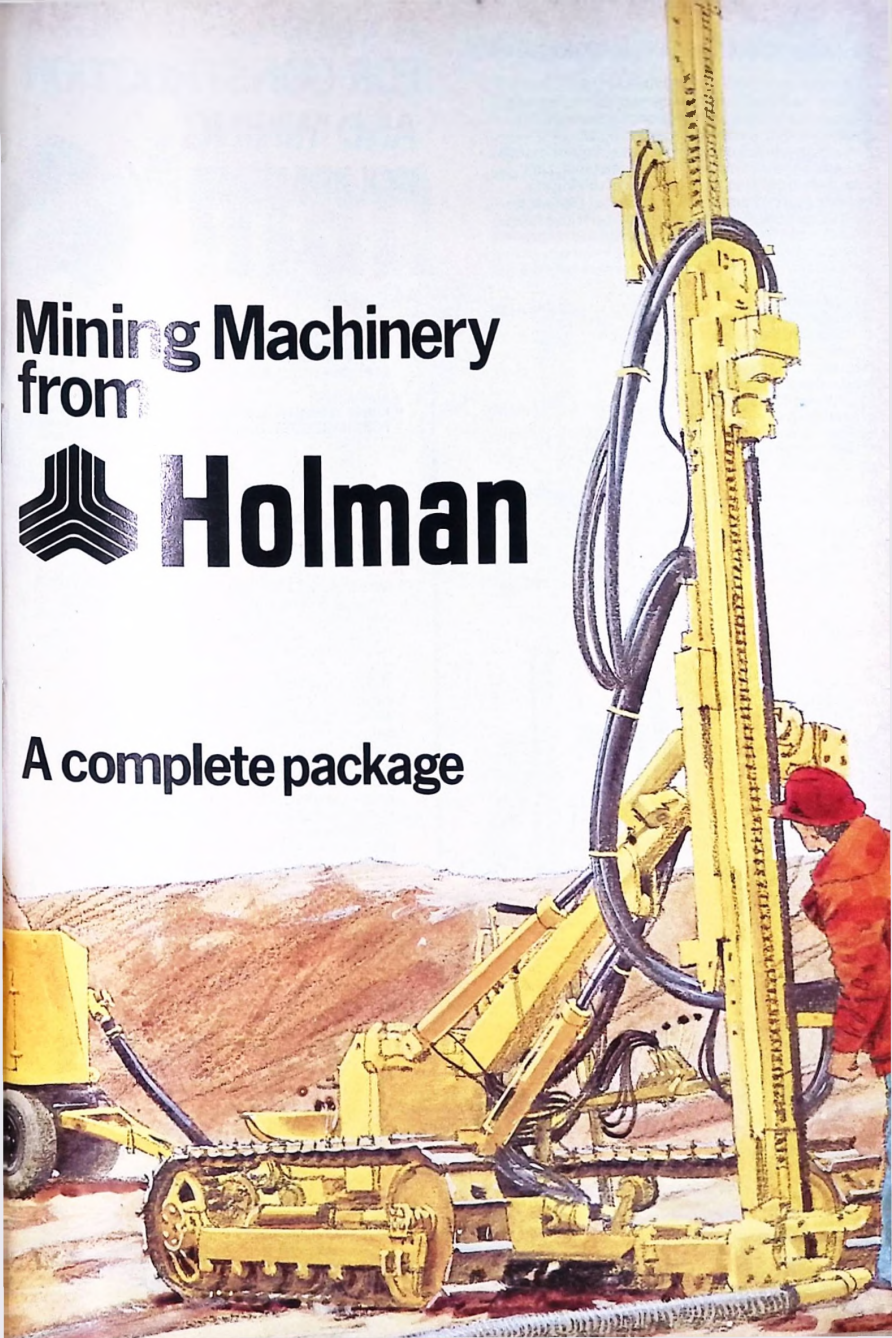

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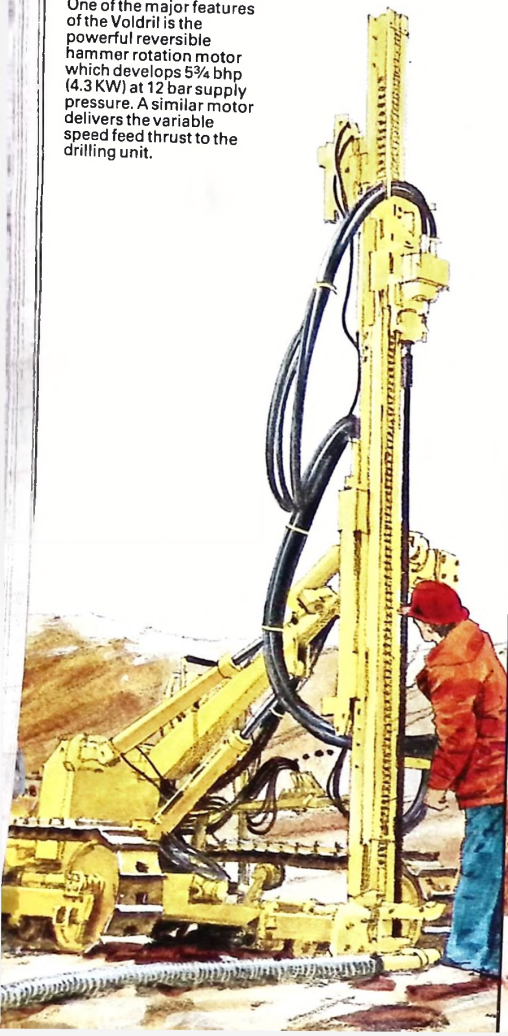
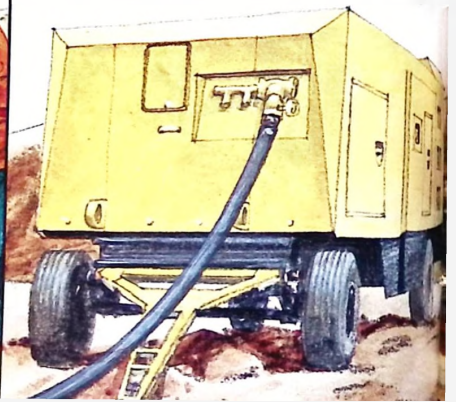
Holman 'Down-the-Hole' Voldrill

The Holman Voldril crawler drilling rig and 'Down-the-Hole' hammer combination produces high performance drilling in both hard and soft ground with the appropriate drilling bit.
The equipment is designed for use in quarries, open pits and for civil engineering applications. This one-man-operated rig is capable of drilling at a constant rate of penetration to 140 ft. (45m.) and beyond at 100 lbf/in^2 (7 bar) pressure, with a hole capacity of 107 mm. to 130 mm. Higher penetration rates can be obtained when the rig is used in conjunction with a Holman 'High Pressure', 170 lbf/in^2 (12 bar) portable air compressor.
One of the major features of the Voldril is the powerful reversible hammer rotation motor which develops 5¾ bhp (4.3 KW) at 12 bar supply pressure. A similar motor delivers the variable speed feed thrust to the drilling unit.



Holman R045-1[illegible] High Pressure' Air Compressor

Ideally suited for matching to the Holman Voldril range of drilling rigs, the Holman 'High Pressure' air compressors, such as the R045-170, 450 ft^3/min at 170 lbf/in^2 (210 litres/sec at 12 bar), have some twenty years of rotary screw experience behind them.
The Holman rotary screw air compressor unit is virtually trouble- and wear-free, being an oil-flooded, single-stage unit with an axial air flow delivery developed from two mating rotors supported by heavy duty bearings. The asymmetric profile of the rotors produces optimum efficiency.
The extra air pressure from the high pressure machines gives added punch where it is needed and makes the compressors more versatile in application.
Built on a robust, girder-built chassis, large square beam axles and all-round heavy duty leaf-spring suspension, the compressors have full 180° turntable steering allowing maximum manoeuvrability.
A choice of diesel prime mover is available.



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Aveling Barford 35 Tons Dump Truck

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More Power

With a high power/weight ratio that means better acceleration and better climbing ability for faster cycle times.

More Driver Comfort

Spacious cab insulated for temperature and noise control. Suspension seat and steering wheel both fully adjustable with all controls ready to hand. Outstanding visibility and safety with "Fail safe" braking. Riding on Nitroleo suspension, soaking up loading and haul road shock.
The operator, truck and tyres all ride smoother to boost profitability.
The RD 035 is one of a fleet of six model range with a choice of payloads from 17-50 tons.

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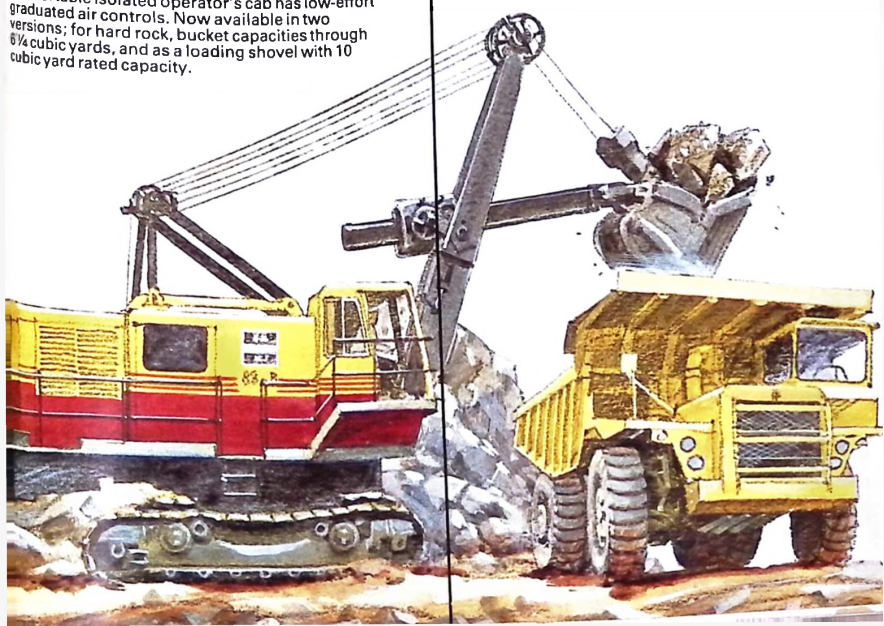

A career in mining?

*R. Gaskell, R. H. Parker and [illegible] H. Thompson explain the function of the Camborne School of Mines and its [illegible]ationship to the West African mining industry.

FOUNDED IN 1859 in Cornwall in the UK, the Camborne School of Mines has a long history of training engineers for the world's minerals industries. British students of the School have traditionally found employment overseas, and for many years students from overseas have come to Camborne for their training. One of the first Africans was Mr. Akiwandi Akiwumi, who came from Sierra Leone in 1922. He returned to become a mines inspector and eventually his country's ambassador to the Sudan.

Old students

Since then, West Africans (mainly from Ghana, Nigeria and Sierra Leone) have been an important part of the School's intake of students. Many senior personnel in the minerals industry of West Africa, and in the relevant government departments are Camborne Graduates. For example, Keith Mantell is Mines General Manager, National Diamond Mining Company (Sierra Leone) Ltd., David Dent-Young is Managing Director and John Dankaro is with Amalgamated Tin Mines of Nigeria. Idowa Gombe is Head of the Mines Division with the Ministry of Mines and Natural Resources in Nigeria, and Chief M.O. Feyide rose through Nigeria's Petroleum Industry to become Secretary-General of OPEC.

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Good career prospects

Until recently, the West African mining industry was dominated by foreign-owned companies. These have now been taken under government control with the state mining corporations having a majority of the capital, and mining activities are being expanded as rapidly as possible. Tin, columbite, manganese, industrial minerals, bauxite, coal, oil, gold and diamonds are being exploited and there is an increasing demand for indigenous engineers.

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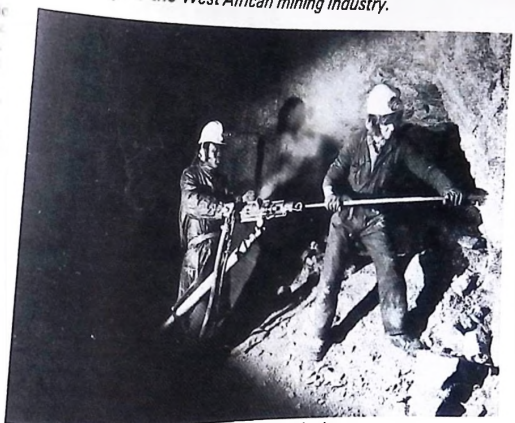

The course at Camborne is both practical as well as academic.

mining and mineral processing has not been popular with West African school-leavers, the jobs are partly filled by expatriate engineers, who still occupy many senior management positions, in spite of moves to reduce the number of expatriate work permits.

The education of a mining or mineral processing engineer embraces civil, mechanical, electrical, mining and mineral process engineering, together with mathematics, geology, surveying, extractive metallurgy and management. It is thus a broadly-based education which can equip a person for a very wide range of careers.

On first entering the industry, the graduate can expect to spend the first year getting to know the company's activities by spending at least half the time on production work, the remainder in technical departments. Greater responsibility comes after about a year with moves to underground and open pit manager, or mill manager taking about five to eight years.

A good engineer could then expect to enter senior management, and the serious shortage of indigenous engineers means that all graduates entering the West African industry now have a good chance of getting to the top. The need for personnel is not, however, limited to the potential Senior Manager. The support of well-trained, experienced technicians and supervisory managers is essential to the successful development and consolidation of the industry.

Qualifications

The West African school leaver can study to three main levels if he wishes to enter the industry – Ordinary National Diploma (OND), Higher National Diploma (HND) or Bachelor of Science (B.Sc.). The OND holder would normally work at technician level, the HND is aimed at Higher Technician or Supervisory Manager and the holder of the B. Sc. Degree would normally be expected to become a Senior Manager.

At the Camborne School of Mines, there are three year degree courses leading to the B.Sc. in mining and the B.Sc. in Mineral Processing Technology (which includes Extractive Metallurgy). Successful students on these courses are also awarded the Associateship of the Camborne School of Mines (ACSM), which is a well-known qualification in the world's mining industry. Camborne also offers a two-year Higher Diploma in Mineral Industries (roughly equivalent to the HND), which for entry requires at least one 'A' level pass in the General Certificate of Education, compared with the requirement of at least two 'A' level passes for entry to the B.Sc.

continued

*Dr R. Gaskell is Head of Engineering, Mr R. H. Parker is Vice-Principal and Mr K. H. Thompson is Head of Management and Mineral Economics at the Camborne School of Mines in Cornwall, UK.

Circle No. 288 on enquiry card

A career in mining?

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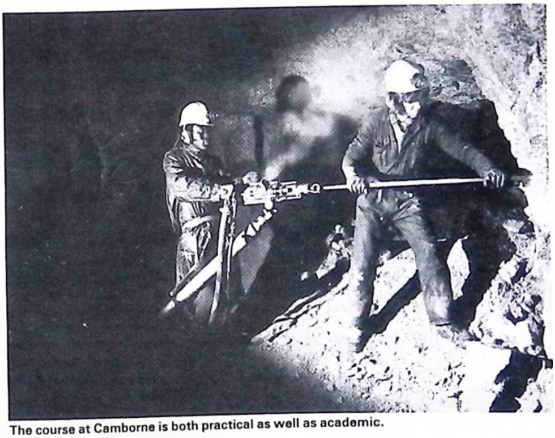

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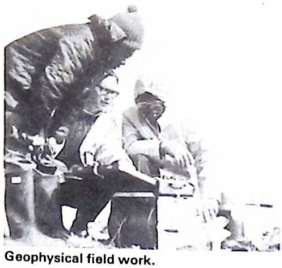
courses.

At post graduate level, where holders of the B.Sc. can specialise, or extend their studies by research, the School offers a one-year M.Sc. in Mining Geology, a one-year Post-graduate Diploma in Mineral Technology (DMT) and research programmes leading to the award of Master of Philosophy (M.Phil) after two years, Doctor of Philosophy (Ph.D) after three years' successful research.

Of a total of 67 overseas students currently at Camborne, 18 are from Ghana, nine from Nigeria and two from Sierra Leone. We have recently received an application for a place from the Ivory Coast.

The demand for engineers and technicians in the industry cannot be satisfied by those trained abroad, and Camborne has been prominent in helping developments in Ghana and Nigeria which have led to the establishment of institutions for the education and training of local personnel. In Nigeria, a training school for government mines inspectors was set up in Jos. In the 1960's, Dr Bannister was invited from Camborne to Jos to advise on course structure and teaching methods. Other Camborne staff gave advice on the setting up of a small mining school at Ilorin (Kwara State), and a large mining department at Kaduna Polytechnic.

In 1978, Mr K. H. Thompson was seconded from Camborne for a period of



Geophysical field work.

two years as Head of the new Mining and Applied Geology Department at Kaduna, where courses at OND, and HND levels have been started, and about one hundred Nigerian students are now enrolled on these courses. At the same time, Kaduna Polytechnic have for several years sponsored between four and six students to study for the B.Sc. Degrees at Camborne, to form the nucleus of engineers for the mining industry of Northern Nigeria and to eventually supply teaching staff for the Polytechnic.

In Ghana, training for supervisory posts has been via the two-year General Mining Certificate course, and a three-year Mining Diploma course at the Tarkwa School of Mines. Students have been sponsored to go overseas to study for degrees by the Ashanti Goldfields Corporation (Ghana) Ltd., Ghana Consolidated Diamonds Ltd and the State Gold Mining Corporation, and the Mines Department of the Ghana Government, and have gone to universities and colleges in Britain, Canada and Russia. However, the majority of these students have gone to Camborne and Camborne Graduates provide almost all the management and technical expertise for the Ghanaian Mining and Minerals Industry.

Since 1974, the United Nations and UNESCO have supported assistance to strengthen the facilities offered by the Tarkwa School of Mines, which in 1978 became part of the University of Science and Technology, whose campus at Kumasi offers a B[illegible] degree in Mineral Engineering and M[illegible]ergy.

In 197[illegible] R. Gaskell was seconded from Ca[illegible]e for one year to join the UNDP [illegible]ce programme at Tarkwa. He has [illegible]eturned to Tarkwa for a further s[illegible]riod to advise on laboratory planning [illegible]e development of both the Diploma [illegible] and the newly-planned B.Sc. co[illegible]Mining Engineering.

Thus, [illegible]rne School of Mines has contribut[illegible]nsively to the development of the W[illegible]rican Industry, and its involvemen[illegible]s development is currently directly [illegible]irectly greater than it has ever been. [illegible] School intends to continue with this c[illegible]ibution which it sees as an essential pa[illegible] of its work.

New pumping partner from UK

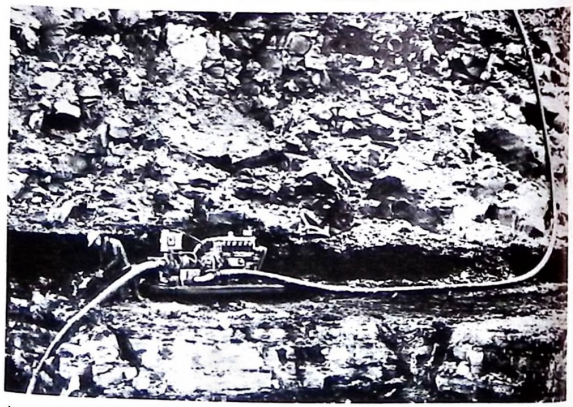
A new pump designed primarily for quarrying, opencast mining and similar operations requiring high head discharge and performance reliability, particularly when dealing with intermittent inflows under snore conditions, has been introduced by **Sykes Pumps Limited.**

Designated the Univac 150MH, the pump, which has 150mm (6in) suction and delivery connections, has been designed to operate at a maximum closed valve delivery head of 91m (300ft), while its maximum output capacity is rated at approximately 6,800 litres/min. At a head of 61m (200ft) it has a capacity of 4,545 litres/min.

Since such pumps are usually required to operate for long periods without attention, often in remote parts of the workings, total reliability of the priming system, which must continue to function effectively even when the suction inlet becomes exposed to air, is essential. This is maintained through a separate vacuum pump which extracts air from both behind and in front of the impeller. It is fully automatic and enables the pump to prime and re-prime at suction lifts down to 9m.

The pump has been fitted with a new type of six-bladed impeller which has been designed to give a high head delivery without sacrificing suction performance. This overall design avoids the necessity of constantly moving the pump as the workings develop. Although not intended for continuous solids handling, it will pass solids up to 25mm (1in) diameter. The impeller is screwed and locked on to the main shaft, access being provided through a bolted front plate. This enables a replacement standard type impeller to be fitted in order to operate the pump for general usage.

Modular construction, offering interchangeability of many of the 150MH components, allows for ease of servicing. A further advantage is its low overall weight which, without fuel, is 1,300kg (2,860lb). This lessens the problem of site mobility.



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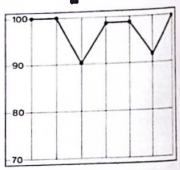

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Ghana's gold resources reviewed

*Towards the end of 1980 the Government of Ghana published (*The Economist, *December 27, 1980) an invitation to a seminar on "Ghana's Gold Endowment" to be held in Accra, January 6–8, 1981. This invitation was extended to "Gold Mining Companies, Mining Equipment Manufacturers, Financial and Banking Institutions, and all other interested parties". The range of topics proposed for discussion was comprehensive and this article by G. A. Schnellman deals only with the first-named, "Gold Potentials in Ghana", for the benefit of those who were unable to attend the seminar.*

Historical background

Ghana, before it achieved independence, was known by the significant name Gold Coast Colony. It is one of the many claimants to be the location of King Solomon's mines. There is reason to believe that the Phoenicians and Carthaginians sailed to West Africa in the fifth and sixth centuries BC, but it has not been established that they reached Ghana. Overland routes via the Sahara desert were also established in early times, and it appears that from AD 943 gold was regularly carried by this route from what is to North Africa and to Europe, but again it is not certain how much if any of this derived from Ghana. The first authentic record of gold being obtained from Ghana dates back to AD 1471, when the Portuguese established a trade in the metal near the mouth of the Pra river.

The first recorded shipment to England was in AD 1553 when a Captain Thomas Wyndham landed with 150lb of gold dust. From then onwards a regular trade was set up. This early production was in all probability of alluvial origin, that is, won from river gravels. It would appear that the first hard-rock operation was instituted by the Portuguese about 1630. From this date the industry is well documented by travellers and traders rather than by mining men.

The modern phase of exploration began in the latter part of the nineteenth century. The British Government had assumed control of the British settlements in 1821, but as late as 1868 a Dr Horton was lamenting the fact that little was being done by government to encourage development of the rich gold resources of the Gold Coast. It was not until after the Ashanti war of 1873 that European interest was stimulated to any degree. A Frenchman, Pierre Bonnat, while a prisoner of the Ashantis, heard of the rich gold workings in Wassaw. On his release he obtained concessions and instigated the formation of a French-financed mining company. He is generally regarded as the father of modern gold-mining in Ghana.

Work in the Ashanti mines.

Other pioneers were the aforementioned Dr Horton and Messrs Swanzy and Co., both of whom obtained concessions in 1878. A gold-rush ensued but most of the ventures failed and by the end of 1884 a total of only 7,000 ounces of gold had been produced.

In 1895 a Cape Coast merchant, E. A. Cade, obtained a concession in the Obuasi district. From this grew the famous Ashanti Goldfields Corporation which has ever since dominated the Ghanaian gold industry. Dredging the river gravels for gold commenced in the Offin river, near Dunkwa, in 1902 and by 1909 fifteen dredgers were at work. The last of these ceased operation in 1924, but after a lapse of several years dredging was revived and continues.

The outbreak of the 1914 War led to a serious decline in gold production, the nadir being reached in 1928. It then started to rise, and Great Britain's abandonment of the gold standard in 1931 resulted in an increase in the price of the metal which gave the industry a great impetus. In 1939 goldmining once again fell prey to war conditions, and in the immediate post-war years the mining companies, with the exception of Ashanti Goldfields Corporation, were in poor financial shape.

Eventually the point was reached at which there was a consensus of opinion that the mines were no longer capable of yielding an economic return though all had reserves of ore. In 1966 the State Mining Corporation, since renamed State Gold Mining Corporation, took them over (with the exception of Ashanti Goldfields Corporation) as a national enterprise. Most recently in 1972, government acquired a majority holding in Ashanti Mining Corporation, the only remaining private sector operation, in which Lonrho retains the minority holding and management.

State Gold Mining Corporation

The State Gold Mining Corporation has had an unhappy history. Taking over the uneconomic mines as what the Financial Times then described as a rescue operation, when the country's gold production had already passed its peak of 912,592 ounces in 1963, it has had to struggle through a prolonged period of national economic disaster. Insufficient foreign capital was available for the purchase of replacements for obsolete machinery or of spare parts to keep the existing plants running at capacity. Exploration was at a standstill. Government policy was opposed

continued

**G. A. Schellmann is Chairman and Senior Partner of the firm, Mackay & Schnellmann Ltd, Geological and Mining Consultants. He has worked extensively in anglophone and francophone West Africa, and his company was appointed as adviser to Ghana's State Gold Mining Corporation from 1970–1974 by the Ministry of Overseas Development.*


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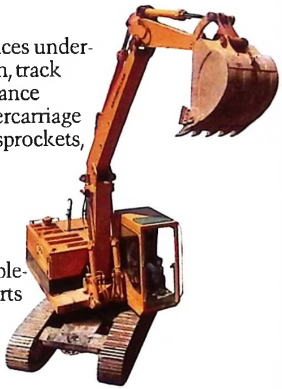

Technology in hydraulics

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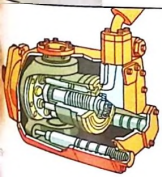
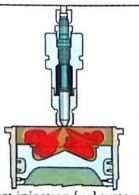


Variable-flow piston pump



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MEC

to the introduction of foreign capital, and it has to be admitted that the country's economic and political situation was not conducive to investment from outside.

The inevitable result was that production continued to decline and the estimated output for 1980 was only 600,000 ounces. In 1976 government decided to set up an exploration company independent of the operating mines and to invite foreign participation in joint ventures between the public and private sectors. Potentially interested investors remained chary, however, no doubt awaiting enabling legislation and the publication of terms and conditions. Then, as reported by *African Business* in its issue for March 1980, President Limann in his first Sessional Address made a positive declaration of government's decision to start revamping existing mines "so as to extend their life span and ensure that maximum benefits accrue to us from the favourable world price". It is to be presumed that the seminar held recently is the first stage of the implementation of this policy.

Geological background

So much for Ghana's track record as a past performer. What of its form for the future? The convening notice for the Accra seminar stated that "Ghana has abandoned mines and highly prospective sites totalling over 200". If that figure includes ancient indigenous workings it is by no means an understatement, but it is not suggested that every one of those sites is a potential mine by modern standards.

The first geological map of Ghana was published in 1928, since when it has been continuously revised by the Geological Survey and extended into areas not fully mapped at that time. For the purpose of this article only that part of the country south of latitude 7°30′ N need be considered, and within that area the most productive districts in the past have been those underlain by rocks of the Birrimian and Tarkwaian Systems.

Keeping geological jargon to a minimum, the Birrimian is older than the Tarkwaian and was intensely folded and altered in character before the Tarkwaian rocks were deposited. It is further subdivided into the Lower and Upper Birrimian. Both systems are intruded by granites of two types known as Dixcove and Cape Coast from their type areas.

The gold deposits are of four types: quartz veins along or close to the contact of the Upper and Lower Birrimian rocks; in the Tarkwaian System; disseminated in the Dixcove granite; river gravels. The greater potential lies in the first two. The quartz veins lie principally in a belt extending south-west from Kononga (40 miles north of Kumasi) to Prestea (20 miles north-west of Tarkwa) and include two operating mines, Obuasi (Ashanti Goldfields Corporation) and Prestea. An isolated quartz vein type of mine, closed within the last decade, is Bibiani, 55 miles west-south-west of Kumasi. This too lies close to a contact between the Upper and Lower Birrimian rocks but is on the opposite limb of a large fold.

Systematic exploration

The Tarkwaian bedded deposit underlies an area of about 1,500 square miles trending south-west through the centre of the country and bears a close geological resemblance to the South African banket deposits, the continuity of which is well established. The deposits in the Dixcove granite are sporadically distributed, and the gravel deposits are of course aligned along the rivers. Discoveries in the past have been fortuitous, but it is possible to doubt that systematic exploration using modern methods would result in major discoveries.

Several hundred linear miles of the geologically significant Upper/Lower Birrimian contact remain untried. Of the 1,500 square miles underlain by the Tarkwaian banket only 160 square miles at the south-western tip around Tarkwa, plus an isolated occurrence over 100 miles to the north-east, have been exploited. No basis was given for the arbitrary figure in the invitation to the seminar of "2.7 million ounces per year for 200 years" as a potential for the industry, but no-one familiar with the facts would dispute it.

TECHNOLOGICAL DEVELOPMENTS

Trelleborg rubber products

Trelleborg, one of the pioneers in making rubber products for the mining, quarrying, cement and other mineral processing industries, developed a special wear-resistant rubber – TRELLEX – for various applications in these industries. TRELLEX formed the base for an extensive range of products and systems.

One product offered by Trelleborg is the Trellex wear-resistant lining. For truck boxes these linings last longer than steel, and also protect the underlying structure of the truck – chassis, wheels, axles. The Trellex lining is composed of modular units which can be easily replaced, which means that standstill time is reduced to a minimum. The rubber lining reduces the risk of material jamming or freezing and helps to reduce noise. Truck chutes are one example of cargo containers that rubber linings can protect from particularly hard wear, especially when loading ore and stone in cubic metre size. Other examples are dumpers, feeders, material bins, hoppers, excavator-buckets, front loaders etc.

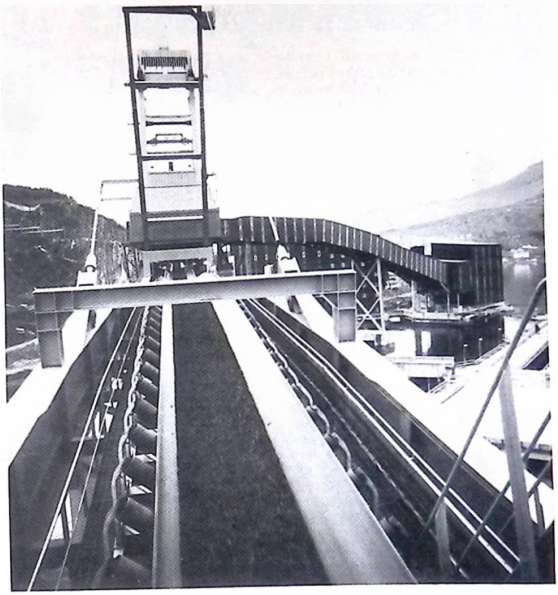
Elastomere screen cloths and screening elements for both dry and wet screening are also manufactured by Trelleborg. The advantages of rubber screen cloths include increased life time, increased screening capacity, reduced risk for clogging due to the elasticity of the rubber and lower maintenance costs. The screen cloths are used in all kinds of screening processes involving all types of dry or wet materials – ore, sinter, gravel, macadam, coal, coke and limestone.

TRELLEX mill linings are made from standard wear-resistant rubber elements. A patented fastening system has been developed for mill linings, consisting of three parts – rubber lifters with vulcanised metal profiles, T-bolts and plates with vulcanised metal flanges. The system results in a completely rigid metal connection of high tensile strength that makes the assembled lining totally collapse-proof.

Trelleborg also produces a materials handling hose system for transporting slurries, abrasive material or for pneumatic materials handling. The system is used in mines, rock and cement industries and is based on three exchangeable components – hose, coupling and packing. The hose is reinforced with a high flexible steel wire and has an inntertube made of wear-resistant rubber. The lightweight coupling is mechanically mounted around the hose and is not exposed to wear. It can therefore be re-used when worn hoses are replaced.

Conveyor belts are offered in widths up to 2,500mm and in different grades of rubber for different applications. Trellamid is a new conveyor belt reinforced with Aramide fibre. Aramide fibre has properties close to those of steel regarding strength and modulus at less than one-sixth the weight of steel. This fact has made the material interesting as reinforcement in conveyor belts. Trelleborg has developed a process for the use of Aramides in conveyor belts giving a very high adhesion between the fibre and the rubber. Trelleborg has a complete range of Aramide reinforced conveyor belts and are able to supply any strength class up to A3150.

Circle No. 17 on enquiry card



Zitec breaker

CompAir Construction and Mining's Zitec 20 breaker is now available in Nigeria through Holman Bros. Following the launch of this contractors' tool last year, Zitec 20 now enters full production. The compressed-air breaker is designed for low noise emission, good power-to-weight ratio, and high productivity.

Zitec 20's polyurethane exterior houses integral air channels to operate the breaker and give a long exhaust to reduce noise at the exhaust port. Noise is also minimised by the intimate bonding of the plastic body to the steel tube core. The noise generated is not more than 84dB(A) at 7m.

Weighing only 20kg (44lb), Zitec 20 is easier to handle than heavier traditional breakers, yet will tackle all but the heaviest normal breaker jobs. Using a 1in hexagonal steel tool, the Zitec's blow energy is at least that of a 25kg (55lb) traditional breaker using a $1\frac{1}{4}$in steel. Weight has been reduced by replacing many heavy forgings with polyurethane steel, or cast iron components which can be easily formed or machined. The number of components has been reduced by 50 per cent, thus simplifying maintenance and reducing spares holding. Operator benefits include cushioning against vibration and a handle assembly using non-conductive polyurethane cladding.

Circle No. 23 on enquiry card

For further information please circle appropriate number on card facing inside back cover.

Excavator from Germany

TO DEVELOP an hydraulic excavator that is nearly twice as big as the traditional large-capacity machines, it is not enough to have courage; one must also be prepared to take a risk. It was not the intention of Mannesmann Demag Baumaschinen to build the biggest, heaviest, most powerful machine with an outsize bucket. It was rather the object to design a mining machine that was matched to the big hauling units used in recent years increasingly in the mining industry, and these cannot do a profitable job unless teamed with a loading machine of a suitable capacity.

Easy handling

The 270-ton machine was introduced in 1978. Now – after about two years with 19 units of this type sold so far – job experience has shown that the H241 is just right in terms of size, production and profitability. With ten units sold in the first year, a success was in the offing already then. The first H241 went to the US where it started working for Benjamin Coal in their Pennsylvania open-cast mines in 1979. Even the transport of the machine to the job site and its erection from easy-to-handle assemblies of under 30 tons in weight did not create any difficulties. Six erectors got this job done in a week's time with the help of two 60-ton cranes.

To avoid unforeseen difficulties in the starting up of the machine, the local dealer provided an on-the-job service support which was backed by a containerised stock of spares containing as many as 600 items. In actual fact this did not have to be called upon. Even round-the-clock operation did not result in major troubles or extended downtime. Some minor repairs and improvements, which could be made during the normal maintenance periods, were the only work done so far on the machine, so that right from the beginning an enviably high availability with a yearly average of 90 per cent could be reached.

After nine months of operation, the machine, working 16 hours a day, had as much as 4,000 hours on its service record. The machine, working on a stripping job, removed 3,000 tons of overburden per hour at the beginning and increased production to a peak of 3,600 tons as work progressed, based on an average bucket factor – or capacity rating – of 130 per cent. It took only three weeks for the operator to work on a 30-to-35-second loading cycle, and after three months, cycle time was down to surprisingly low 20 to 25 seconds. This means that the H241 is capable of loading a 75-ton hauler with the 19-yard bucket in about 1½ minutes.

The second H241, working in Australia for Griffin Coal, has a similarly good service record. Here it is where the outstanding crowding force proves its worth in digging tough sea gravel. With an average availability of 93.5 per cent, this unit – which is in operation since June 1979 – has proved itself in more than 2,000 service hours to date.

Peabody Coal received the second USA machine of this type for their Black Maysa mine. This excavator meanwhile reached a record-breaking availability of 97 per cent.

The market for hydraulic excavators of this size is not restricted to overseas countries. The H241, for instance, which works in England for McErlain Ltd, shows an availability of 96 per cent so far. This progressively orientated company acquired this machine primarily with the object of cutting the loading costs. The machine works in a big strip mine where the strata overlying the hard-coal seam includes layers of hard clay slate and sandy limestone which the excavator is loading into 75-ton haulers. From 2,000 to 2,500 tons of material, or 30 to 33 of these vehicles – depending on the severity of the conditions – are loaded in an hour. In applications of this kind, the H241 benefits from the unusually high break-out force of as much as 100 tons and the fact that buckets up to 21m³ capacity can be handled. Mine haulers in capacities from 100 to 150 tons are used in ever increasing number in open-cast mines of North America and Australia. The H241 is the ideal match for these big hauling units.

The applications for this machine are not limited to open-cast mines; Mannesmann Demag Baumaschinen has succeeded in selling two of these units (one to Sweden and one to Belgium), mounted on a barge, for use as "Aquadigger". Both are equipped with a 11½m³ backhoe bucket.

Success secrets

The big success with this machine, according to Mannesmann Demag Baumaschinen, is due to the innovative design, the outstanding efficiency, and the fact that it proved to be right in terms of capacity and price.

The H241 has single-engine drive which provides not only important maintenance benefits, but also considerable savings in weight and fuel consumption, and it has a much lower number of wearing parts than a twin-engine machine of this size. The unit-construction concept used here permits this excavator to be shipped on commercially available equipment, and minimises field-erection time.

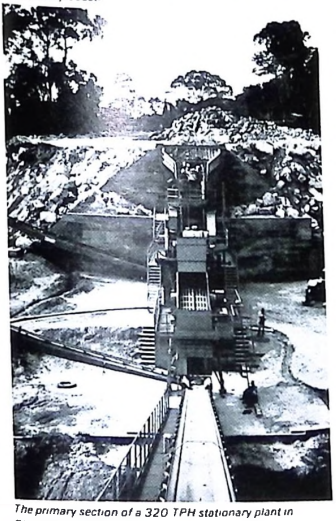
Demag handles at present a number of requirements from all over the world and looks forward to selling further excavators of this type.

Circle No. 33 on enquiry card

Bergeaud
crushing equipment

A 150 TPH mobile p… …aw crusher (1 080 m wide) in The Ivory Coast

A 200 TPH mobile plant in Nigeria



The primary section of a 320 TPH stationary plant in The Ivory Coast

A 5 1/2' mobile Symons cone crusher in a 360 TPH plant in Ore (Nigeria)

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Process Machinery Division
Circle No. 295 on enquiry card

TECHNOLOGICAL DEVELOPMENTS

Christensen product lines

Christensen Diamond Product (UK) Ltd are marketing three new product lines in Nigeria. The first is a range of continuous flight augers and hollow stem augers. They provide a means of making rapid holes in a wide range of sedimentary formations without the use of any flushing media. The continuous flight augers are designed so that the spoil is transported up along the flight to the surface by rotation without the need to pull the augers until the hole is completed. A benefit of auger drilling is that the borehole will nearly always remain open when the augers are pulled, and cave-ins are rare.

Circle No. 19 on enquiry card

The second product line is the D-4 core barrel series. It has been developed as a means of accurately measuring the exact thickness of coal seams and examining roof and floor contacts in potential mining areas. The design of the core barrel enables cores to be examined while still retained in the opened split inner tube. One of the important features of the core barrel is its rigidity, which results from the thickness of the outer tube. Its consequent strength takes more weight on the barrel. Because the annular clearance between the inner and outer barrels is larger than standard, the D-4 can be used with air, mud or water.

Circle No. 20 on enquiry card

Christensen's third line is a range of polycrystalline diamond drilling bits. The 'Chrisdril' bits consist of a 0.020in-thick polycrystalline diamond material grown under high pressure/high temperature conditions on a 0.100in-thick tungsten carbide substrate. These discs are mounted on special bit blanks. The cutting element has the sharpness of new carbide with the wear resistance of diamond. Unlike carbide bits, which start by drilling fast but soon slow due to worn edges, the Chrisdril bit maintains a uniform penetration rate throughout its life.

Circle No. 20 on enquiry card

Underground drilling market

A product programme, consisting of a wide range of hydraulic and pneumatic equipment is offered by **Gardner-Denver**. A new boom, designated TB104, has been developed to serve the hard rock underground and surface drilling markets, as well as the HPR1 hydraulic percussion Hydra-Drill. The Hydra-Drill has been designed for flexibility; impact and frequency of hammer blows can be adjusted in accordance with rock conditions.

Gardner-Denver also offers a range of pneumatic underground drilling jumbos called the Mine King, and for the surface mining market, the new SCH3500A Hydra-Trac, a fully self-contained trac drill. The company also manufactures a full range of hand-operated equipment including sinker drills, stoppers, feed leg drills as well as drill steel and accessories.

Circle No. 17 on enquiry card

Crusher for African market

Construction machinery manufacturers **Loro and Parisini** have launched a new crusher model in West Africa. Introduced recently at the Public Works Exhibition of construction equipment, the CR100.90 is a primary jaw crusher with a 255-350tph maximum output.

Design features on the new model include a stress-relieved crusher frame made of welded steel plate, and an interchangeable shield protecting the pitman head from wear due to material impact. Shaft supports have been aligned with sidewalls to eliminate the bending effect which occurs when supports partially bear on the lateral cantilevered brackets. In order to improve output capacity, alterations in the design of the crushing chamber, including a change in chamber shape, have been introduced.

Other adjustments include a restricted nip angle between jaws, intended to produce properly distributed wear and a high but gradual reduction ratio. The nip angle does not require an excessive length of jaw, therefore eliminating the need for an increase in height or weight of machines.

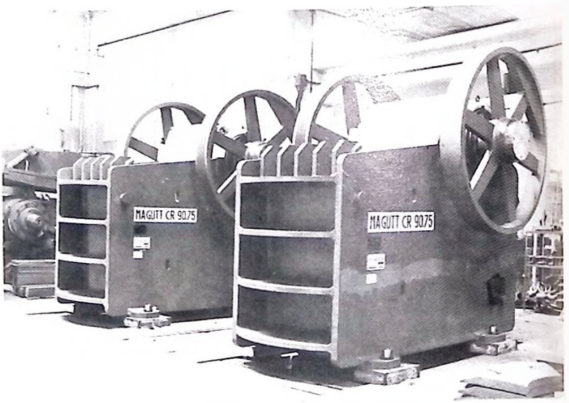
The CR100.90 also features a patented bearings system. In order to remove the threat of damage due to displacement of alignment, the bearings are self-aligning, and be[illegible] together with labyrinths in special [illegible]n bushings.

The [illegible]ing system uses centralised grease [illegible] to enable manual greasing of bearing[illegible]g intervals and from a safe position [illegible] the machine is running. Grease [illegible]n into labyrinths is done by a time[illegible]or-driven pump placed in a positio[illegible]d from material falls.

A [illegible]e cylinder encloses the hydraulic setting device fastened to the head of the frame behind the sliding element supporting the toggle plate. The cylinder is fed by a hand-controlled pump equipped with an on-off valve.

The range of Loro & Parisini construction machinery includes equipment for crushing, grinding and screening, batching, mixing and hoisting. The company also deals in the preparation and treatment of raw materials.

Circle No. 16 on enquiry card

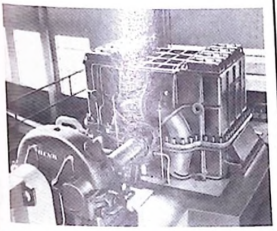


For further information please circle appropriate number on card facing inside back cover.

Applying turbocompressors in the mining industry

Compressed air is a safe means of power transmission for numerous mechanical requirements and is used in many areas of the mining industry. Some of these uses include drift-cutting in connection with drilling work in galleries and tunnels, excavation of rock, coal and ore with scrapers, lifting in small intermediate shafts, and operating tools and air doors.

Applications of this kind are associated with the mining of coal, bauxite, copper, nickel and gold. Isotherm turbocompressors are particularly suitable for the compression of air in the mining industry. For example, Sulzer Isotherm compressors have capacities of up to 600,000m³/h and an availability of up to 99.5 per cent. **Sulzer** recently received an order for two axial compressors, which will thus be used in mines for the first time.



The designation "Isotherm" explains the working principle of these compressors: the medium being handled is subject to intensive intermediate cooling during the compression process, in order to come as close as possible to the ideal isothermal compression.

Isotherm compressors are suitable for the oil-free compression of air and similar gases starting from atmospheric conditions to discharge pressures of between 5 and 11 barabs. The compressors are also frequently used in air separation plants, in the chemical and petrochemical industries, as well as for the supply of compressed air in iron and steel works.

Circle No. 22 on enquiry card

In the next issue:

Generator buyers' guide,
Commercial vehicles in Nigeria,
Computers in the tropics

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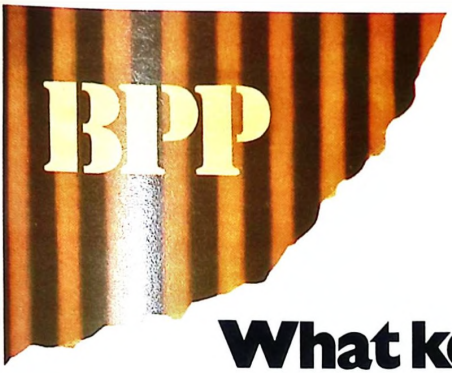

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Circle No. 289 on enquiry card

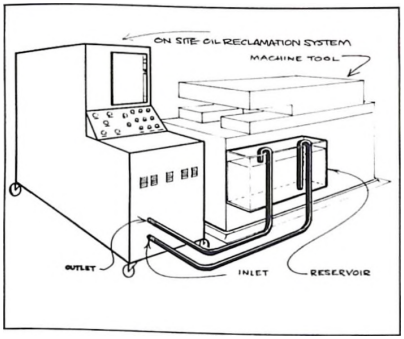
Small stabilisers

Two new ranges of Voltage Stabilisers have been introduced by **Galatrek Engineering**. The first is a range of Constant Voltage Transformers, which incorporate innovative developments on the ferro-resonant saturable reactor technique. They provide an output stabilisation of ±1 per cent for a ±20 per cent supply voltage fluctuation. In addition they attenuate high-voltage transients and provide momentary power back-up in the event of transient interruptions in the main supply. They are of particular value in reducing data corruption and spurious responses from these causes in micro computers and all microprocessor based systems.

The second range is intended for domestic use where wide mains fluctuations are commonplace. They are intended to provide stabilisation levels adequate for efficient operation of domestic appliances such as refrigerators, freezers, air-conditioners and other small appliances or machines. The range covers free-standing types for use with individual appliances and rated from 250VA through to large stabilisers, rated up to 15kVA, intended to stabilise the total supply to a house, office or other premises.

Circle No. 4 on enquiry card

New oil reclamation systems



A major breakthrough in reducing costs and use of industrial oils for hydraulic, lubrication, power generation and parallel uses, while extending significantly the life of equipment is promised by a new oil reclamation system proven in the United States and now available for world-wide distribution through Signo Trading International Ltd.

Developed by **Aquanetics, Inc.**, two types of units initially are available. An on-site/stationary system can be installed in conjunction with a holding tank under the floor level. An ORS mobile equipment unit is movable easily through a plant to service reservoirs of machines using hydraulic and lube oils. The units presently are designed to handle the following types of fluids: hydraulic, lube, quench and transformer oils, plus synthetic-phosphate esters and diesters. Various units have an actual oil process rate of from 50 to 250 gallons/hour. A variety of special options are available for particular industry needs.

The equipment now available through Signo can retain as much as 80 per cent of existing oil, by reducing water content to as little as 5ppm. Depending on the model used, oil reclamation costs can run from .035 to .057/Gallon. A single North American automobile plant already has effected savings of over $200,000 annually using a single Aquanetics unit.

While scientists agree that lubricating oils can never wear out mechanically, the build up of contaminants such as water, acids, air, dirt, metals, bacteria and other suspended solids traditionally have caused large amounts of oil to be wasted. The patented filtration system on the Aquanetics equipment allows original and expensive oils to be used indefinitely.

Circle No. 1 on enquiry card

Hydraulic power unit

Stanley Hydraulic Tools has announced the addition of a new power unit to its line of tools and accessories. The HP1-8-2000 model is a single circuit power unit capable of operating hydraulic tools up to 9gpm. An air-to-oil cooler, energising automatically to keep oil temperature under 130°, is standard equipment on the model, and a direct readout gpm tachometer is included. Offering an

alternative to large air compressors where space is at a premium, the HP-8 runs a full 12 hours on one tank of gasoline.

Circle No. 2 on enquiry card

Injection moulded pallets

A plastic pallet designed to carry dynamic loads of 2,000kg and static loads of 15,000kg has been introduced by **Palletower**. Offered in three sizes, the pallet is injection moulded in one piece from high density polyethylene structural foam. Chemically inert, it will not be affected by acids, solvents or other substances to produce contamination.

Circle No. 8 on enquiry card

Anti-static mat

High-conductivity rubber mats called "Stati-Ex" have been introduced for electronic assembly areas where static charges must be bled off to avoid damaging the product.

The new charge-eliminator

mats offer a cushioning work surface well suited for high-precision measurement laboratories, where static build up could annul the accuracy of critical readings, or cause false inputs on computer terminals. In chemical plants, these mats will eliminate the generation of dangerous sparks that could lead to ignitions or explosions.

Circle No. 12 on enquiry card

Carbide-tipped blades

A new assortment of carbide-tipped circular saw blades for power hand saws has been introduced by **Sandvik**. The new blades last more than 50 times longer than steel blades and are suited for all kinds of sawing in ordinary wood, chipboard, plastic laminates or other similar materials. The new circular saw blades are produced with centre holes and bushings to fit all common machine makes.

Circle No. 3 on enquiry card

For further information please circle appropriate number on card facing inside back cover.

Two new pump models

The **Stuart Turner** range of centrifugal pump units has been augmented by the addition of two new submersible models. A maximum flow rate of 400 gallons per hour and a 9ft maximum head is claimed for both the mains voltage version and the low voltage alternative. The pump motor bearings in both versions are self-lubricating and therefore require no maintenance.

Shaded pole induction motors are fitted to both models and are protected by thermal overload cut-outs; if the thermal overload cut-out is activated the motor will restart automatically when the temperature has dropped to within safe limits. The magnetic drive system of both models is designed to slip if the impeller is obstructed by debris or if too great a volume of water is being pumped – such as could occur if no outlet fitting is employed.

Circle No. 5 on enquiry card

Sweat connections on smaller solenoid valves

To reduce maintenance to a minimum, **Teddington Refrigeration Controls** offer sweat connections as an alternative to flared pipe connections on its thermostatic expansion valves and solenoid valves. Sweat connections are cheaper and quicker to install and provide a positive, leak-tight joint for many years.

Latest in the Teddington range of refrigeration components to be made available with the sweat connection option are Type KDD solenoid valves in the $\frac{1}{4}$in and $\frac{3}{8}$in nominal sizes. The larger $\frac{1}{2}$in and $\frac{5}{8}$in sizes offered this option when they were first introduced. This means that the complete KDD range is now supplied with either flared or sweated pipe connections.

Circle No. 10 on enquiry card

Electronic forklifts

Computerised forklift trucks, substantially employing electronic engineering, are now available from **Komatsu**. Using a microprocessor, the lift trucks afford more efficient handling by button operation than the conventional types, which rely heavily on the skill of the operators.

The lifting height of the fork can be set in nine stages with a capacity for memorising the height of withdrawing material and setting material. The actual lifting height can be digitally displayed on a panel, with the microprocessor automatically

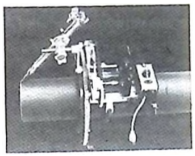
controlling all such operations as the tilting speed of the mast, the horizontal adjustment of the fork and the mast angle during travel. The control mode is switchable from automatic operation to manual operation even in the course of automatic lifting by the microprocessor.

Circle No. 9 on enquiry card

Precision pipe cutting

The development of the new 1A Torch Arm Carrier Assembly, included as standard equipment on "H&M" pipe bevelling machines, has been announced by **Ferrex International.**

The torch carrier assembly has a 2in (5cm) lateral adjustment which allows the operator



to start his cut on the end of the pipe and then manually rack the cutting torch into the line to be cut. This feature eliminates blow holes and assures a precision cut over the entire pipe circumference.

Back bevelling is also possible without the need for any major disassembly of the torch holder. A protractor permits accurate setting of the torch at variable angles of up to 45 degrees in either direction and a positive torch holder lock is also provided to ensure total accuracy during bevelling.

Circle No. 11 on enquiry card

New Ford Cargo

After 16 years of production, in which it has consistently taken between 6 and 8 per cent of the market for heavy commercial vehicles, the **Ford** D-series truck (N-series in Germany) is to be replaced by a totally new range. To be known as the Cargo, the new truck will form the foundation of Ford's efforts in the heavy commercial market spanning gross vehicle weights from 6 to 28.5 tonnes.

Circle No. 6 on enquiry card

Superplasticiser

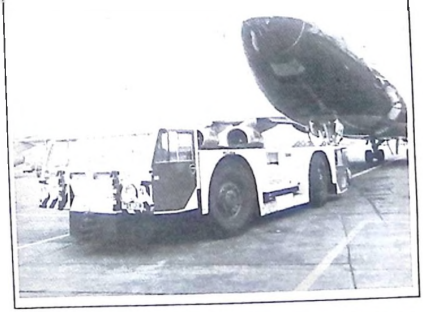
Joseph Crosfield & Sons has announced the development of Cormix SP2, a superplasticiser specially designed for the precast manufacturer. In high ambient temperatures, Cormix SP2 has been found to offer good retention and workability properties without loss of high early strength development. Large and difficult pours can be made with little or no vibration, the concrete being virtually self-compacting. Cormix SP2 is free from chloride and presents no fire hazard.

Circle No. 7 on enquiry card

Tugmasters

F. L. Douglas announce their Tugmaster range of aircraft towing, industrial and dockside vehicles. For RoRo, terminal and container port operation Tugmasters fitted with hydraulic elevated fifth wheels are available. Drawbar pull Tugmasters are also offered, ranging from units of 6,000lb pull for general port, airfield and industrial use to 60,000lb drawbar pull for handling large wide-bodied aircraft.

Circle No. 32 on enquiry card



For further information please circle appropriate number on card facing inside back cover.

...yers' guide

A guide to services and supplies for buyers in West Africa

Organisations involved in supplying or servicing industry, government or commerce may be listed in this guide for a period of 12 months at: Naira 100, Cedes 150, Leone 125, $140, or equivalent per listing.

CLASSIFIED INDEX

Full addresses listed alphabetically on following pages.

Abrasives
Bissolu Enterprises Ltd, Apapa
Landmark Industrial Supplies Limited
Reiss & Co. (Nig.) Ltd, Ebute-Metta

Accounting Machines & Systems
GBO BEAM (a Divison of UAC of Nigeria Ltd), Lagos
Leventis Technical Ltd, Lagos

Adhesives
Bostik Ltd, Leicester, UK

Aerial Photography
Kenting Africa Resource Service Ltd, Lagos

Agricultural Chemicals
Yakon Enterprises (Nig.) Ltd, Benin

Agricultural Consultancy
Yakon Enterprises (Nig.) Ltd, Benin

Agricultural Equipment
Afrocommerce (W.A.) Ltd, Lagos
Afrotec Technical Services (Nigeria) Ltd, Isolo
J. Allen & Co. Ltd, Apapa
Bewac Limited Apapa
Blackwood Hodge (Nigeria) Ltd, Apapa
R. T. Briscoe (Nigeria) Ltd Agricultural Equipment Group, Kano
Camplant, Apapa, Nigeria
Dizengoff, W.A. (Nigeria) Ltd, Apapa
Elof Hansson Ltd, UK
Hallam Graders, Leicester, UK
Incar (Nigeria) Ltd, Lagos
KAH Engineering Services Ltd Members of Hamzagroup, Apapa
Leventis Motors Ltd, Apapa
Morpol Industrial Corp. Ltd, Apapa
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Phoenix Motors Ltd, Lagos
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Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos
UTC Technical, Isolo-Mushin
UTC Hardware Division, Apapa
Waateco Ltd, Technical Division, Lagos
Yakon Enterprises (Nig.) Ltd, Benin

Agricultural Services
Cidpag Nigeria Ltd, Calabar

Agrochemical Fertilisers
A/S Cheminova, Denmark

Air Cargo Services
IMNL International Messengers (Nigeria) Ltd, Lagos, Kano, Ikoyi, Kaduna, Port Harcourt, Zaria
Nigeria International Air Services Ltd, Apapa
Triana Ltd, Apapa

Air Compressors & Pneumatic Plant
Blackwood Hodge (Nigeria) Ltd, Apapa
R. T. Briscoe (Nigeria) Ltd, Technical Department, Maton – Oshodi
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Scoatrac (Nig.) Ltd, Isolo
Waateco Ltd, Technical Division, Lagos
Wayne (West Africa) Ltd, Apapa
C. Zard & Co. Ltd, Lagos

Air Conditioning & Refrigeration
Dizengoff, W.A. (Nig.) Ltd, Apapa
Drake & Scull (Nig.) Ltd, Lagos
Equip Home (a Division of SCOA Nigeria Ltd), Lagos
Equip Iard, Scoa (Nig.) Ltd, Ogba
Hademec Ltd, Lagos
Haven Nigerian Computer Co, Lagos
Holt Engineering Ltd, Apapa
ITT NK GE IA Ltd, Yaba
James Kilpatrick (Nigeria) Ltd, Ilasamaja
Leventis Technical Ltd, Lagos
Mandilas Limited, Apapa
Nigeria Engineering Works Ltd, Port Harcourt
Norman Industries Ltd, Ikeja
Morpol Industrial Corp. Ltd, Apapa
Patterson Zochnis & Co. Ltd, Lagos
R. & A. Services (Division of UAC Ltd), Lagos
VYB (Nigeria) Ltd, Apapa
Waateco Ltd, Technical Division, Lagos

Air Courier Services
IMNL – International Messengers (Nigeria) Ltd, Lagos, Kano, Ikoyi, Kaduna, Port Harcourt, Zaria
Redcoat Express Ltd, Surrey, UK
Triana Ltd, Apapa

Aircraft Test/Aid Equipment and Accessories
Intermaco (Ghana) Ltd, Accra

Air Tools
Reiss & Co. Nigeria Ltd, Ebute-Metta

Aluminium Doors & Windows
Alumaco, Apapa
Brossette (Nigeria) Ltd, Apapa
Cego (Engineering) Ltd, Essex, UK
Central Hoge Nigeria Limited, Ikeja
Flag Aluminium Products
Fawaz – Tealwood & Chemicals (Kano) Ltd, Kano
Metraprod Industries Ltd, Ikeja
Metalum Ltd, Isolo
Steel Works Ltd, Ibadan, Nigeria

Aluminium Cookware
Alumaco, Apapa
Tower Aluminium (Nigeria) Ltd, Ikeja

Aluminium Extruded Sections
Cego (Engineering) Ltd, Essex, UK
Metraprod Industries Ltd, Ikeja
Nigalex – Nig. Aluminium Extensions Ltd, Oshodi
Tower Aluminium (Nigeria) Ltd, Ikeja

Aluminium Roofing & Cladding
Alumaco, Apapa
Flag Aluminium Products
Metalum Ltd, Isolo

Apple Micro Computers
Kittell Systems Int (Nig.) Ltd, Lagos

Arc Welding Equipment
Alumaco (Aluminium Manufacturing Company of Nigeria Limited), Apapa
R. T. Briscoe (Nigeria) Ltd, Technical Department
Gas & Welding (Nigeria) Ltd, Mushin
Industrial Gases Ltd, Apapa
Maton – Oshodi
Nigeria General Motors Ltd, Lagos
Nigerian Hardware Industries Limited, Apapa
UTC Technical Division, Isolo-Mushin

Architectural Services
Cidpag Nigeria Ltd, Calabar

Asbestos Cement Building Materials
Eternit Ltd, Sapele
Mandilas Enterprises Ltd, Lagos
Turners Building Products (Emene) Ltd
Scoatrac, Ikeja, Lagos

Asbestos Manufacturers
Giwarte Ltd, Kano

Asphalt Plants
Afrotec Technical Services (Nigeria) Ltd, Isolo
Blackwood Hodge (Nigeria) Ltd, Apapa
M. & E. (a Division of UAC of Nigeria Ltd
Morpol Industrial Corp. Ltd, Apapa
Nigerian Motors Industries Ltd, Apapa
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Scoatrac (Nig.) Ltd, Isolo
Tarpaulin Industries (WA) Ltd, Apapa

Audio Visual Equipment
Beam (Division of UAC Nig. Ltd), Lagos
Controls and Automation, Apapa
Grette Communications (Nig.) Ltd. Lagos
Ihekoke International Concern (Nig.) Ltd, Jos

Automotive Parts
J. Allen & Co. Ltd, Apapa
Leventis Motors Ltd, Apapa
Morpol Industrial Corp. Ltd, Apapa
NITECO, Apapa
Phoenix Motors Ltd

Bearings – Ball, Roller & Needle
R. T. Briscoe (Nig.) Ltd, Apapa

Bearing Metals
Makeri Smelting Co. Ltd, Jos

Bitumen Boilers & Distributors
Blackwood Hodge (Nigeria) Ltd, Apapa
M. & E. (a Division of UAC of Nigeria) Ltd
Morpol Industrial Corp. Ltd, Apapa
NITECO, Apapa
Scoatrac, Ikeja, Lagos

Block Making Machinery
Adamog (Nigeria) Ltd, Ibadan
Afrotec Technical Services (Nigeria) Ltd, Isolo
John Finlay (Engineering) Ltd, N. Ireland
M. & E. (a Division of UAC of Nigeria) Ltd
Reiss & Co. (Nig.) Ltd, Ebute-Metta
UTC Technical – Isolo-Mushin

Borehole Drilling
West African Water Drilling and Allied Services Co. Ltd, Lagos

Boilers
Brossette (Nigeria) Ltd, Apapa
VYB (Nigeria) Ltd, Apapa

Bitumen Boilers
Scoatrac (Nig.) Ltd, Isolo

Bread Ovens & Equipment
Sears Lumsden Ltd, Essex, UK

Building & Civil Engineering Contractors
Alakija & Alakija Contracting Services Ltd, Lagos
Alhaji M. R. Shitu & Sons Ltd, Lagos
Costain (West Africa) Ltd, Lagos
Cubitts Nigeria Limited, Lagos
Fuad Lekan Enterprises, Lagos
Foundation Construction Ltd, Ijaiye
Foundation Engineering (Nigeria) Ltd, Lagos
Fuad-Lekan Ent., Lagos
Italo Builders Co. Ltd, Ebute Metta
James Kilpatrick (Nigeria) Ltd, Ilasamaja
Alhaji M. R. Shuttu & Sons Ltd, Lagos
Remco Nigeria Ltd, Calabar
Sears Lumsden Ltd, Essex, UK
Samek Construction Company Ltd, Lagos
Structor, Apapa
Taylor Woodrow of Nigeria Limited, Lagos
George Wimpey & Co. (Nigeria) Ltd, Lagos

Building Construction
Inter-Beton (Nig.) Ltd, Ikeja

Building Materials
[illegible]x Paints Ltd, Ikeja
[illegible]ewac Limited, Apapa
[illegible]olu Enterprises Ltd, Apapa
[illegible]ette (Nigeria) Ltd, Apapa
[illegible]eram's Building Materials Department, Apapa
[illegible]engoff, W.A. (Nigeria) Ltd, Apapa
[illegible]up Nigerian Industries Ltd, Ikeja
[illegible]lass Reinforced Plastics Co. Ltd, [illegible]okuta
[illegible]schaleks Building Materials, Lagos (Division of UAC Nig. Ltd)
[illegible]ntis Stores, Lagos
[illegible]nco, Sweden & Donefor
[illegible]an Commercial & Industrial [illegible]terprises Limited, Lagos
[illegible]y Stephens Builders' Merchants, [illegible]apa
[illegible]ers Building Products (Emene) Ltd, [illegible]ugu
[illegible]ard & Co. Ltd, Lagos
[illegible]ster Technical Services (Nigeria) [illegible]d, Kano
[illegible]C – Hardware Division, Apapa
[illegible]neral Metals Products) Hdtb Ltd, Apapa

Burglary Alarms Equipment
Jos Hansen & Sochne Ltd, Lagos

Business Consultants
Cidpag Nig. Ltd, Calabar

Business Services
Danlon Associates, Lagos

Business Establishment Services
Danlon Associates, Lagos
Travel Agents
Air Marketing International Group of Companies, Crawley, UK
All Counties Business Agency, UK

Capacitors – AC Motor Starting & Electrolytic
Daly (Condensers) Ltd, Dorset, UK

Carbon Brush Manufacture
H. F. Schroeder (WA) Ltd, Ijaiye (under licence from Morganite UK)

Cargo Airlines
Redcoat Cargo Airlines, UK

Catering Equipment
Electrolux Mandilas Ltd, Ikeja
Equip Home (a Division of SCOA Nigeria Ltd), Lagos
Leventis Technical Ltd, Lagos
Nirexim GmbH, Vienna
F. Steiner & Co. Ltd, Lagos
VYB (Nigeria) Ltd, Apapa

Cement Manufacturers
Calabar Cement Co. Ltd, Calabar
Nigerlink Industries Ltd, Lagos

Chemical Engineering
Heplac Nigeria Ltd, Lagos
Shogbola Techniteonics Inc., Lagos

Charter Operations
Ngerdeita Shipping Agencies Ltd, Lagos

Civil Engineering Contractors
Inter-Beton (Nig.) Ltd, Ikeja

Civil Services
Cidpag Nigeria Ltd, Calabar

Civil, Electrical & Mechanical Engineers & Constructors
Hademec Ltd, Lagos
James Kilpatrick (Nig.) Ltd, Lagos
Remco Nig. Ltd, Calabar

Cold Stores
Alumaco, Apapa
Phoenix Refrigeration (UK) Ltd

Commercial Painting & Maintenance
Fuad-Lekan Ent., Lagos

Compactors
Afrotec Technical Services (Nigeria) Ltd, Isolo
Blackwood Hodge (Nigeria) Ltd, Apapa
Holman Brothers (Nigeria) Ltd, Apapa
Holt Engineering (a Division of J. Allen & Co. Ltd, Oregun Village)
Leventis Motors Ltd, Apapa
Metro Technical, Ikeja and Agbara
Morpol Industrial Corp. Ltd, Apapa
Nigerian Motor Industries Ltd, Apapa
NITECO, Apapa
Henry Stephens Engineering Co. Ltd, Ilupeju
Scoatrac, Ikeja
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos
UTC Technical, Isolo-Mushin

Computers & Related Services
GBO BEAM (a Division of UAC of Nigeria Ltd), Lagos
Haven Nigerian Computer Co, Lagos
Infodata Ltd, Lagos
International Computers (Nigeria) Ltd, Lagos, Nigeria
Leventis Technical Ltd, Lagos
Rimax Computer Services, Surulere
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Concrete Machinery
Adamog (Nigeria) Ltd, Ibadan
Afrotec Technical Services (Nigeria) Ltd, Isolo
Holman Brothers (Nigeria) Ltd, Apapa
M. & E. (a Division of UAC of Nigeria) Ltd
Morpol Industrial Corp. Ltd, Apapa
Henry Stephens Engineering Co. Ltd, Hupeju Industrial Estate
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Structor Technique
UTC Technical, Isolo-Mushin

Concrete Reinforcement
Nigerian Wire Industries Ltd

Construction Equipment
Blackwood Hodge Nigeria Ltd, Apapa
Camplant, Apapa, Nigeria
Joy Manufacturing Co., USA
Incar (Nigeria) Ltd, Lagos
Landmark Industrial Supplies Ltd, Lagos
Metro-Technical, Ikeja and Agbara
Scoatrac (Nig.) Ltd, Ikeja
Henry Stephens Engineering Co. Ltd, Ilupeju
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Consultancy Services
Cidpag Nigeria Ltd, Calabar

Containers & Tanks
Fibreglass Reinforced Plastics Co. Ltd, Abeokuta

Copy/Duplicating Machines & Products
GBO BEAM (a Division of UAC of Nigeria) Ltd, Lagos
Leventis Technical Ltd, Lagos

Corrugated Boxes
Nigerian Carton & Packaging MFG. Co. Ltd, Ikeja
Polythene Enterprises (Nigeria) Ltd, Ikeja

Couplings
R. T. Briscoe (Nig.) Ltd, Apapa

Cranes, Ropes & Hydraulic Excavators
Afrotec Technical Services (Nigeria) Ltd, Isolo
Blackwood Hodge (Nigeria) Ltd, Apapa
Camplant, Apapa, Nigeria
Conveyancer (Nigeria) Ltd, Apapa
Holman Brothers (Nigeria) Ltd, Apapa
Holt Engineering Ltd, Apapa (a Division of J. Allen Oregun Village & Co. Ltd)
Jones Cranes Ltd, UK
Leventis Motors Ltd, Apapa
Metro Technical, Ikeja & Agbara
Morpol Industrial Corp. Ltd, Apapa
Nigerian Motors Industries Ltd, Apapa
H. F. Schroeder (W.A.) Ltd
Henry Stephens Engineering Co. Ltd, Ilupeju
Stronghold (Nigeria) Ltd, Engineering Services Division, Ikeja
Scoatrac (Nig.) Ltd, Isolo
Tractor & Equipment, Ebute-Metta
Wanteco Ltd, Technical Division, Lagos

Crown Wheel & Pinions (for commercial vehicles)
Gajra Gears, Malaysia

Cutting & Bending
Afrotec Technical Services (Nigeria) Ltd, Isolo
UTC – Hardware Division, Apapa

Decoration & General Joinery
Northern Sawmill & Furniture Manufacturing Co. Ltd, Kano

Dewatering Wellpoint Equipment and Services
Morpol Industrial Corp. Ltd, Apapa
Mandilas Enterprises Ltd, Lagos

Diesel Generating Plant
Afrotec Technical Services (Nigeria) Ltd, Isolo
Blackwood Hodge (Nigeria) Ltd, Diesel Sales and Service Division, Apapa
R. T. Briscoe (Nigeria) Ltd, Technical Department, Maton-Oshodi
Camplant, Apapa, Nigeria
Clausen Eng., Co. Kano
E. D. G. (Nigeria) Ltd, Kano
Holman Brothers (Nigeria) Ltd, Apapa
Holt Engineering (a Division of J. Allen & Co. Ltd, Oregun Village)
ITT Nigeria Ltd, Yaba
Leventis Technical Ltd, Lagos
M. & E. (a Division of UAC of Nigeria) Ltd
Nigerian Motors Industries Ltd, Apapa
Nigerlink Industries Ltd, Lagos
NITECO, Apapa
Phoenix Motors Ltd, Oregun, Lagos
Powermaker Generators (Technical Division Tarpaulin Inc. (WA) Ltd), Apapa
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Scoatrac, Ikeja
Stokvis Nigeria Limited, Ebute Metta
Stronghold (Nigeria) Ltd, Engineering Services Division, Ikeja
Structor Technique, VYB (Nigeria) Ltd, Apapa
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos
UTC Technical, Isolo-Mushin
Wanteco Ltd, Technical Division, Lagos
Wartsila Nigeria Ltd, Apapa
C. Zard & Co. Ltd, Lagos

Diesels – Industrial and Marine
Blackwood Hodge (Nigeria) Ltd, Apapa
R. T. Briscoe (Nigeria) Ltd, Technical Department, Apapa
Equip Home (a Division of SCOA Nigeria Ltd), Lagos
Holt Engineering Ltd (a Division of J. Allen & Co. Ltd, Oregun Village)
Leventis Technical Ltd, Lagos
M. & E. (a Division of UAC of Nigeria) Ltd
Morpol Industrial Corp. Ltd, Apapa
Nigerian Motors Industries Ltd, Apapa
Nigerlink Industries Ltd, Lagos
Scoatrac (Nig.) Ltd, Ikeja
Henry Stephens Engineering Co. Ltd
Ilupeju Industrial Estate
Stokvis Nigeria Limited, Ebute Metta
Tarpaulin Industries (WA) Ltd, Apapa
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos
Tractor & Equipment, Ebute-Metta
UTC Technical Division, Isolo-Mushin
Wartsila Nigeria Ltd, Apapa

Dispensing and Bulk Pumps
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Wayne (West Africa) Ltd, Apapa

Doors & Windows
Aluminium Manufacturing Company of (Alumaco), Nigeria Limited, Apapa
Bisiolu Enterprises Ltd, Apapa
Crittall-Hope Nigeria Limited, Ikeja
General Metal Products, Apapa
Steel Works Ltd, Ibadan, Nigeria

Dredging & Reclamation Contractors
Ham Dredging (Nig.) Ltd, Ikeja
Nigerian Dredging & General Works Ltd, Apapa
Westminster Dredging (Nig.) Ltd, Lagos

Dumpers
Afrotec Technical Services (Nigeria) Ltd, Isolo
Camplant, Apapa, Nigeria
Conveyancer (Nig.) Ltd, Apapa
Holman Brothers (Nigeria) Ltd, Apapa
Leventis Motors Ltd, Apapa
M. & E. (a Division of UAC of Nigeria) Ltd, Lagos
Morpol Industrial Corp. Ltd, Apapa
Nigerian Motors Industries Ltd, Lagos
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Scoatrac, Ikeja
Henry Stephens Engineering Co. Ltd, Ilupeju
Structor Technique
UTC Technical, Isolo-Mushin
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Earthmoving Equipment
Afrotec Technical Services (Nigeria) Ltd, Isolo
Bewac Ltd, Apapa
Blackwood Hodge (Nigeria) Ltd, Apapa
R. T. Briscoe (Nigeria) Ltd, Lagos
Camplant, Apapa, Nigeria
Greenham Plant Hire (a Division of UAC of Nigeria Ltd), Ikeja
Holman Brothers (Nigeria) Ltd, Apapa
Holt Engineering (a Division of J. Allen & Co. Ltd, Oregun Village)
Conveyancer (Nigeria) Ltd, Apapa
Hallam Graders, Leicester, UK
Holman Brothers (Nigeria) Ltd, Apapa
Joy Manufacturing Co, USA
Leventis Motors Ltd, Lagos
Metro Technical, Ikeja & Agbara
Nigerian Motors Industries Co. Ltd, Apapa
Scoatrac, Isolo
Stronghold (Nigeria) Ltd, Engineering Services Division, Ikeja
Tractor & Equipment (a Division of UAC of Nigeria Ltd), Lagos

Electrical Contracting Materials
Clausen Engineering, Co. Ltd, Kano
Cutler-Hammer Nigeria Ltd, Yaba
Holt Engineering Ltd (a Division of J. Allen & Co. Ltd, Oregun Village)
Pan Electric, Apapa
Remco Nigeria Ltd, Calabar
West African Engineering Co. (Nig.) Ltd, Apapa

Electrical/Electronic Equipment
R. T. Briscoe (Nigeria) Ltd, Technical Department, Matori – Oshodi
Cutler-Hammer Nigeria Ltd, Yaba
EMS (a Division of UAC of Nigeria Ltd), Apapa
Fado Engineering Co. Ltd, Ebute-Metta
Grette Communications (Nig.) Ltd, Lagos
Haven Nigerian Computer Co., Lagos
Holt Engineering Ltd (a Division of J. Allen & Co. Ltd, Oregun Village)
Leventis Technical Ltd, Lagos
Mofat Engineering Co. Ltd, Lagos
Nigerian Computer Co., Lagos
NITECO, Apapa
G.N. Okosala Electric Company
VYB (Nigeria) Ltd, Apapa
West African Engineering Co. (Nig.) Ltd, Apapa

Electrical Engineering Contractors
Aluminium Wire & Cable Co. Ltd
Artec Engineering Ltd, Yaba
Clausen Engineering Co. Ltd, Kano
Electric Cable & Overhead Conductor
Bennet Babs Electrical Co., Ikeja
Drake & Scull (Nig.) Ltd, Lagos
E.D.G. (Nigeria) Ltd, Kano
A.D. Green & Co. Ltd, Ibadan
Hademec Ltd, Logos
Heplac Nigeria Ltd, Lagos
James Kilpatrick (Nigeria) Ltd, Ilasamaja
Lilleker Brothers (Nig.) Ltd, Zaria
Marryat Daniel (Nigeria) Ltd, Lagos
Mofat Engineering Co. Ltd, Lagos
Technical Constructions (Nigeria) Ltd, Lagos

Electric Fans
Nigeria Engineering Works Ltd, Port Harcourt
Reiss & Co. (Nig.) Ltd, Ebute-Metta

Electric Generating Sets
Lanre Bhadmus Ind. Ltd, Lagos
Phoenix Motors Ltd, Lagos
Scoatrac, Ikeja, Lagos
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Electrical/Mechanical Contractors
Lilleker Brothers (Nig.) Ltd, Zaria

Electrical Services
Afrotec Technical Services (Nigeria) Ltd, Isolo
Bennet Babs Electrical Co., Ikeja
Cidpag Nigeria Ltd, Calabar
Reiss & Co. (Nig.) Ltd, Ebute-Metta
H. F. Schroeder (WA) Ltd, Iganmu

Electric Pumps
Morpol Industrial Corp. Ltd, Apapa
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Tractor &Equipment (Division of UAC Nigeria Ltd), Lagos

Electrolytic Capacitors
Daly (Condensers) Ltd, Dorset, UK

Electronic Communication Equipment
GTE Nigeria Ltd, Lagos
Grette Communications (Nig.) Ltd, Lagos
Jos Hansen & Soehne Ltd, Lagos

Electronic Kits ("do it yourself")
Steen Bolbroe A/S Denmark

Engineering Services
Cutler-Hammer Nigeria Ltd, Ikeja

Drake & Scull (Nigeria) Ltd, Lagos
James Kilpatrick (Nigeria) Ltd, Ilasamaja

Engineering Laboratory Services

Artec Engineering Ltd, Yaba
Foundation Engineering (Nigeria) Ltd, Lagos

Excavators (Hydraulic)

Camplant, Apapa, Nigeria
Metro Technical, Ikeja & Agbara
Scoatrac, Ikeja, Lagos
Henry Stephens Engineering Co. Ltd, Ilupeju
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Feed, Mill & Grain Storage Systems

Lolita Nigeria Ltd, Enugu

Fencing

Nigerian Wire Industries Limited

Fibreglass Stockists

Pilkington Glass (Nigeria) Ltd, Apapa

Filters

Morpol Industrial Corp. Ltd

Fire-fighting Equipment & Vehicles

Guthrie (Nigeria) Ltd, Lagos
Leventis Motors Ltd, Lagos
Omot Fire Protection Eng. Ltd, Ikeja
Preussag Drilling Engineers Ltd, Maiduguri
SIDES
Stronghold (Nigeria) Ltd, Security & Safety Services Division, Ikeja

Fire Protection Equipment & Systems

Omot Fire Protection Eng. Ltd, Ikeja
Intermaco (Ghana) Ltd, Accra
Reiss & Co. (Nigeria) Ltd, Lagos

Flow

Brossette (Nigeria) Ltd, Apapa

Flow Meters

Wayne (West Africa) Ltd, Apapa
West African Engineering Co. (Nig.) Ltd, Apapa

Food Processing Equipment

Henry Stephens Engineering Co. Ltd, Apapa
UTC Technical, Isolo-Mushin

Fork Lift Trucks

Adamog (Nigeria) Ltd, Ibadan
Afrocommerce (W.A.) Ltd, Lagos
Afrotec Technical Services (Nigeria) Ltd, Isolo
Bewac Limited, Apapa
R. T. Briscoe (Nigeria) Ltd, Technical Department, Apapa
Conveyancer (Nig.) Ltd, Apapa
Engineering Services Division, Ikeja
Leventis Motors Ltd, Lagos
Lyntraco Sweden (Nig.) Ltd, Ikeja
Nigerian Motors Industries Ltd, Apapa
NITECO, Apapa
Henry Stephens Engineering Co. Ltd, Ilupeju
Tarpaulin Industries (WA) Ltd, Apapa
Tractor & Equipment (a Division of UAC of Nigeria Ltd), Lagos
Waateco Ltd, Iganmu

Foundation Works

Foundation Construction Ltd, Iganmu
Raymond Constructors (Nigeria) Ltd, Lagos
Trevi Foundations Nig. Ltd, Oshodi

French Windows and Doors

Crittall-Hope Nigeria Ltd
Steel Works Ltd, Ibadan
General Metal Products, Apapa

Full and Split Charter Operations

Air Marketing International Group of Companies, Crawley, UK

Triana Ltd, Apapa

Furniture

Beam (Division of UAC Nig. Ltd), Lagos
Nigerian Office Stationery Supply Stores Ltd, Apapa

Garage Equipment

Landmark Industrial Supplies Ltd, Lagos
Pump Services Nigeria Ltd, Lagos
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Stokvis Nigeria Limited
VYB (Nigeria) Ltd, Apapa
Wayne (West Africa) Ltd, Apapa
C. Zard & Co. Ltd, Lagos

Gas and Arc Welding Equipment

Nigerian Gas Industries Ltd, Lagos

General Building Contractors

Fuad-Lekan Ent., Lagos

Generating Sets

Holman Brothers (Nigeria) Ltd, Apapa
Incar (Nigeria) Ltd, Apapa
Lilleker Brothers (Nig.) Ltd, Zaria
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Tarpaulin Industries (W.A.) Ltd, Apapa

Glasshouses

Makin Ltd, Ilupeju
General Metal Products, Apapa

Glass/Mirrors Processors

Pilkington Glass (Nigeria) Ltd, Apapa

Graders

Blackwood Hodge (Nigeria) Ltd, Apapa
Camplant, Apapa, Lagos
Holt Engineering Ltd (a Division of J. Allen & Co. Ltd, Oregun Village)
Metro Technical, Ikeja and Agbara
Morpol Industrial Corp. Ltd, Apapa
Nigerian Motors Industries Ltd, Apapa
Scoatrack, Ikeja, Lagos
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Graphic Arts Requisites

A.M. Faltas (West Africa) Ltd, Lagos

Hand & Power Tools

Landmark Industrial Supplies Limited
Reiss & Co. (Nig.) Ltd, Ebute-Metta
UTC – Hardware Division, Apapa

Hemodialysis Systems

Intermaco (Ghana) Ltd, Accra

Hoses

Akan Ltd, Kano
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos
Equip Home (a Division of SCOA Nigeria Ltd), Lagos
A.M. Faltas (West Africa) Ltd, Lagos
Fawaz Steelwood & Chemicals (Kano) Ltd, Kano
Nirexim GmbH, Vienna
Ihekoke Int. Concern Ltd, Jos
Scoaltrac, Ikeja, Lagos
F. Steiner & Co. Ltd, Lagos
UTC Technical, Isolo-Mushin

House Furniture

North Sawmill & Furniture Manufacturing Co. Ltd, Kano

Ice Plants

Phoenix Refrigeration (UK) Ltd, Lagos

Identity Cards

Veritas & Co. (Nig.) Ltd, Lagos

Importers/Exporters

G.N.A. Hamzer & Co. (Nig.) Ltd

Industrial Electrical Installations

H. F. Schroeder (W.A.)Ltd

Industrial Engines & Accessories

Landmark Industrial Supplies Ltd, Lagos
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Scoatrac, Ikeja, Lagos
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Industrial Chemicals

Stauffer Chemical Europe S.A., Switzerland

Industrial Gases

Gas & Welding (Nigeria) Ltd, Ikeja
Industrial Gases Ltd, Apapa

Industrialisation Services

Danlon Associates, Lagos

Innoculation Apparatus

Intermaco (Ghana) Ltd, Accra

Instrumentation

Brossette (Nig.) Ltd, Apapa

Insecticides

A/S Cheminova, Denmark

Insurance Brokers & Consultants

Interbroker & Co.

Interior Decorating

Fuad/Lekan Ent., Lagos

Intruder Detection & Alarm Systems

Reiss & Co. (Nigeria) Ltd, Lagos

Ironmongery & Locks

UTC – Hardware Division, Apapa

Irrigation Equipment

Afrotec Technical Services (Nigeria) Ltd, Isolo
Brossette (Nig.) Ltd, Apapa
Guthrie (Nigeria) Ltd, Lagos
Jos. Hansen & Sochne (Nig.) Ltd, Lagos
I.I.D.C., New York
Landmark Industrial Supplies Ltd, Lagos
Leventis Technical Ltd, Lagos
Scoatrac, Ikeja, Lagos
Stokvis Nigeria Limited, Ebute-Metta
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos
U.T.C. Engineering Division, Lagos

Kitchen Cabinets

Steel Works Ltd, Ibadan, Nigeria

Laboratory Chemicals/Reagents

Ihekole International Concern (Nig.) Ltd, Jos
The Twilights Nigeria Ltd
Intermaco (Ghana) Ltd, Accra

Laboratory Furniture

Fawaz Steelwood & Chemicals (Kano) Ltd, Kano
Ihekole International Concern (Nig.) Ltd, Jos
Intermaco (Ghana) Ltd, Accra
Nirexim GmbH, Vienna

Laundry Equipment

Electrolux Mandilas Ltd, Ikeja
Equip Home (a Division of SCOA Nigeria Ltd), Lagos
F. Steiner & Co. Ltd, Lagos
VYB (Nigeria) Ltd, Apapa

Library Equipment

Ihekole International Concern (Nig.) Ltd, Jos
Nigeria Engineering Works Ltd, Port Harcourt

Lift/escalator installations/maintenance

Nigerian Motors Industries Ltd, Otis Division
H. F. Schroeder (WA) Ltd, Iganmu

Light Fittings

Context (Nig.) Ltd, Lagos

Liquid Storage Tanks

Braithwaite Dept. Gottshalcks Building Materials, Apapa
Reiss & Co. (Nigeria) Ltd, Lagos

Lighterage

Niger Benue Transport Co. Ltd, Warri

Livestock Feed Mills

UTC Technical, Isolo-Mushin

Machine Tools & Woodworking Machinery

Holt Engineering Ltd (a Division of J. Allen & Co. Ltd, Oregun Village
Landmark Industrial Supplies Ltd, Lagos
Leventis Technical Ltd, Lagos
Lyntraco Sweden (Nig.) Ltd, Ikeja
M. & E. (a Division of UAC of Nigeria Ltd), Lagos
Nigerian Motors Industries Ltd, Apapa
Stokvis Nigeria Limited, Ebute-Metta
Stokvis-Nigerian Tool & Die Co. Ltd, Ebute-Metta
UTC Technical, Isolo-Mushin
UTC – Hardware Division, Apapa
C. Zard & Co. Ltd, Lagos

Manhole Covers & Gully Gratings

Isolu Enterprises Ltd, Apapa
Nigerian Foundries Ltd, Lagos

Mapping

Mapping Africa Resource Service Ltd, Lagos

Marine Engines & Accessories

Atlas Marine, Port Harcourt
Blackwood Hodge (Nigeria) Ltd, Diesel Sales and Service Division, Apapa
R. T. Briscoe (Nigeria) Ltd, Lagos
Holman Brothers (Nigeria) Ltd, Apapa
Nigerian Motors Industries Ltd, Apapa
Henry Stephens Engineering Co. Ltd, Apapa
UTC Technical, Isolo-Mushin
Scoatrac, Ikeja, Lagos
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Materials Handling Equipment

Gottshalks Building Materials (a Division of UAC Nig. Ltd), Apapa
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Mechanical Services

Cidpag Nigeria Ltd, Calabar

Mechanical & Electrical Engineering Contractors

Artec Engineering Ltd, Yaba
Equip Jard (Division of Scoa Nigeria Ltd), Ogba
Fado Engineering Co. Ltd, Ebute-Metta
Hademec Ltd, Lagos
Heplan Nigeria Ltd, Lagos
Landmark Industrial Supplies Ltd, Lagos
Marryat Daniel (Nig.) Ltd, Lagos
Remco (Nigeria) Ltd, Calabar

Medical Gases & Medical Equipment

Ihekole International Concern (Nig.) Ltd, Jos
Industrial Gases Ltd, Apapa

Metal Cutting Machinery

Afrocommerce (W.A.) Ltd, Lagos

Mining Equipment & Quarrying

Holman Brothers (Nigeria) Ltd, Apapa
Joy Manufacturing Co. Ltd, USA
Morpol Industrial Corp. Ltd, Apapa
Scoatrac, Ikeja, Lagos

Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Mobile Broadcasting Vehicles

Grette Communications (Nig.) Ltd, Lagos

Motor Transport (Trucks)

J. Allen & Co. Ltd, Apapa
R. T. Briscoe (Nigeria) Ltd, Motor Division, Igamnu
Incar (Nigeria) Ltd, Lagos
Leventis Motors Ltd, Apapa
NITECO, Apapa
Phoenix Motors Ltd, Lagos
Henry Stephens Engineering Co. Ltd, Apapa
Waateco Ltd, Igamnu

Motor Spare Parts and Accessories

Gapa Gears, NS SDN BHD, Malaysia
Lanre Ghadmus Ind. Ltd, Lagos
Morpol Industrial Corp. Ltd
Mufbat Brothers, Yaba & Lagos
World Life General Motors (Nigeria) Co. Ltd

Municipal and Specialist Vehicles

World Life General Motors (Nigeria) Co. Ltd

Office Equipment

Fawaz Steelwood & Chemicals (Kano) Ltd
GBO BEAM (a Division of UAC of Nigeria Ltd), Lagos
Leventis Technical Ltd, Lagos
Nigeria Engineering Works Ltd, Port Harcourt
Nigerian Office Stationery Supply Stores Ltd, Apapa
F. Steiner & Co. Ltd, Lagos
General Metal Products Ltd, Apapa
Steel Works Ltd, Ibadan

Oil – Seals

R. T. Briscoe (Nig.) Ltd, Apapa

Oil Tank Calibrators

Caleb Brett & Sons (Nig.) Ltd, Apapa

Ovens

Reiss & Co. (Nig.) Ltd, Ebute-Metta

Oxygen, Acetylene & Special Gases

Gas & Welding (Nigeria) Ltd, Mushin
Industrial Gases Ltd, Apapa

Packaging Materials

Akan Ltd, Kano
Nigerian Carton & Packaging MFG Co. Ltd
Polythene Enterprises (Nigeria) Ltd, Ikeja

Paging & Public Address Systems

Grette Communications (Nig.) Ltd, Lagos
Jos Hansen & Soehne Ltd, Lagos

Paints & Varnishes

Apex Paints Ltd, Ikeja
Berger Paints (Nigeria) Ltd, Ikeja
Bisiolu Enterprises Ltd, Apapa
Dulux, ICI Paints (Nigeria) Ltd, Ikeja
Nigerlux Paints, International Paints (West Africa) Ltd, Ikeja
Reiss & Co. (Nig.) Ltd, Ebute-Metta

Paper Converting Machinery

Elof Hansson Ltd, UK

Partitioning

Context (Nig.) Ltd, Lagos

Petroleum Hoses

Wayne (West Africa) Ltd, Apapa

Piling

Foundation Construction Ltd, Igamnu
Raymond Constructors (Nigeria) Ltd, Lagos
Trevi Foundations (Nig.) Ltd, Oshodi

Pipes, Building & Pressure

Akan Ltd, Kano
Bisiolu Enterprises Ltd, Apapa
Brossette (Nigeria) Ltd, Apapa
Dunlop Nigerian Industries Ltd, Ikeja
Interplast Ltd, Accra
Leventis Stores, Lagos
Mandilas Enterprises Ltd, Lagos
Nigerian Foundries Ltd, Lagos
Turners Building Products (Emene) Ltd, Enugu

Plant Hire

Camplant, Apapa, Nigeria
Costain (West Africa) Ltd, Lagos
Greenham Plant Hire (a Division of UAC of Nigeria Ltd), Ikeja
Holman Brothers (Nigeria) Ltd, Apapa
James Kilpatrick (Nigeria) Ltd, Ilasamaja

Plant Protection Chemicals

A/S Cheminova, Denmark

Plastic Processing Equipment

Nigerian Office Stationery Supply Stores Ltd, Apapa
Reiss & Co. (Nig.) Ltd, Ebute-Metta

Plumbing Contractors

Akan Ltd, Kano
Artec Engineering Ltd, Yaba
Hademec Ltd, Lagos
Equip Iard – SCOA Nigeria Ltd
James Kilpatrick (Nigeria) Ltd, Ilasamaja
Marryat Daniel (Nig.) Ltd, Lagos

Pothole Repair Materials

Roadcare (Nigeria) Ltd, Ibadan

Poultry Feed Distribution Equipment

Afrotec Technical Services (Nigeria) Ltd, Isolo

Printing Machinery

Elof Hansson Ltd, UK

Printing Materials

Makeri Smelting Co. Ltd, Jos
Nigerian Office Stationery Supply Stores Ltd, Apapa
Reiss & Co. (Nig.) Ltd, Ebute-Metta

Road Services

Cidpag Nigeria Ltd, Calabar

Projected Windows

Steel Works Ltd, Ibadan

Protective Coatings

Bostik Ltd, Leicester, UK
General Metal Products Ltd, Apapa

Protective Clothing

Akan Ltd, Kano
Landmark Industrial Supplies Ltd, Lagos

Protective Plant

Roadcare (Nigeria) Ltd, Ibadan

Pumps

Afrotec Technical Services (Nigeria) Ltd, Isolo
R. T. Briscoe (Nigeria) Ltd, Technical Department, Apapa
Brossette Nigeria Ltd, Kano
Jos. Hansen & Soehne Nigeria Ltd, Lagos
Holman Brothers (Nigeria) Ltd, Apapa
I.I.D.C., New York
Landmark Industrial Supplies Ltd, Lagos
Leventis Technical Ltd, Lagos
M. & E. (a Division of UAC of Nigeria Ltd), Lagos
Mandilas Enterprises Ltd, Lagos
Morpol Industrial Corp. Ltd
Nigerian Motors Industries Ltd, Apapa
NITECO, Apapa
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Henry Stephens Engineering Co. Ltd, Ilupeju
Stokvis Nigeria Limited, Ebute-Metta
UTC – Engineering Division, Apapa
UTC – Technical, Isolo-Mushin
VYB (Nigeria) Ltd, Apapa
Waateco Ltd, Technical Division, Lagos

Quarry Plant

Afrotec Technical Services (Nigeria) Ltd, Oshodi
Blackwood Hodge (Nigeria) Ltd, Apapa
John Finlay (Engineering) Ltd, N. Ireland
Holman Brothers (Nigeria) Ltd, Apapa
M. & E. (a Division of UAC of Nigeria Ltd), Lagos
Morpol Industrial Corp. Ltd
Reiss & Co. (Nig.) Ltd, Ebute-Metta
Scoatrack Ikeja, Lagos
Henry Stephens Engineering Co. Ltd, Ilupeju

Radio Communication Equipment

J. Allen & Company Ltd, Apapa
Comsec Communications Associates of Nigeria Ltd, Ikeja
R. T. Briscoe (Nigeria) Ltd, Telecommunications Department, Apapa
Dizengoff, W.A. (Nig.) Ltd, Apapa
GTE Nigeria Ltd, Lagos
Grette Communications (Nig.) Ltd, Lagos
ITT Nigeria Ltd, Yaba
Mofat Engineering Co. Ltd, Lagos
Philips (Nigeria) Ltd, Lagos
Plessey (Nigeria) Ltd, Lagos

Radio Distributors

Leventis Technical Ltd, Lagos
Pan-Electric (a Division of UAC of Nigeria Ltd), Ebute-Metta

Radio Telephones

Comsec Communications Associates of Nigeria Ltd, Ikeja
Grette Communications (Nig.) Ltd, Lagos
Mandilas Enterprises Ltd, Lagos

Radio & Television Broadcast Equipment

Grette Communications (Nig.) Ltd, Lagos

Refrigeration

ITT Nigeria Ltd, Yaba
Phoenix Refrigeration (UK) Ltd

Refrigeration Gases

Industrial Gases Ltd, Apapa

Repair/Rewinding of Electric Motor/Generators

H. F. Schroeder (WA) Ltd, Igamnu

Reprographic Materials

Veritas & Co. (Nig.) Ltd, Lagos

River Transport

Niger Benue Transport Co. Ltd, Warri

Road Making Equipment

Blackwood Hodge (Nigeria) Ltd, Apapa
Holman Brothers (Nigeria) Ltd, Apapa
Joy Manufacturing Co., USA
Levenus Motors Ltd, Apapa
M. & E. (a Division of UAC of Nigeria Ltd), Lagos
Metro-Technical, Ikeja and Agbara
Morpol Industrial Corp. Ltd, Apapa
NITECO, Apapa
Phoenix Motors Ltd, Oregun, Lagos
Henry Stephens Engineering Co. Ltd, Apapa
Scoatrac, Ikeja, Lagos
Tractor & Equipment (Division of UAC Nigeria Ltd), Lagos

Road Repair Products (Instant)

Roadcare (Nigeria) Ltd, Ibadan

Roller Shutter Doors

Crittall-Hope Nigeria Ltd, Ikeja
Steel Works Ltd, Ibadan

Roofing & Cladding Materials

Alumaco (Aluminium Manufacturing Co. of Nigeria Ltd), Apapa
Eternit Ltd, Sapele
Fibreglass Reinforced Plastics Co. Ltd, Abeokuta
Tower Aluminium (Nigeria) Ltd, Ikeja

Ropes

Nigerian Ropes Ltd, Apapa
UTC – Hardwood Division, Apapa

Safety Equipment

World Life General Motors (Nigeria) Co. Ltd

Sales/Installation/Service Electrical Hoisting Equipment

H. F. Schroeder (WA) Ltd, Ioanmu

Sanitary Ware Manufacturers

Armitage Shanks Ltd, Glasgow

Sanitary Ware & Fittings

Bisiolu Enterprises Ltd, Apapa
Brossette (Nig.), Apapa
Gottschalcks Building Materials, Lagos
Leventis Stores, Lagos
Nigerian Foundries Ltd, Lagos
F. Steiner & Co. Ltd, Lagos
Henry Stephens Engineering Co. Ltd, Apapa
Henry Stephens Engineering Co. Ltd, Apapa
Structor, Apapa
UTC – Hardware Division, Apapa
C. Zard & Co. Ltd
Projects Department, Apapa

School Furniture

Ihekole International Concern (Nig.) Ltd, Jos
Fawaz Steelwood & Chemicals (Kano) Ltd, Kano
Steel Works Ltd, Ibadan, Nigeria

Science & Laboratory Instruments

A. M. Faltas (West Africa) Ltd, Lagos
Ihekole Int. Concern Ltd, Jos
F. Steiner & Co. Ltd, Lagos

Screening Equipment

John Finlay (Engineering) Ltd, N. Ireland
Scoatrac (Nig.) Ltd, Isolo

Sealants

Bostik Ltd, Leicester, UK

Sewage Treatment Plant

Bewac Ltd, Apapa
R. T. Briscoe (Nigeria) Ltd
UTC – Engineering Division, Apapa

Sewing Machines

Cinsere Sewing Machines Ind. Co. Ltd, Lagos
Pfaff Industrial Sewing Machines

Sewing Threads & Cords

West African Thread Co. Ltd, Apapa

Shelving Systems

Brossette (Nig.) Ltd, Apapa
The Twilights Nigeria Ltd
General Metal Products Ltd, Apapa
Gottschalks Building Materials (a Division of UAC Nigeria Ltd), Apapa
Steel Works Ltd, Ibadan, Nigeria

Shipping & Forwarding Agents

Air Marketing International Group of Companies, Crawley, UK
Sevenseas Shipping Co. Ltd (Hamzer), Apapa
Triana Ltd, Apapa
Veritas & Co. (Nig.) Ltd, Lagos

Soil Investigation

Foundation Engineering (Nigeria) Ltd, Lagos

Nigerian Dredging & General Works Ltd, Lagos
Raymond Constructors (Nigeria) Ltd, Lagos
Trevi Foundations Nig. Ltd, Oshodi

Solders

Makeri Smelting Co. Ltd, Jos
Reiss & Co. (Nig.) Ltd, Ebute-Metta

Stationery

Nigerian Office Stationery Supply Stores Ltd, Apapa

Steel Structures

Nigerian Engineering Works Ltd, Port Harcourt
Steel Works Ltd, Ibadan

Storage & Equipment

Brossette (Nig.) Ltd, Apapa
Dexion Department
Gottschalcks Building Materials, Apapa
Leventis Stores Ltd, Lagos
Nigeria Engineering Works Ltd, Port Harcourt
Stronghold (Nigeria) Ltd, Handy Angle Division, Ikeja
General Metal Products Ltd, Apapa

Structural Steelwork – Fabrication & Erection (Roof Trusses)

Grid Index Nigeria Ltd, Suru-Lere
Intermaco (Ghana) Ltd, Accra

Survey Equipment

Atlas (Nig.) Ltd, Lagos
Kenting Africa Resources Survey Ltd, Lagos
Ihejoke Int. Concern Ltd, Jos
Plessey (Nigeria) Ltd, Lagos
F. Steiner & Co. Ltd, Lagos

Suspended Ceilings

Context (Nig.) Ltd, Lagos
Gottschalcks Building Materials, Lagos

Swimming Pool Construction & Maintenance

Ojo-Famo Nig. Co., Ikeja
C. Zard & Co. Ltd, Lagos

Technical Management Consultants

Shogbola Technitronics Inc., Lagos

Technology Transfer

Shogbola Technitronics Inc., Lagos

Telephone Equipment

J. Allen & Company Ltd, Apapa
Comsac: Communications Associates of Nigeria Ltd, Ikeja
Grette Communications (Nig.) Ltd, Lagos
GTE Nigeria Ltd, Lagos
Jos. Hansen & Soehne Ltd, Lagos
ITT Nigeria Ltd, Yaba
Philips (Nigeria) Ltd, Lagos
Plessey (Nigeria) Ltd, Lagos
Sentrycom Alarms (Nigeria) Ltd, Lagos
Ultra-Modern Electronics Ltd, Surulere

Time Card Clocks & Systems

Bisiolu Enterprises Ltd, Apapa
Jos. Hansen & Soehne Ltd, Lagos
Leventis Technical Ltd, Lagos
F. Steiner & Co. Ltd, Lagos

Towage

Niger Benue Transport Co. Ltd, Warri

Trailer Axles and Components

Shannon Ltd, UK

Tugs & Barge Hire

Nigerdelta Shipping Agencies Ltd, Lagos

Turnkey Laundry & Drycleaning Systems and Equipment

Laundry Systems (Nigeria) Ltd, Yaba

Under Water Services

Nigerian Divising Services, Lagos

Water Drilling, Water Sources Prospecting & Water Wells

Atlas Copco, Stockholm, Sweden
Scoatrac, Ikeja, Lagos

Water Treatment Chemicals

Ihekole Conwn (Nig.) Ltd, Jos

Welding Equipment

Reiss & Co. (Nig.) Ltd, Ebute-Metta

ALPHABETICAL LISTINGS

Adamog (Nigeria) Ltd,
N5B/66 Idi-Ape, Iwo Road, POB 910, Agodi Gate, Ibadan. Tel: 61696
Afrocommerce (W.A.) Ltd,
168 Awolowo Road, Ikoyi, Lagos, Nigeria.
Afrotec Technical Services (Nigeria) Ltd,
PMB 1061, Oshodi, Lagos.
Tel: 45656/44706
Akan Ltd,
3 Beirut Road, PO Box 2038, Kano, Nigeria.
Alakija & Alakija Contracting Services Ltd,
6 Ondo Street, West Ebute-Metta, Lagos, Nigeria. Tel: 48286
Armitage Shanks Ltd, Glasgow,
Tubal Works, Barrhead, Glasgow G78 1NG, UK.
Air Marketing International Group of Co's,
9 Church Road, Lowfield Heath, Crawley, Sussex, UK.
Tel: Crawley 515651. Telex: 877180.
Alhaji M. R. Shittu & Sons Ltd,
41 Oguntola Street, Shomoly, Lagos.
Tel: 44191.
All Countries Business Agency,
West House, Slough Lane, Saunderton, Nr. High Wycombe, Bucks, UK.
Tel: 024024 3701. Telex: 837560.
J. Allen & Company Ltd,
PO Box 542, 25 Creek Road, Apapa.
Tel: 47881.
Allens Marine, J. Allen & Co. Ltd,
9/10 Yakubu Gowon Drive, PO Box 282, Port Harcourt, Rivers State, Nigeria.
Aluminium Manufacturing Company of Nigeria Limited (Alumaco),
32 Creek Road, PO Box 60, Apapa.
Tel: 844664/5, 844686.
Cable: PANALPINA.
Aluminium Wire & Cable Co. Ltd,
Port Tennant, Swansea, Glamorgan, UK.
Artec Engineering Ltd,
1 Popo St., Yaba, PO Box 3763, Lagos.
Tel: 42593. Cable: AGRIGBABU, Lagos.
Atlas Copco,
Water Well Drilling Dept/KNS-105 23, Stockholm, Sweden. Tel: 08/7438000.
Telex: 14090 COPCO S EXDA +
Atlas (Nigeria) Ltd,
Oshodi Scheme, Isolo Industrial Estate, Oshodi Expressway. PO Box 2120, Lagos, Nigeria. Tel: 848868
Beam (Division of UAC Nig. Ltd),
H.O. 58 Marina, PO Box 1081, Lagos, Nigeria. Tel: 663241, 662179, 662197.
Bennett Babs Electrical Co.,
PO Box 444, Ikeja, Lagos.
Berger Paints Nigeria Ltd,
Oba Akran Avenue, PMB 1052, Ikeja.
Bewac Limited,
1 Commercial Road, PMB 1016, Apapa.
Tel: 450955, 41193.
Bisiolu Enterprises Ltd,
1 Warehouse Road, Apapa.
PO Box 3214, Lagos.
Tel: 47288. Telex: BEKBEK 21543N.
Blackwood Hodge (Nigeria) Ltd,
15 Burma Road, PO Box 109, Apapa.
Tel: 47107/47049.
Bostik Ltd,
Ulverscroft Road, Leicester LEH 6BW.
Tel: Leicester 50015. Telex: 34625.
R. T. Briscoe (Nigeria) Ltd,
Agricultural Equipment Group,
1 Independence Road,
PO Box 3, Kano, Nigeria.
Technical Dept., Matori & Oshodi & Apapa.
Motor Division: Iganmu.
Telecommunications Dept., Apapa.
Projects Dept., Apapa. Tel: 46471.
British Caledonian Airways,
c/o Central Hotel, PO Box 794, Kano.
Tel: 2040, 4834/5.
British Caledonian Airways,
18/19 Ahmadu Bello Way, PO Box 238, Kaduna. Tel: 22029, 22032.
British Caledonian Airways,
10 Beach Road, PMB 2248, Jos.
Tel: 2638/5. Telex: 81365 BCALJ.
Brossette (Nigeria) Ltd,
311 Apapa Road, PMB 1135, Apapa.
Brossette Nigeria Ltd,
Bompai Road, PO Box 2013, Kano.
Calabar Cement Co. Ltd,
PO Box 219, Calabar. Tel: 306.
Caleb Brett & Sons (Nig.) Ltd,
29/34 NPA Commercial Block "A", Wharf Road, PO Box 52, Apapa.
Tel: 45456, 47015.
Camplant Engineering Sales & Services Ltd,
225 Apapa Road, PMB 1155, Nigeria.
Tel: 846336, 846504/6.
Cable: Camplantlagos.
Telex: 21324 Lagos.
Cego (Engineering) Ltd,
Silver Eng. Witham, Essex, UK.
Tel: 0376 83241. Telex: 987425.
Chellaram's Building Materials Department,
19 Wharf Road, Apapa. Tel: 46177.
Cheminova A/S,
PO Box 9, DK-7620, Lemvig, Denmark.
Tel: (07) 83 4100. Telex: 66514.
Cidpag Nigeria Ltd,
58 Fossberry Road, PO Box 1096, Calabar, Nigeria.
Cissere Sewing Machines Ind. Co. Ltd,
5 Badejo Kalesanwo Street, Matori Ind. Estate, Oshodi-Mushin, Nigeria.
Clausen Engineering Co. Ltd,
Plot 83 Airport Road Ext.
Box 5037, Kano.
Tel: 7674. Telex: 77206NG.
Context (Nigeria) Ltd,
21 Danmole Street, Victoria Island, PO Box 1742, Lagos.
Controls and Automation,
270 Herbert Macaulay Street, PO Box 448, Apapa. Tel: 41958.
Conveyancer (Nigeria) Ltd,
Plot 12, Igamu Industrial Estate, Iganmu, PMB 1189, Apapa. Tel: 47025.
Comsac Communications Associates of Nigeria Limited,
Block E Industrial Crescent, Ilupeju Industrial Estate, PMB 22129, Ikeja.
Tel: 900304 900305.
Cable: COMDEC, Lagos.
Costain (West Africa) Ltd,
174 Western Avenue, PO Box 88, Lagos.
Tel: 434774/5/6.
Crittall-Hope Nigeria Limited,
Agege Motor Road, PO Box 28, Ikeja, Lagos. Tel: 831508, 845790.
PO Box 231, Kaduna. Tel: 42329
PO Box 1336, Ibadan. Tel: 61475.
PO Box 398, Port Harcourt. Tel: 21165.
Cutler-Hammer Nigeria Ltd,
5 Eleruwa Street, Ikeja Industrial Estate, PO Box 490, Ikeja.
Daly (Condensers) Ltd,
Granley Works, Granby Ind. Estate, Weymouth, Dorset DT4 9TE, UK.
Tel: 030 2871. Telex: 41476.
Danlon Associates,
25 Illupeju Road, off Cappa Avenue, Palm Grove, Lagos, Nigeria.
Tel: 863189. Cable: Dan Consult Lagos.
Dexion Dept., Gottschalcks Building Materials,
PO Box 321, Burma Road, Apapa.
Tel: 47298-9.
Dizengoff, W.A. (Nigeria) Ltd,
23 Creek Road, PO Box 340, Apapa.
Tel: 42080, 42089.
Drake & Scull (Nigeria) Ltd,
PO Box 2389, 90 Lewis Street, Lagos.
Tel: 631252 and 636549. Telex: 21298.
Dulux, ICI Paints (Nigeria) Ltd,
Adeniyi Jones Avenue, Industrial Estate, Ikeja.
Dunlop Nigerian Industries Ltd,
Oba Akran Avenue, PMB 1079, Ikeja.
Tel: 3165.
E.D.G. (Nigeria) Ltd,
11 Zaria Road, PO Box 243, Kano.
Tel: 5532. Telex: 77129.
EMS,
40 Warehouse Road, Apapa.
Electrolux Mandilas Ltd,
Isolo Industrial Estate, PO Box 4065, Ikeja, Nigeria.
Tel: 840058. Telex: 21383 NG.
Elof Hansson Ltd,
32/36 Great Portland Street, London W1N 5AD, UK.
Tel: (01) 636 1881. Telex: 23133.
Etco (Nigeria) Ltd, Engineering & Technical Co,
14 Creek Road, PO Box 337, Apapa.
Tel: 46666 and 42127.
Equip Home (a Division of SCOA Nigeria Ltd),
152/156 Broad Street, POB 452, Lagos, Nigeria.
Equip/Iard (a Division of SCOA (Nigeria) Limited),
Surulere Industrial Road, Ogba Scheme, Ikeja, PMB 21518 Ikeja, Nig.
Tel: 962052, 962054.
Eternit Ltd,
PO Box 483, Sapele, Bendel State, Nigeria. Tel: (054) 41311
Fado Engineering Co. Ltd,
Phoenix Motors Building,
52/54 Murtala Mohammed Way,
PO Box 35, Ebute/Metta. Tel: 44006
A.M. Faltas (West Africa) Ltd,
PO Box 1915, 62/64 Campbell Street, Lagos. Tel: Lagos 26774, 23639.
Fawaz Steelwood & Chemicals (Kano) Ltd,
UmaRU Babura Rd., Bompai Industrial Area, PO Box 980, Kano.
Fibreglass Reinforced Plastics Co. Ltd,
PO Box 206, Ibara, Abeokuta, Ogun State.
Tel: 0362 2246. Cable: Glassplast Abeokuta
John Finlay (Engineering) Ltd, N. Ireland,
Export Dept., Drumquin Road, Omagh, Co. Tyrone, N. Ireland, UK.
Tel: Omagh (0662) 45127. Telex: 747929
Flag Aluminium Products,
Wesley House, 21/22 Marina, Lagos, Nigeria. Branches: Port Harcourt, Kaduna
Foundation Construction Ltd,
174 Western Ave., Iganmu, POB 2100, Lagos
Tel: 845090/835393. Telex: 21100 or 21227
Cable: Foundations Lagos.
Foundation Engineering (Nigeria) Ltd,
... Western Avenue, Iganmu,
... Box 2100. Tel: 845090/83593
... 21100 or 21227. Cable: Foundations
...
... Lekan Eni,
... 50743 Falomo-Lagos, Nigeria.
... ogun Street, Ilasamajor, Mushin.
... EAM (a Division of UAC of ... Ltd),
... Office: 58 Marina, Lagos.
... 678/57234/23976. Branches. Sales
... vice throughout Nigeria.
... Nigeria Ltd,
... 5154, 2 Tinubu Square, Lagos.
... 432/658025. Telex: 21518.
... Gears NS SDN BHD,
... 210, Seremban NS, Malaysia.
... 131/2. Telex: MA 63875 Bagranc
... Welding (Nigeria) Ltd,
... 21551, Ikeja, Nigeria.
... al Metal Products Ltd,
... Rd., Iganmu, PO Box 442, Apapa.
... 13651. Cable: Gemsprol.
... chalcks Building Materials (a Division of UAC Nig. Ltd),
... Dept., 2 Sapele Road,
PO Box 321, Apapa, Nigeria.
A.D. Green & Co. Ltd,
Electrical Contractors,
346A Dugbe Market Street, Adekunle Fajuyi Road, PO Box 1329, Ibadan. Tel: 23726.
Greenham Plant Hire (a Division of UAC of Nigeria Ltd),
Ilupeju Road, Mushin Industrial Estate.
PO Box 8, Ikeja. Tel: 47428.
Grette Communications (Nig) Ltd,
15 Abeokuta Street, Anifowoshe, Ikeja.
Tel: 931776/932959.
POB 1043 Surulere, Lagos, Nigeria.
Grid Index Nigeria Ltd,
PO Box 3743, Suru-Lere, Lagos State, Nig.
Guthrie (Nigeria) Limited,
Plots 37-39, Iganmu Industrial Estate, PO Box 7585, Lagos. Tel: 43471/2.
Hallam Graders,
Leicester LE8 0LT, UK.
Local M.F. Distributor.
Hademec Ltd,
Industrial Avenue, Ilupeju, Lagos.
PO Box 205, Yaba. Tel: 962168.
Cable: Coolth, Lagos.
GNA Hamzer & Co. (Nigeria) Ltd,
34/36 Burma Road, PMB 1047, Apapa, Lagos. Tel: 847873. Cable: Sevnshie.
Telex: 21396 NG
19 Kofo Avayomi Avenue, PO Box 11..., Apapa. Tel: 845858 and 842854.
Telex: 21396. Cable: Galhamzaro.
Jos. Hansen & Soehne Nigeria Ltd,
31/33 Martins Street, POB 141, Lagos.
Tel: 633864, 633721. Telex: 21413.
Haven Nigeria Computer Co. Ltd,
Hamburg House, 31/33 Martins Street.
PO Box 4034, Lagos.
Tel: 636651. Telex: FANHOL 21457
Heplac Nigeria Ltd,
Head Office, Plot 21, Mile 74, Ikorodu Road, PO Box 5498, Marina, Lagos
Holman Brothers (Nigeria) Ltd,
26 Burma Road, PO Box 81, Apapa.
Tel: 45007/8. Overseas cables: Airdrill, Lagos. Inland telegrams: Airdrill Apapa.
Telex: 21502. Branches: POB 293, Harbour Road, Port Harcourt. POB 427, Textile Road, Kaduna South.
Holt Engineering,
Div. of J. Allen & Co. Ltd,
Plot 3 & 4 Adewunmi Industrial Estate, PMB 2143, Oregun Village, Ikeja, Lagos
Ihekole International Concern (Nig) Ltd,
33 Murtala Mohammed Way, PMB 2201, Jos, Nigeria. Tel: 55341.
Telex: 81344 IHEKOLE NG.
Cable: Ihekole Jos.
Incar (Nigeria) Ltd,
10 Ijora Causeway, Ijora, PO Box 2581, Lagos

Tel: 843652/843664/843667.
Telex: 21382 Incar, Lagos.
Industrial Gases Ltd,
214 Apapa Road, PO Box 53, Apapa.
Tel: 42041/4.
Oshodi Industrial Estate,
State Highway, Isolo. Tel: 32497.
McDermott Road, PO Box 23, Warri.
Tel: 378.
49 Ijebu By-pass, Oke-Ado Road,
PMB 5327, Ibadan. Tel: 23201.
3 Kachia Road, PO Box 144, Kaduna.
Tel: 43353.
31a Sakpoba Road, Benin City.
Infodata Ltd,
PO Box 6687, Lagos.
Interbroker & Co,
80 Adebola Street, Surulere.
Cable: Terbrok, Lagos.
Intermaco (Ghana) Ltd,
PO Box M352, Accra.
International Computer (Nigeria) Ltd,
178 Awolowo Road, Ikoyi, Lagos, Nigeria.
Tel: 684957, 684763.
International Messengers (Nigeria) Ltd
(IMNL),
Afnet House, 17 Lasde Tannery Street,
off Medical Road, Ikeja,
PO Box 2780, Lagos. Tel: 96[illegible]
International Messengers (Nigeria) Ltd
(IMNL),
Afnet House, 360 Sarkin Yaki Road, Kano
PO Box 1785.
Tel: 7726 Telex: 77150 (Answer: NG).
International Messengers (Nigeria) Ltd
(IMNL),
Afnet House, 451 Zaria Road, Opposite
Plateau Broadcasting Co.
International Messengers (Nigeria) Ltd
(IMNL),
Afnet House, 22 Almadu Bukar Way,
Kaduna. Tel: 213697. Telex: [illegible]
International Messengers (Nigeria) Ltd
(IMNL),
8 Agbo Oba Street, off Tra[illegible], Surulere,
Ilorin.
International Messengers (Nigeria) Ltd
(IMNL),
1st Floor, Block B, Unit 1, Lagos State.
International Messengers (Nigeria) Ltd
(IMNL),
c/o KLM, Forestry Commission, Maiduguri.
International Messengers (Nigeria) Ltd
(IMNL),
Commercemoda Village Road, Aba Road, Aba
Road, Nr. Presidential Hotel, Port Harcourt.
International Messengers (Nigeria) Ltd
(IMNL),
5 Commercial Area, Samaru,
PO Box 589, Zaria. Tel: 3744.
Inter-Store (Nig.) Ltd,
PDB 826, Ikeja, Nigeria.
Interplast Ltd,
PO Box 1069, Accra. Tel: 21771.
Telex: 2068. Cable: Interplast.
Irrigation and Industrial Dev. Co. (IIDC),
260 Madison Avenue, New York, NY
10016, USA.
Tel: (212) 832 7070. Cable: Irredeco.
Telex: RCA 234182 IDC NY, ITT 420856
IDC NY.
ITT Nigeria Ltd,
3a Ikorodu Road, Yaba.
Tel: 47681/2. Telex: 21439
Italo Builders Co. Ltd (in association with
Kramer Ltd, Zurich), 13 Shonda Street,
Ebute Metta, PO Box 3578, Lagos.
Tel: 46290 and 46295
James Kilpatrick (Nig.) Ltd,
Plot 10, Block B, Isolo Expressway, Ilire
Junction, Ilasamaja, Nigeria. Tel: 847513
Jones Creamer Ltd,
c/o Publicity Dept, 600 Group Engineering
Division, PO Box 13, Letchworth,
Herts SG6 1LU.
Joy Manufacturing Co,
Oliver Bldg., Pittsburgh, PA 15222,
USA. Tel: 412 562 4593. Telex: 86 6558.
Keating Africa Resource Service Ltd,
33 Lawson Street, Lagos. Tel: 636555.
Kitsell Systems Inc. (Nig.) Ltd,
42 Kayode Street, Ogba-Ikeja, Lagos,
PO Box 3765, Lagos, Nigeria.
Landmark Industrial Supplies Limited,
39 & 50 Ibrahim Street (West), Ebute Metta,
POB 1552, Lagos.
Lanre Bhadmus Ind., Ltd,
26 Calcutta Crescent, PO Box 516,
Apapa, Lagos.
Tel: 875216 and 870639.
Cable: CarCareLagos.
Laundry Systems (Nigeria) Ltd,
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Apapa Road, PO Box 390, Apapa, Lagos.
Tel: 452146.
Leventis Stores Ltd,
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Leventis Technical Ltd,
PO Box 159, Iddo House, Iddo Island,
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Zaria State, Nigeria, Lagos.
Tel: 41311.
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Tel: 681959. Cable: LYNTRACO, Lagos.

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Tel: 663845, Telex: 21115 DANCO.
PO Box 474, Lagos.
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Avenue.
Obanikoro, Ikorodu Road, Lagos
Tel: 963146
Metro-Technical,
PO Box 2919, Ikeja, 11 Olatunde Ayoola
Avenue, Obanikoro, Off Ikorodu Road.
Tel: 963146
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PO Box 6165, Lagos. Cable: Mofat Eng.
Morpol Industrial Corp. Ltd,
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Tel: 43802. 41254. Telex: 21517
Cables: Morcor Lagos
Branch Office: 12 Kodesoh Street, Ikeja.
Mufhat Brothers,
304 Murtala Muhammed Way, Yaba,
170 Nnamani Azikwe Street, Idumota, Lagos,
Nigeria. Tel: 863640.
Nigalex-Nigerian Aluminium Extrusions Ltd,
Plot No. 5 Block (H),
Ikeja-Apapa Express Way,
Oshodi Industrial Scheme, Nigeria.
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Telex: 43283 FLOSUD NG.
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41710. Telex: 42266 NIDELT.
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Lagos, Nigeria.
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Tel: 45045, 45046.
Nigerian Engineering Works Ltd,
Plot 49, Trans Amadi Industrial Layout,
PO Box 519, Port Harcourt.
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Factory: Old Ojo Road, off KM11,
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Victoria Island. Tel: 610068
Kano, PMB 3383, Port Harcourt.
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(West Africa) Ltd,
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Ikeja Industrial Estate, Ikeja. Tel: 33895/6.
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Telex: 11918. Cables: Nirexim.
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Lagos. Tel: 43647, 47398.
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Engineering Contractors),
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PO Box 2049, Lagos.
West African Engineering Co. (Nig.) Ltd,
30 Wharf Road, POB 388, Apapa, Nigeria.
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Nigeria.
Tel: 847876, 845127.
Cable: STRUSTING, APAPA.
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Tel: 932038.
London office: World General Motors
(Export), 49 Osborne Road, Forest Gate,
London E7 0PJ, UK.
Tel: 01-534 4016 or 01-555 0823.
Telex: 897 356.
Yakon Enterprises (Nig.) Ltd,
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Tel: 24178, 243900. Telex: 41359 YAKON N
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