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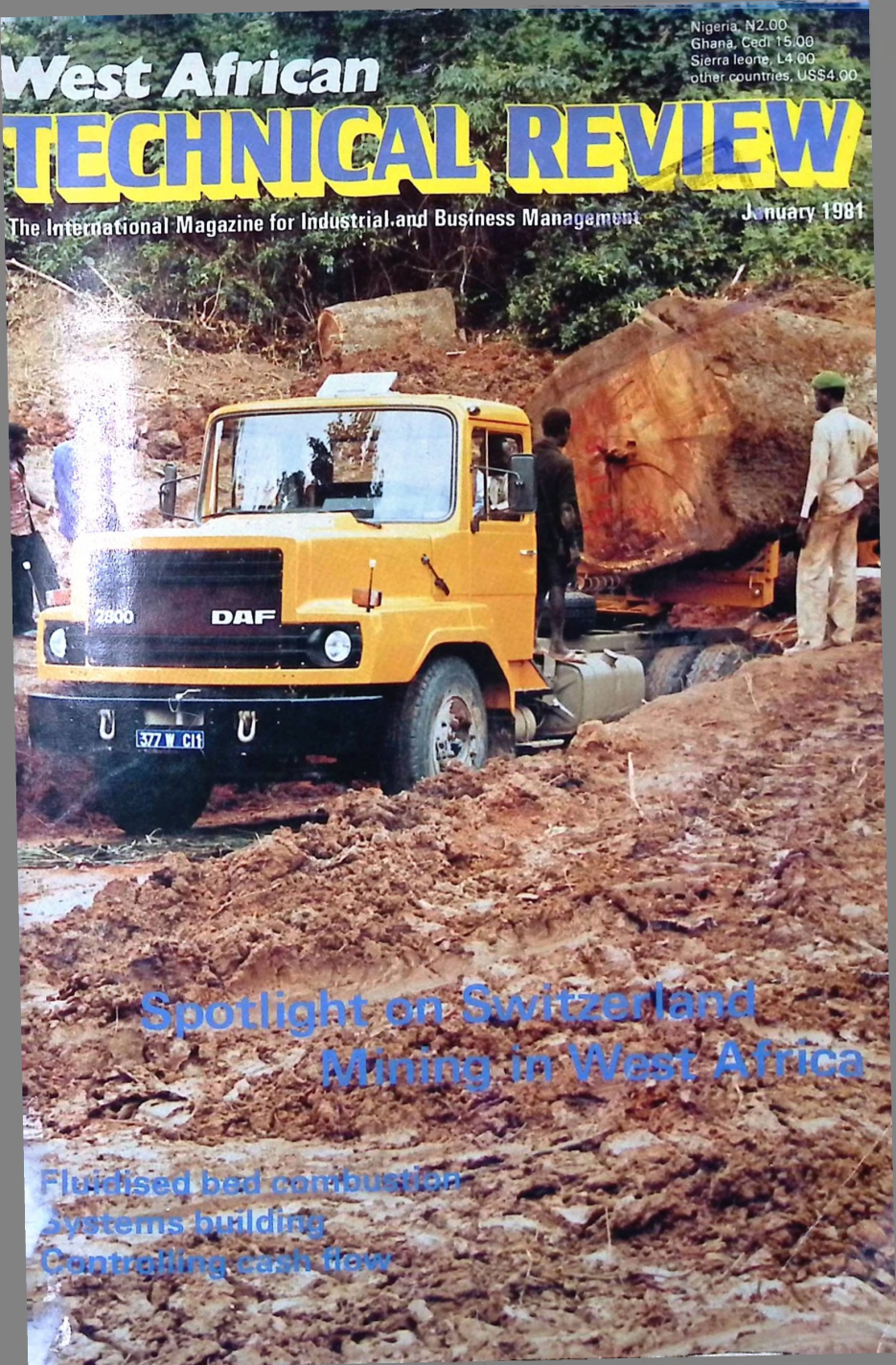
West African TECHNICAL REVIEW

The International Magazine for Industrial and Business Management

January 1981



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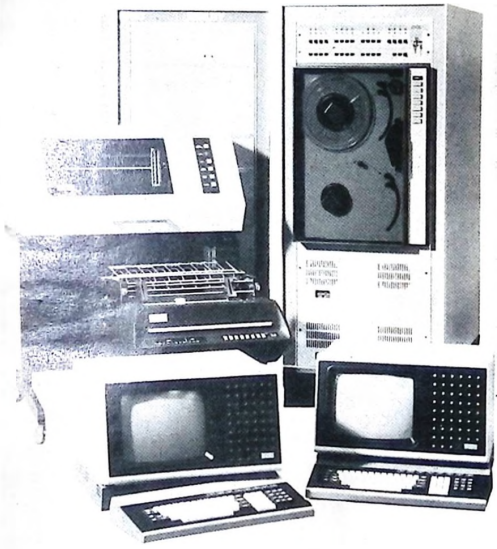

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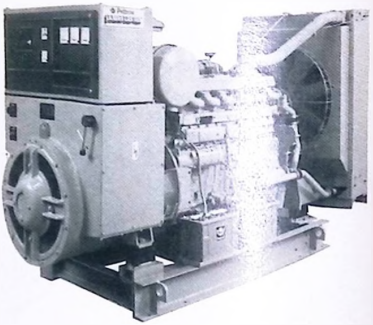

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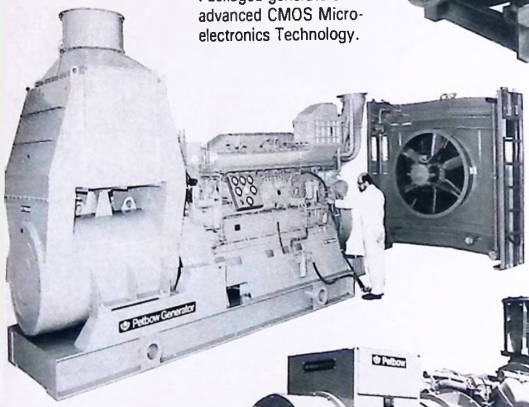

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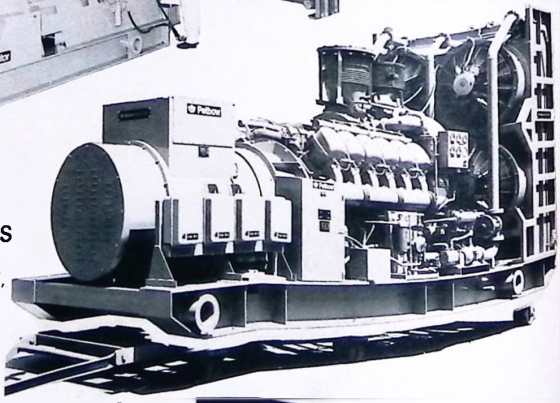

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This month's cover: DAF trucks in Nigeria. See page 69 for more details

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Jan – May 1981.
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West African CONSTRUCTION

including focus on Mining and Quarrying

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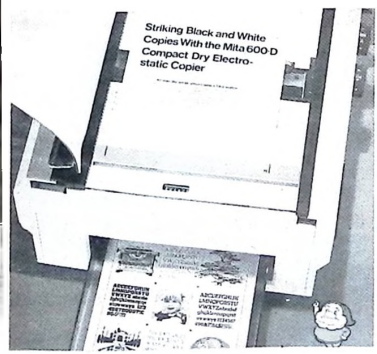

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Lockheed Hercules

Argentina sounds out Africa

Argentina made a major trade initiative in African countries with good products and technology this November. Two trade missions visited seven countries and Argentine industrialists exhibited at trade fairs in Khartoum and Dakar.

The export drive is part of Argentina's focus on expanding markets for goods and services in developing countries looking for intermediate technology.

Major exports in 1979 were 17.4 million tons of grains and oilseeds; 338,500 tons of chilled and frozen beef; 246,965 tons of fruit and 22.4 million boxes of fresh fruits. It is also exporting the technology that has helped it to expand food exports during the past few years.

Nearly three quarters of Argentina's exports to the African region comprise industrial products and a growing percentage includes machinery, equipment, technology and turnkey plants to increase food production.

Argentine trade with 31 African countries rose from $261.5 million in 1978 to $333.6 million with 28 countries during the first 11 months of 1979.

Argentine exports to the region were $76,548,680 in 1978 and $65,007,540 during the 1979 period, and its imports $184,964,990 and $268,569,230, respectively. The increase in import value was due largely to oil imports from Gabon, Angola and Nigeria.

Leading importers of Argentine goods and services in January to November 1979 were Angola ($26,703,590), South Africa ($9,362,740), Ivory Coast ($6,309,960) and Senegal ($3,999,810). Grains, meat, sugar and processed vegetables accounted for most consignment value. A 600-bed hospital in Abidjan (Ivory Coast) and cold-storage plants in Brazzaville (Congo) and Port Said (Egypt) also boosted export income.

Most of Argentina's imports from African countries are oil, minerals and building materials such as wood. Major suppliers in 1979 were Gabon ($77,739,840), Angola ($70,905,660), South Africa ($31,299,160) and Nigeria ($11,422,320).

Argentina's oil production covers 92 per cent of domestic requirements, but imports will be necessary for some years to come. Large-scale development of mineral resources is only just beginning. The country's mineral import bill last year was nearly $700 million, most of which were for metal-bearing minerals.

Argentine demand will also remain strong for timber, veneer, cotton, coffee, cocoa and tropical fruit, according to National Trade Director Tomas de Estrada.

The Lome Convention remains a relative impediment to Argentine trade in much of the region. However, bilateral agreements according 'most favoured' status are allowing the country easier placement of its products and technology in a growing number of African nations.

Argentine industrialists will exhibit at the Dakar International Fair from 25 November–7 December. Two private trade missions will also be assessing markets for agro-industry and metalworking equipment and technology in Cameroon, Gabon, Senegal and Ivory Coast in West Africa.

World Bank in Liberia and Cameroun

The World Bank is to provide a $15 million loan to a small and medium-scale enterprise programme in the Cameroun. This project, with an estimated total cost of $21.2 million, is in line with the government's objectives of promoting Cameroonian enterprises, generating employment, and encouraging a better geographical distribution of industrial activity in the country.

The project, which includes an institution-building component, will provide credit for artisans and small and medium-scale enterprise projects. Banque Camerounaise de Développement, B.P. 55, Yaoundé, United Republic of Cameroon, will be the implementing agency and will itself benefit from the technical assistance which is being financed by the loan.

A pilot programme for artisans will be initiated by Centre National d'Assistance aux Petites et Moyennes Entreprises which will receive a grant for technical assistance.

The project will be implemented over a four-year period and is expected to generate additional direct employment for about 1,800 persons. An earlier project for assisting small and medium-scale enterprises, which received an IDA credit of $3 million in 1975, is nearing completion.

● Small and medium-scale enterprises in Liberia will also benefit from a line of credit amounting to SDR 3.2 million ($4 million) from the International Development Association (IDA), the World Bank affiliate for concessionary lending.

Of the credit amount, $3.4 million will be re-lent by the Liberian Government through the central bank, the National Bank of Liberia, to the banking system. The amount will be shared by small-scale enterprises which will receive $1 million, and the medium-scale enterprises which will account for $2.4 million. All enterprises except trade will be eligible for financing. They include wood and metal working, food processing, building materials, tailoring, and road transportation, repair and maintenance. Both fixed investment and permanent working capital will be financed.

Technical assistance will also be provided under the project to the National Investment Commission (Mail Bag 9043, Monrovia, Liberia. Cable: INVEST LI Telex: 4560 LI), recently established to promote and assist small and medium-scale enterprises.

The IDA credit to Liberia is for 50 years, including a 10-year grace period. It carries no interest, but bears a service charge of three quarters of one per cent per annum.

Liberian debt rescheduled

Liberia's outstanding public debt is to be re-scheduled under an agreement drawn up by those representatives of the major Western industrialised nations and Japan, who make up the Club of Paris. The meeting was called at the request of the Liberian Government and was observed by Austria, Belgium and Switzerland.

● The European Space Study Group, Eurospace, in association with Innovation Tiers-Monde (ITM) has been awarded the contract by the African Postal and Telecommunications Union (APTU) for a feasibility study to determine the requirements of an African regional telecommunication satellite network. The study will be financed by the European Development Fund.

Nigerian-Italian trade

Italian-Nigerian trade relations experienced important new developments at the end of last year. Following the visit of the Italian Trade Minister, Signor Enrico Manca, to Italy in December, Nigeria has declared it is prepared to nearly double its oil exports to Italy from 3.6 million tons to 6 million tons annually. In turn, Italian companies have been awarded major contracts, particularly in the construction and civil engineering sectors. Public works projects involving Italian companies include dams, roads, harbours, petrochemical construction work, a thermal power station, an oil refinery and a railway.

Solar energy exhibition

August 23–28, 1981 is the date set for the latest International Solar Energy Exhibition. The exhibition, to be held in Brighton, UK, will, the organisers claim, be the "largest international marketplace for solar products and technology". Over 200 companies will be exhibiting, showing products and equipment made in Germany, Korea, Australia, Canada and Italy, to name but some of the countries involved.

Running alongside the International Energy Exhibition is the International Solar Energy Congress. An expected 2,000 delegates will visit the congress which will be held over a period of six days, providing a platform for exchanging ideas and identifying the needs for future research and development.

The exhibition is being organised by: **Montbuild Ltd, 11 Manchester Square, London W1M 5AB. Tel: 01-486 1951; telex: 24591.**

Commodity Report

THE PEANUT industry has not known a crisis like this since the 1950s. Traders and manufacturers of peanut-based products report that supplies of HPS groundnuts are so tight that the nut cannot now be obtained in many parts of the world for any price. This has led to the price of all types of nuts, but especially best quality US kernels, rocketing to all time highs. American nuts in Europe are now trading at well over twice the level prevailing at the beginning of the season (see graph).

The reason for the shortage is a catastrophic failure of the harvest in the world's largest exporting nation – the US. In a normal year peanut farmers in the main growing areas (Alabama, Florida, Georgia, Virginia, the Carolinas, Texas and Oklahoma) wait for August rains to bring on their crops. This season the rains simply did not come. Other areas of American agriculture, such as cotton and garins, were also hit by the drought but none so badly as peanuts. It is now obvious that the 1980 crop, just harvested, is over 40 per cent down on last year's level at just over 1mln tonnes. This is the lowest since 1954.

Peanuts imports

In an attempt to alleviate the situation, the US Agriculture Department has taken the unprecendented step of allowing the import of 90,000 tonnes of peanuts. But many analysts consider this to be a merely cosmetic sop to the domestic industry. Potential US importers will only be able to find a fraction of this tonnage on the world market because European industries have already mopped up most of the exportable surpluses from other producers in Africa and Asia.

Of course, while the Americans are bringing in their drought-withered crop, other producers are basking in the unexpectedly high prices. China and India are expected to considerably step up their sales this year. The price rise has also been very beneficial to West African producers, although the shortage of early rains in Senegal and the Gambia may restrict the quantity of good quality nuts available from this area.

Confectionary

In the long-term, although there is no reason why the US crop should fail in 1981, prices are not likely to start to come down until at least the spring. This could pose a very real threat to the attractiveness of peanuts to the confectionary industry. For while peanuts have been rocketing, other nuts, with the exception of cashews, have been falling in price due to the recession. Brazil nuts are now cheaper than the best peanuts, and in the highly competitive confectionery industry (which sets the pace for most edible nut demand) this could well prompt some switching away from peanuts.

Cocoa hits new lows

The euphoria over the possibility of a new international cocoa agreement proved to be shortlived and London futures once again fell to lows not seen since 1976.

To a certain extent a Year-End fall in cocoa is to be expected as this is the time that a lot of new crop West African cocoa comes onto the market. Prices have been particularly depressed this year in relation last year however, because of the change in the Ivory Coast's marketing policy. In the Winter 1979/80 the Abidjan government decided to stockpile over 100,000 tonnes of cocoa in an attempt to boost prices.

This year the Ivory Coast has decided to sell heavily early on in the season – although there is still a possibility that stockpiling may be inaugurated later in the season. The effect has been to bring much more cocoa onto the market than last year and thus depress values.

For the future, leading trade commentators expect the market to revive somewhat when the new cocoa pact comes into force and starts to buy cocoa off the world market. Such a rally, however, may be shortlived. Despite assurances from the International Cocoa Organisation that, with bank borrowing, it has adequate funds to buy its full buffer stock quota, some observers feel that the market may fall too far too fast for the Organisation to be able to summon enough cash to really support the commodity.

As in the case of peanuts, much will depend on the confectionery industry. At the moment the industry is engaged on a very "hard-sell" campaign which includes providing larger bar sizes for the same money. Provided that the recession does not bite too hard this winter the campaign could succeed in boosting consumption.

Another factor of great importance to the industry is the question of sugar prices: expensive sugar obviously increases the burden on confectionery costs and manufacturers are therefore financially unable to offer "special offers". The sugar market reached a peak in October 1980. The question is will prices now decline or will the market move on to new highs?

● Delegates from cocoa producing countries meeting in Accra this month have decided to take measures to halt the slide in world prices. Attempts last year to do the same thing failed when Brazil and the Ivory Coast witheld supplies from the world market.

Halting sliding prices will probably be a major feature of the new International Cocoa Agreement which may come into force on April 1st. The Ivory Coast will not join until the terms negotiated at the end of last year are changed.

Commercial Review

Rural Electrification Programme

Marcel Massé, president of t Canadian International Developm Agency (CIDA), recently signed memorandum of understanding for a $ million grant to Ivory Coast. Ambassa Louis Guirandou-N'Diaye represented African nation in the signing ceremony the contribution toward a $41 million ru electrification scheme.

The purpose of the fourth Ivory-Co Canada rural electrification programme to link the towns of Odienné and Ségu with the Ivory Coast electric ener network and supply electricity to the s rounding towns and villages, benefiting estimated 90,000 people.

Through the electrification programm Canada and the Ivory Coast have sou to reduce regional disparities and promo economic, social and cultural developm in these rural areas in order to integr them into the national economy.

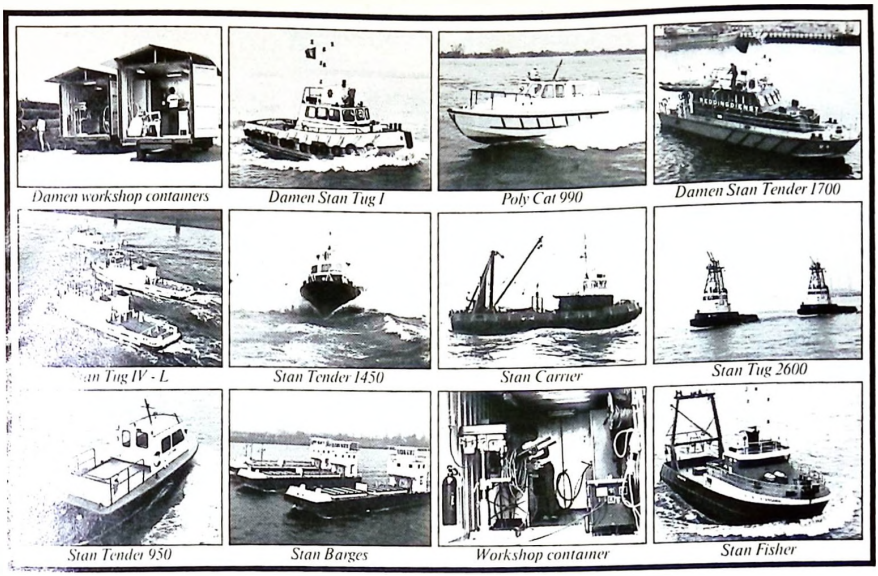
This grant, which will ultimately be co plemented by a $5 million loan, will p for engineering services, the equipment fittings needed to install power lines in two areas, the development of ser managerial staff, the training of transpo tion and distribution technicians and sending of line installation maintenance instructors to Ivory Coast.

During the ceremony, Mr Massé said hoped to see the Canadian governm concentrate its efforts in the area of ha structures, particularly in the elec fication and transport sectors.

Kaduna trade fair

The Kaduna Trade Fair which will place from January 14–22 has had a fic international response. There will exhibitors from the UK, France, many, Austria, Japan, South Ko Sweden and the US, as well as Nigeria itself, of course. The emphasis the fair will be on agriculture – indeed out of three British firms will be exhibi agricultural products. However, the organiser Mr Alhaji Bawa Garba wishes make the fair open to as many diffe types of exhibits as possible.

There will be over 600 exhibitors at fair. The French are very strongly re sented; among the Franch exhibitors Stenuick France (manufacturers of dri equipment), B.I.E.F. representing Rennes Chamber of Commerce, the subsidiary Maco Meudon and Poc Among the British companies exhibi are Leyland Vehicles Export Ltd, Lin UK Ltd, Salopian Industries Ltd Poultry and Animal Products Ltd. Bes the main exhibiting area, there will Dual National Hall where companies discuss joint venture projects with Gov ment representatives.



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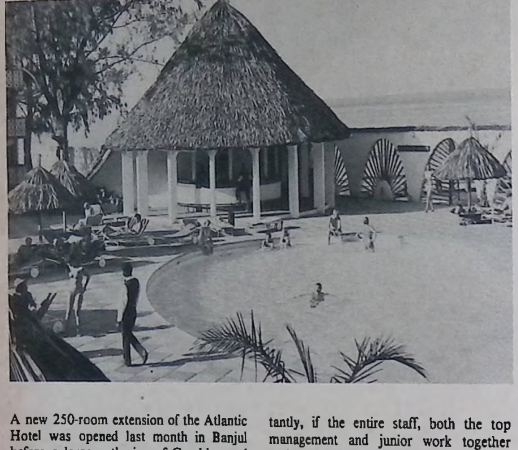

A new 250-room extension of the Atlantic Hotel was opened last month in Banjul before a large gathering of Gambian and foreign visitors as well as a sizeable group of overseas visitors by the President of Gambia, Alhaji Sir Dawda Kaoraba Jawara.

"As with all developing nations", the President said, "In The Gambia, the government has the responsibility of assuming the leading role in investing in industrial development in the country. It is hoped that Gambians will follow the example that government has set by investing in the hotel industry. I must emphasise that it is an investment made on behalf of and for the benefit of the Gambian people. Let me say, however, that the full benefits from this investment can only be realised if the hotel is managed strictly on business and commercial lines, and more importantly, if the entire staff, both the top management and junior work together amicably and with a true sense of purpose and dedication".

The construction and architectural supervision work was undertaken by Balfour Beatty Construction Limited. Their managing director, Mr James Stevenson, said: "In promoting the new Atlantic Hotel, the government has taken a bold step forward and set the pace for the future. With this hotel, a major investment has been made in a facility which is well up to international standards. Very substantially the work has been carried out by Gambians with the minimum involvement of expatriates and the minimum of imported materials. It has been carried out at very low cost and in a remarkably short construction period of fourteen months".

Mr Stevenson added: "I should especially like to congratulate CH donian Hotel management). I t have performed magnificently, es getting this hotel on full stream ir no time since taking over".

After thanking the Presi inaugurating the extension to the Wim Mentink, managing directo donian Hotel Management, said itself, like tourism in The Gambia ing with each year and is now re for filling some four thousand ro day in hotels located in Africa a Our expansion plans call for dev of other hotels in Africa, North a America, Europe, Hong Kong tralia".

The other ev ts in a week-l gramme includ visits to man tourist attracti n The Gambi the ninety-plus pecially invitec from all over th orld. Among the Minister of rism from Za journalists and vel trade per from US, UK France, Nige Netherlands, itzerland, Morocco and ain. The tou arranged by The ambia Ministry mation and Tou ism, who also performances by the Gambian sir national dance troupe, the poli wood-carvers and craftsmen.

Two other main events were the the Miss Gambia 1980 competit by 20-year-old Naba N'Jie and Atlantic Hotel Open Golf Tou which attracted the largest-ever amateur golfers at the Fajara Golf The tournament was won by Mr Kirby, wife of the local golf club ca

Nigeria Airways 1980 record

Nigeria Airways recently an that its London-based cargo earned a record £1,350,000 fron sales in 1980.

The airline, which operates D Boeing 707 jets from Heathrow A Lagos, Kano and Port Harcourt c total of 2,237 tonnes of freight f UK to Nigeria between January December 31, 1980 – an increase per cent compared to the same l period in 1979 when 864 tonnes wa

Nigeria Airways had earned £1 from export cargo sales by Octob from the carriage of over 1,734 to cargo. An additional 278 tonnes, c November and 224 tonnes in De resulted in the overall record incom

Nigeria Airways is expected to an the purchase of extra aircraft la year. Both Boeing 747 Jets and A3 bus aircraft are currently being ev by airline executives with a view chase. The additional equipment used on the airline's UK, Europe Transatlantic network.

In addition to six weekly DC10

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.

February		
31 Jan-8	DEBAU — 10th Building Exhibition and International Building Congress	ESSEN
5-14	International Boat Show	GOTHENBURG
10-13	AIRMEC — International Aircraft Maintenance Engineering Exhibition	
21-28	SWISSBAU — Building Trade Fair Basle with Congress	ZURICH
21-1 Mar	Building for Billions — The Scandinavian Building Exhibition	BASEL
22-26	Frankfurt International Fair	COPENHAGEN

New mill in Kano

Gaskiya Textile Mills Limited is building a new, fully verticalised textile plant embracing spinning, weaving and finishing at Kano, Nigeria. Sulzer, Winterthur (Switzerland), is playing a major part in this project.

Besides being responsible for the planning and engineering of the whole plant, and for the co-ordination of all building installation and commissioning activities, the Sulzer Group is supplying the entire weaving capacity consisting of 174 weaving machines, the air-conditioning equipment for the spinning and weaving departments, a central vacuum-cleaning system and new boiler plant (output 10t/h steam). Whilst conventional room air-conditioning is provided for the spinning section, a modern zone air-conditioning system according to the Sulzer Condifil principle is being installed in the weaving shed.

The weaving machine installation comprises 174 single-colour units with tappet shedding (maximum working width 2,830 and 3,340mm). In the main, these machines will produce African print cloths and men's outerwear fabrics made of cotton and cotton/polyester.

New airline rep

Gatwick Broker/Consolidator Viking Air Freight has signed a general sales agency agreement to represent an Accra, Ghana-based airline called Inter Air Services in the UK and Europe.

Viking will be marketing up to three 707/DC-8 freighter flights every week from Gatwick and Schipol to Accra where traffic will then be transhipped to a waiting Inter Air Britannia.

Rates from 90p a kilo will be offered from the UK to Accra while add-on prices to Abidian would be as little as 10p for 15 tonnes, 25p for a similar load to Conakry, 33p to Dakar and 9p to Lome.

Transit times over Accra will be measured in "hours rather than days" according to McMullen who suggests this will be a marked improvement on some of the services currently operating from Europe to the Francophone states.

New shipping agency

A new joint agency company has been formed, called Rotterdam Amsterdam Cargadoors Kantoor (RACK), which will handle outward-bound services of five shipping lines – the Compagnie Maritime Belge, Cie. de Navigation Denis Freres, Deutsche Afrika Liniene-Woermann Linie, Nedlloyd Lines B.V. and Ste. Navale Chargeurs Delmas-Veiljeux.

The company commences operations on January 5 of this year. RACK will also represent two other West African shipping lines – Société Nationale des Transports Maritimes (SONATRAM) (National Line of Gabon) and the Société togolaise de Navigation Maritime (National Line of Togo).

Port study

Sir William Halcrow & Partners have been appointed by the National Port Authority of Liberia to carry out a regional study for the South East Ports of that country. The work will include economic and engineering investigations of the ports, together with trade, agriculture, industry and land transport in the region and Halcrow will advise on the course of development over the next 20 years.

The project is financed by the European Development Fund under the Lomé Agreement and fieldwork is expected to commence early this year.

Korean fertilisers shipped to Nigeria

Some 10,000 metric tons of compound fertilisers worth about US$3 million were shipped by a South Korean firm, Hyu Corporation, to Nigeria.

The export contract was made in A 1980 with a Nigerian local agent on b of the Federal Ministry of Agricultur Water Resources, Nigeria.

The compound fertilisers produce the Chin Hae Chemical Co. of Kore be used for crops in Nigeria, and Hyu is going to supply Nigeria and Keny more fertilisers.

● The Hyundai Corporation turned o be the lowest bidder in an internat tender conducted by the National El Power Authority of Nigeria, in whic competitors took part. The tender inv the supply of US$12 million worth of t formers.

Meanwhile, the Korean comp already received the fourth purchase o for two 138kV generator transfo from the National Electric P Authority. Thus the total contracted amounted to US$ million.

Water systems for Niger

Culligan International Company, o UK has supplie four more Sauvey packaged drin g water system Nigeria. The la t installation, for Kaduna State Water Board, consis four standard C 60 systems each w

conti

acity of 60m³/hour. They take muddy ter from the Kaduna River and deliver it ar and bacteriologically safe to the ard's distribution system. The water ality maintained is well above the stan-rd recommended by the World Health uthority.

Culligan Sauvegarde systems are desig-d to potabilise surface water from lakes, ers or wells that is naturally polluted by ological impurity, organic matter and eneral turbidity. Their modular design is ased on relatively small standard compo-ents with the result that systems to meet a ange of requirements are despatched uick and transported readily to remote r... On arrival they can be assembled nd ... by unskilled labour with a mi... supervision.

Oth... Culligan Sauvegarde systems are e... the water authorities at Onne, P... Lagos and Port Harcourt.

M... eel mill in Lagos

The Board of Directors of the Export-Im... Bank of the United States has a... a loan to support $44.2 million in ... exports for the construction of a ... on per year mini-steel mill in the State of Lagos, Nigeria.

The principal US supplier, **Pennsylvania Engineering Corporation**, Pittsburgh, will undertake the project as a joint venture partner with the Government of Lagos State. The new venture will be called LAPEC Nigeria Limited (LAPEC), with 64 per cent equity participation by Lagos State and 36 per cent by Pennsylvania Engineering. In addition to Pennsylvania Engineering and its Lectromelt Division, US suppliers will include Armco Steel Corporation, Ocmet, Inc, Concast, Inc, and Steinbrock Machinery Corporation.

The new plant will use scrap steel to produce rods and bars for the building and construction industry within Nigeria. Nigeria currently imports approximately 90 per cent of its total consumption of rods and bars from Europe.

LAPEC will make cash payments of $6,630,000. Eximbank will provide a loan of $33,150,000 at an interest rate of 8.75 per cent per annum, and Pennsylvania Engineering will provide a loan of $4,420,000 at the same rate of interest. Repayment will be in 20 semi-annual installments beginning in November 1983.

Anti-theft device

The Newmark Group Ltd of Nigeria have placed an initial order worth £10,000 with an indication that a further orde... worth up to £100,000 could follow for a... anti-theft device for vehicles introduced b... Autoglass Ltd, called Keycard.

Keycard consists of a printed circui... board with an edge connector which is in... serted into a special socket wired into ... vehicle's electrical system. When the key... card, which is smaller than a credit card, is... removed, it breaks up to a total of three... separate electrical systems, providing an... extremely effective method of immobilis... ing the vehicle.

There are several thousand wired con... figurations in which the Keycard and its special socket can be produced, and it is almost impossible to duplicate the Key-card. Each vehicle has, therefore, an almost unique wiring combination, and the hours which it would take to check these com-binations is a deterrent of the type which thieves shy clear of.

The Chairman of the Newmark Group considers that the demand for Keycard will be such that the first shipment of units will be sold in a month and he has indicated that his company is likely to take up the option on a further £100,000 worth of units in the early part of 1981. The simplicity and effectiveness of the Keycard are its obvious attractions.

OIL NEWS

President Shagari's budget proposals for Nigeria's 1981 financial year envisage government revenues from oil totalling Naira 14,750 million – or, in terms of the oil industry's worldwide unit of currency, $27,360 million. According to independent calculations, this is approximately the revenue which the government would receive if production continues to run at around 2.15 million b/d and prices remain at present levels. (The government has confirmed that 2.15 million b/d will remain as an official ceiling for first-half 1981 at least.)

Oil revenues for 1980 – comprising royalty payable to the government, petroleum production tax, and the proceeds from the sale of the government's equity share of production – probably totalled nearly $25,000 million, it is independently estimated. But the 1981 forecast by the government appears to make no allowance for price rises. Even granted a lower than expected level of oil use in many industrialised countries as a result of the business recession, this would appear to be a "worst case" prediction. Realistically, Nigeria's oil income can be expected to total around $30,000 million for the whole of 1981 if production runs at 2.15 million b/d – perhaps more if the Iran-Iraq war continues and results in a long-term shortfall of supplies.

Other matters of interest to the oil industry mentioned in the budget proposals are:

Exploration

A further offer of exploration acreage is to be made in 1981. This had been envisaged for the latter part of 1980, but upheavals within the Nigerian National Petroleum Corporation following the "missing revenues" enquiry resulted in delays. The offer is likely to be of territory mainly in "new" areas, away from the Niger delta, although some offshore concessions in the delta area could be included. Terms are likely to be on a production-sharing or service contract basis, although increased access to the oil produced from successful ventures might be provided for, in view of the poor response to the first offer of "new relationship" contracts.

Exploitation financing

The President said that Naira 996 million ($1,848 million) will be made available to encourage more oil exploration. It is expected that this sum will be for NNPC to spend in its own exploration ventures, as a feature of the new concessions is that the oil companies must finance their exploration work entirely themselves. NNPC contributes only in the case of successful finds.

Tankers

The long-discussed plan for a Nigerian-owned fleet of oil tank-ships gets a fillip, with the announcement that Naira 35 million will be spent towards the objective of supplying a proportion of Nigeria's oil exports in Nigeria-flag ships. It is conjectured that suitable vessels could be purchased advantageously second-hand, at present, due to the surplus tonnage of oil tank-ships in relation to demand.

Funiwa contract awarded

American company UIE has granted a $2 million contract to Blue D Corporation for the construction of the deck section of an accommodation platform for Texaco's Funiwa field. Texaco gave UIE the contract for two platforms, worth $7 million, for which most of the construction work will be carried out at yards being established at Warri and Port Harcourt. The US-built deck section will be towed to Nigeria for installation in mid-June 1981.

Consumption

Nigeria's consumption of oil products increased by nearly 10 per cent in 1979 over the previous year's total, according to an estimated figure given by the OPEC secretariat in a recent survey of energy use in developing countries. In 1979 Nigeria used 169,100 b/d of refined products, it estimates, compared to the previous year's 154,100 b/d. Growth in primary energy consumption in Nigeria averaged 15.38 per cent over the years 1967–79, according to the OPEC report, but petroleum products consumption is increasing considerably faster than the average rate.

Gas processing contracts

Shell has awarded two contracts for gas processing plants to the US office of Worley Engineering Inc, a subsidiary of the UK's Williams Press Company. Worley will provide engineering, procurement and construction supervision services and will also supply equipment for two separate but identical gas processing units.

Angola

Texaco's local subsidiary has given the contract for the development of the Essungo field to McDermott International. Texaco's head office discloses. McDermott is to design, engineer, fabricate and install a six-pile production platform, its processing system, a flareline and separate flare platform. The facilities will have a capacity of 20,000 b/d.

International Energy Development Corporation has been given a contract on production-sharing terms to explore Block 7 in the central offshore area, in association with the state company Sonangol.

Cameroun

Elf was awarded various new exploration permits in the northern part of Cameroun's offshore, near to the median line with Nigeria. The company received a 612sq km oil exploration permit designated Rio del Rey II, two oil/gas permits known as Kita Edem and Bavo Asoma (185sq km and 108sq km respectively), and five gas permits – Sandy Gas (263sq km), Kole Gas (38sq km), Bavo Gas (108sq km), Ekundo Gas (286sq km) and Kita Gas (174sq km).

Equatorial Guinea

Spain's Hispanoil has turned over to the government the data accumulated from seismic work in Equatorial Guinea's waters, and hopes to go ahead with drilling work on a 50:50 basis with the government. Its seismic surveys represent an investment of $3 million.

Gabon

Elf is to use a robot, designed and manufactured by Les Ateliers et Chantiers de Bretagne, to operate an experimental subsea production system at its Grondin field, in deep waters offshore. The equipment is designed to operate in depths of up to 600m, and has two hydraulically operated arms capable of carrying loads of up to 100kg.

Aracca Petroleum is to explore the Tassi Marin II concession, an offshore are of about 350,000 acreas.

Liberia

The World Bank has approved a $5 million loan to finance a seismic survey of a 2,500sq km offshore area, viewed as of good potential for oil finds. The loan period will be 20 years, with interest at 9.25 per cent.

Zaire

Oil exports in first-half 1980 totalled 3 409 187 barrels, according to the government.

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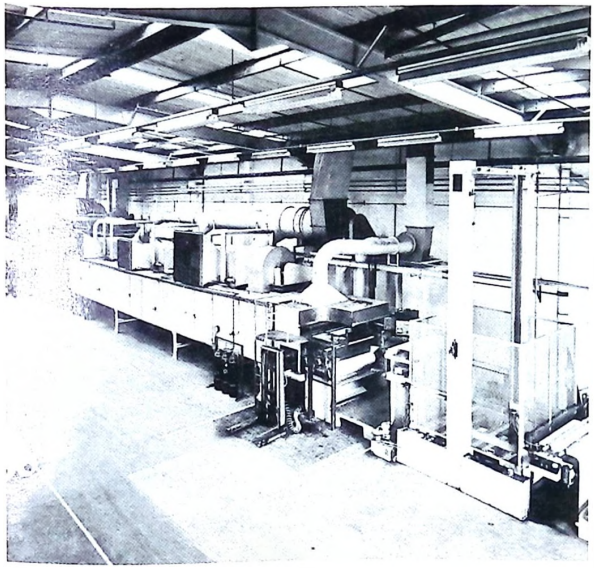
COMMERCIAL REVIEW

PVC factory – machinery dispatched



Three-head coating line which will be installed in Nigeria.

The Industrial Process Division of Spooner Industries Limited, based in the UK, has secured a £1¼ million contract to build and install a PVC leathercloth and flooring plant in Nigeria. This is part of a large scheme being carried out by Femo (West Africa) Limited, for a plastic converting and printing complex.

Negotiations for the contract against strong continental competition were carried out by a team of Spooner engineers working closely with Femo's European consultant, Mr Terry Davison. Manufacture of the machinery is currently under way in the UK. It is expected that installation and commissioning will be carried out by a team of ten engineers early this year.

A green "bush" site, 80 miles north of Lagos, 25 miles west of Ibadan at the Eruwa junction of the new Lagos to Sokoto trunk road, will ensure speedy distribution of finished goods. Chief Ade Ogundoyin, the Chairman of Femo (W.A.) Limited, is a prominent Nigerian businessman and one of his other companies in civil engineering and road construction has been responsible for the building of 57,000 sq ft (5,300 sq metres) on a site of 23.5 acres (9.5 hectares).

When fully on stream it is expected that the plant will produce annually up to 16 million square metres of coated fabrics for the motor industry, for furniture, shoes, travel goods and handbags, plus 3.25 million square metres of PVC floor coverings.

1. A production line with three coaters for PVC-coated textiles 1.6m wide and having a production capacity of up to 16 million square metres per annum.

2. A PVC Flooring Line, capable of producing both solid and cushioned PVC flooring materials up to 2m wide. It will have a production capacity of 3.25 million square metres per annum.

3. An Embossing Line to enable various embossed patterns to be produced on the PVC materials.

4. Two Inspection and Edge Trimming Machines for use in conjunction with both process lines.

5. Ancillary machines which includes all PVC paste preparation equipment.

6. Printing facilities are being provided by a five-station Stork rotary screen with two additional gravure stations by Ramisch Kleinewefers.

Because of the widely fluctuating electrical supply, voltage stabilising controls are to be fitted to all the main machines. In addition the company is supplying a 950kVA standby diesel generator to ensure continuity at the plant in the event of a mains failure.

Rural electrification

The Imo State Government has awarded a three-member British consortium the contract to carry out a rural electrification project worth £14 million.

The consortium consists of the generator manufacturers, **Petbow, James Scott,** major transmission line contractor and **Deutz Engines,** the British subsidiary of the German company Kloeckner-Humboldt-Deutz. The project, which will serve 30 villages in Imo State, will involve the installation of 12.5mW diesel-powered generating sets, 35kV step-up transformers and approximately 186 miles of transmission line.

Mobile grain lab

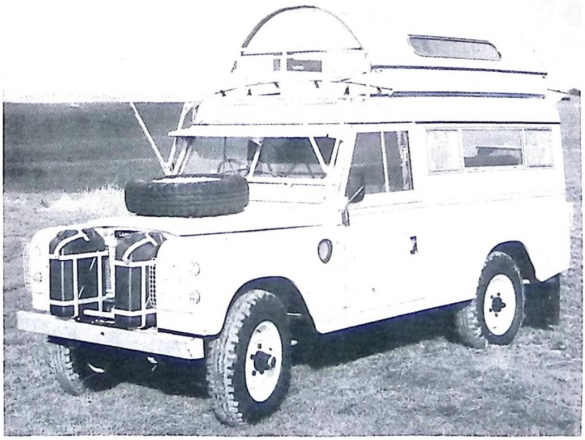
A British Leyland Land-Rover, converted by Cherwell Valley Silos Limited into a mobile grain laboratory complete with office and sleeping facilities, will shortly be leaving for the Third World with a team of grain storage specialists.

Sponsored by the British Government's Overseas Development Administration, the UK based Tropical Stored Products Division of the Tropical Pest Infestation Laboratory are sending biologists to Indonesia and Ghana to assist and advise on grain storage projects.

The roving grain laboratory will enable teams to operate in remote areas where living accommodation is inadequate, making on-site testing possible in grain-growing areas and other locations suitable for possible cultivation.

Based on the 109in. (92.7m) wheelbase Land-Rover, the Cherwell Mobile Grain Laboratory/ Field Office also combines simple living and sleeping facilities.

Variations of the layout and additional fittings are available, extending the mobile laboratory's living capacity and enabling it to be adapted to specific needs. The Mobile Grain Laboratory can also be wired for connection to an external electrical supply of any normal mains or generator voltage, with outlets for other electrical appliances such as a fan heater. Full air-conditioning can also be fitted.



Copper products

Metra Consulting Group Ltd have been awarded a contract by UNIDO to carry out a feasibility study of a plant for production of semi-finished copper products. If the study indicates a viable project the plant will be located in Nigeria and supplied with raw materials from Zambia. Both the Nigerian and Zambian Governments are participating in the project.

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No. 55 on enquiry card

New spark plug developm

Guinness Peat International Limited wholly-owned subsidiary of the Guinn Peat Group, has successfully comple planning and financing arrangements the erection of a £3.2-million factory manufacture automobile spark plugs Nigeria.

A new project company – Autote (Nigeria) Limited – has been formed, a Guinness Peat International has ne tiated an agreement with Smiths Industr Limited of the UK whereby Autotech w have an exclusive licence to manufactu KLG spark plugs in Nigeria. Smiths Indu tries is one of the leading spark plug man facturers and has similar licensing agre ments in over twenty countries throughо the world.

Spare parts

A £1½ million order to carry out th second stage of a project for storage c spare parts for Nigerian Army vehicles ha been won by SSI Fix Equipment Ltd of th UK. This follows a £1 million order for th first stage of the project awarded to SSI Fi Equipment three years ago.

SSI will design, manufacture and instal all the equipment required to furnish th interiors of ten warehouses.

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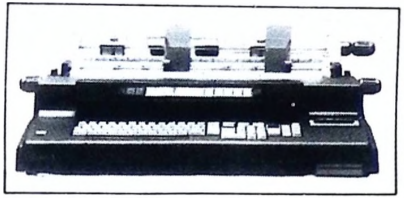

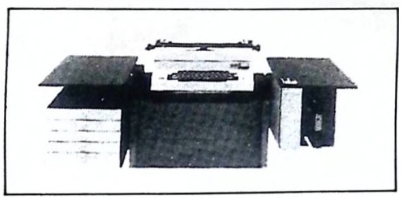

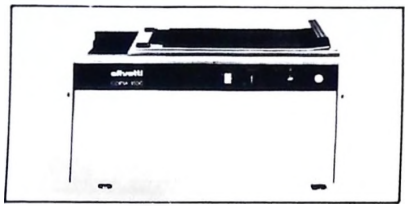

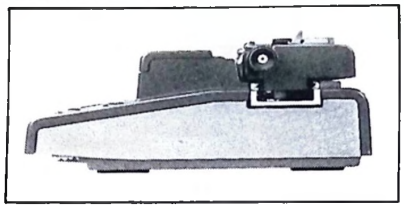

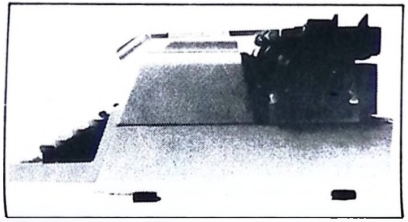

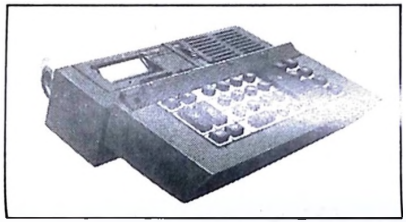

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Interpretation and Comparison of Financial Reports by Use of Ratio Analysis

In my last article we discussed how all the different parts of the balance sheet and profit and loss account fitted together. I now want to show how one balance sheet and one financial report can be compared with another. These documents will be referred to as "Financial Statements". By what means can we compare one financial statement with another? – The way is known as **ratio analysis**.

This method is the most widely used technique for interpreting and comparing financial reports. Why do we use it? – because:–

(a) It helps to summarise relationships,
(b) Performance can be compared year by year,
(c) Trends will emerge,
(d) It assists the decision making process,
(e) Indicates solvency or insolvency.

What Ratios do we use in what situations?

Many people want to know if a company they are interested in is stable and solvent.

The two basic ratios in common use are:–

(a) The Current Ratio,
(b) The acid test or (quick) ratio.

The Current Ratio

This is the ratio of current assets to current liabilities, as follows:–

	₦
Current Assets	4,000
Current Liabilities	2,000

Therefore the current ratio is 2:1.

The Current ratio is a very good indication of whether a company is solvent, but it suffers from one particular problem. In the total of current assets, the stock cannot always be sold easily. To get round this problem we use what is called the **acid test.**

The acid test measures the amount of current assets – stocks and compares the answer with the current liabilities. If the current assets of our company = ₦4,000 but includes stocks of ₦1,000 then we will measure the acid test this way:–

Total

$$\frac{\text{Current Assets} - \text{Stocks } ₦4{,}000 - 1{,}000}{\text{Current Liabilities } 2{,}000} = 3:2$$

Activity ratios

What is very important is whether the company we are examining has the ability to pay its creditors when it has to. To do this depends on the ratios at which cash flows into the company from its current trading. As sales are the critical factor the rate at which the stocks are sold is very important. The following ratios can give you a very clear signal if the company has enough cash coming in or not. They are:–

(a) Average inventory turnover,
(b) The collection period of trade debts.

(a) The average inventory turnover is calculated as follows:–

$$\frac{\text{Cost of goods sold during the period}}{\text{Average stocks held} = ₦\ 900}$$

Sales at cost:
opening stock 110
closing stock 90
Therefore the ratio is

$$\frac{900}{(110+90)/2} = 9x$$

(b) The collection period of trade debts,

$$= \frac{\text{Total annual credit sales}}{365}$$

$$\therefore \text{ Collection period} = \frac{\text{Trade Debtors per Balance Sheet}}{\text{Average Credit Sales/Day}}$$

The next thing to think about is whether the company has enough money in the long term. The ratios that we have been considering will assist you in telling if the company has enough money in the short term.

If a company is to enjoy financial security in the long term then it must have enough money to pay *all* its liabilities, not just the ones that need paying today. The way to do this is to pick two particularly important ratios:–

1. **The Shareholders Equity Ratio**

$$\text{This} = \frac{\text{Shareholders Equity}}{\text{Total assets}}$$

It is generally believed that the greater the amount of shareholders' equity the stronger is the financial position of the company.

2. **Interest Coverage Ratios**

The ability of the company to meet its debt service costs out of current earnings is a rough indication of its long term solvency. Interest coverage ratio equals income before interest and tax divided by the periodic interest charge.

As an approximate guide the ability to have three times more income than interest would be regarded as satisfactory.

Appraisal of financial performance

The ratios we have looked at so far enable us to assess the short and long term financial stability of a company.

Whilst indicating stability and solvency, they do not measure either performance or efficiency of earning power.

There are two particular aspects of a company's financial performance of importance to people who are considering putting their money into it:–

(a) Its ability to generate income.
(b) The value of the shares to investors.

To consider (a) & (b) together we must consider ratios of financial performance.

(a) The overall measure of earnings performance is the return on capital employed. This can be expressed in several ways:–

i. $\frac{\text{Net Income (after interest)}}{\text{Share Capital \& Reserves}}$

ii. $\frac{\text{Net income + interest}}{\text{Share Capital \& Reserves plus long term liabilities}}$

iii. $\frac{\text{Net income}}{\text{Gross Tangible assets}}$

Would be investors must be very careful to check this ratio:–

$$\frac{\text{Net Income}}{\text{Share Capital \& resources}}$$

(b) If you are going to buy shares in the company (be an investor) you will want to know the income that will be received and

continued

**Spicer and Pegler Management Consultants are the consulting arm of Chartered Accountants Spicer and Pegler. They have long-standing connections in Nigeria through their close connection with Egunjobi, Sulaimon Consultants Limited who are based in Kano.*

the prospective growth in value of any shares you may buy. Several ratios are used by would be investors in ordinary shares:–

i. **Earnings per share:**

(a) Net Income after tax & any preference divided

(b) No of ordinary shares

a = ₦100.000

b = 10.000

Therefore the earnings per share = ₦10

ii. **Dividend Yield**

= ordinary dividend per share x 100

market price per ordinary share

This is very useful for investors interested in taking shares that will yield a high income. You can compare the yield on one share with another before you decide to buy it.

iii. Dividend *Leverage* rate (pay out rate)

= after *tax* earnings (available for distribution)

total gross dividend.

If the amount of the dividend is covered three times there is a good chance that future dividens will be maintained at the same or higher levels.

iv. **Earnings Yield**

= The dividend cover rates x the dividend. The higher the earnings yield the better a buy it should be.

v. **Price Earning Ratio**

This is a very widely used ratio and attempts to relate the EPS current market price of the shar expressed as follows:–

P.E. = Market price per shar

E.P.S

This allows the buyer of or shares to obtain a more accurat of the return on investment, sug by current earnings.

Summary

I think that you will agree that the ratio analysis will enable you to asse compare the financial performance o panies both over time and between panies. If they are to be of any value ever, results *must* be collected in a u way. This is a vital point, not overlooked.

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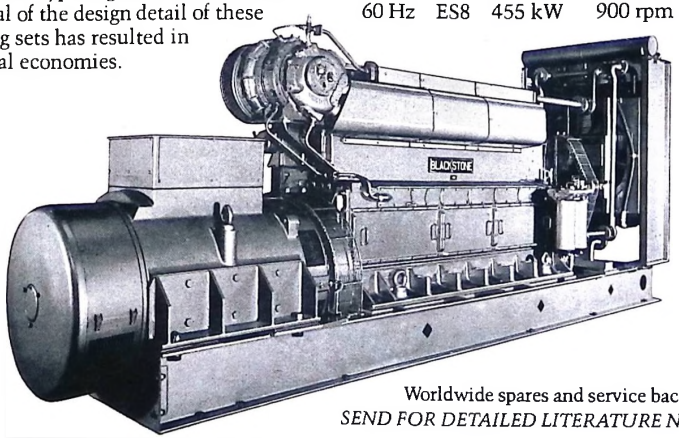
60 Hz	ES6	342 kW	900 rpm
60 Hz	ES8	455 kW	900 rpm



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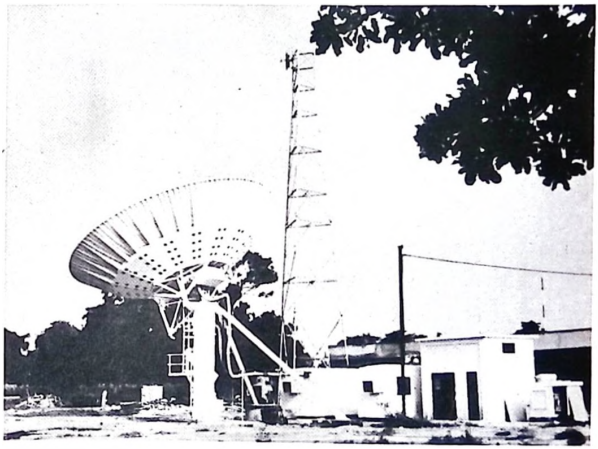
Telecommunications in West Africa

Communications are central to the modern way of life, and research in this field results in increasingly sophisticated developments such as video. Our correspondent looks at some of these developments, and attitudes towards them.

WITH THE world now entering upon an information revolution there can be little doubt that communications will become a central focus of debate and development over the next decade. Technological advances, from the micro-chip to the communications satellite, has ensured that traditional means of gathering and disseminating information will be increasingly challenged. New practises and structures will emerge to utilise the new technology and the effect will be felt in every area of life.

But as with every fundamental new advance, the direction and effectiveness of subsequent change will depend upon knowledge and understanding. It is therefore vital that every individual and organisation acquires an appreciation of the new opportunities which are becoming available and relates them to specific spheres of activity. Whether the concern is commerce, industry, education or social development, current perspective must be re-evaluated in order to determine whether objectives can be met more efficiently through the use of the new communications technology.



INTELSAT standard B earth station in the Republic of Upper Volta.

Already, in 1980, we have seen the growth of international efforts to promote changes in control over the flow of news and information. The call for a new world information order, which would redress the balance of influence between developed and developing nations, has emerged from a series of international gatherings and is a necessary reminder that decisions about communications need not be the sacred preserve of powerful governments and multi-national companies.

One clear statement of the demands now being made came from Cameroon's President Ahmadou Ahidjo in his opening speech to the 'AFRICOM '80' conference on communications policy in Africa. "It is our conviction," he said, "That the world today needs modern communications systems which, instead of reinforcing dependence and domination through ideological or cultural subjugation, may rather help to foster dialogue and communication between peoples; promote scientific, technological and educational development; facilitate the adaptation of technology to the realities and needs of each nation; and allow the affirmation or re-affirmation of national values by peoples whose awareness of their identity is based upon a long history".

Yet concern has also been expressed that the development of modern systems of communication risks ignoring the fact that other important, more traditional, forms exist. It was in answer to this point that Amadou Mahtar M'Bow, Director-General of UNESCO, told 'AFRICOM '80' that, "There can be no question of foregoing the advantages of contemporary technology; rather, the necessary links need to be made between the living forms of inter-personal and community communication and the mass-media".

Thus it becomes clear that the development of communications in such a way as to meet desirable objectives is a matter of importance for all sections of society. While, at an international level, governments may seek to ensure that national broadcast media properly reflect the unique cultures and concerns of their societies, it falls to other decision makers to create new initiatives within their own areas of endeavour. For people with this objective, the advances being made in communications satellites and large-scale television and radio systems are likely to be of less importance than other developments which allow an extension of existing communications methods.

Perhaps the most important single technical advance in this field has been that of video. Through permitting the production of specialised 'television' programming at low cost it radically alters the scale of effective audio-visual communication. With video, the smallest research or training institute, the individual company or a small-scale social development project is able to devise and disseminate an 'information package' which does not depend upon a team of experts working in a sophisticated, and therefore expensive, studio.

In creating a new accessibility to what was previously a broadcast medium, video subtly alters the power relationships which surround communications. The imaginative manager of a small company can compete with the large corporation in training his staff or in presenting his products and services to distant customers. Knowledge and skills need no longer be locked up within schools and colleges – video can project

continued

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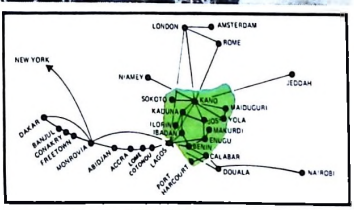

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the information of lecturers and experts to the specialised audience beyond.

On another level, video is also capable of enabling organisations and individuals to produce programmes of broadcast standard for national and local television services at relatively low cost and with a minimum of training. Scope therefore exists for a much higher percentage of locally produced material within any given programming budget, offering one means of ensuring that television services really do reflect the concerns of their audience.

But the new opportunities offered by video and the other technological advances within communications will depend, ultimately, upon the imagination of people in discovering how to use them to the greatest advantage. Technology is a tool to be used. Its usefulness depends upon the creativity and enterprise with which it is used.

Domestic satellite communications network

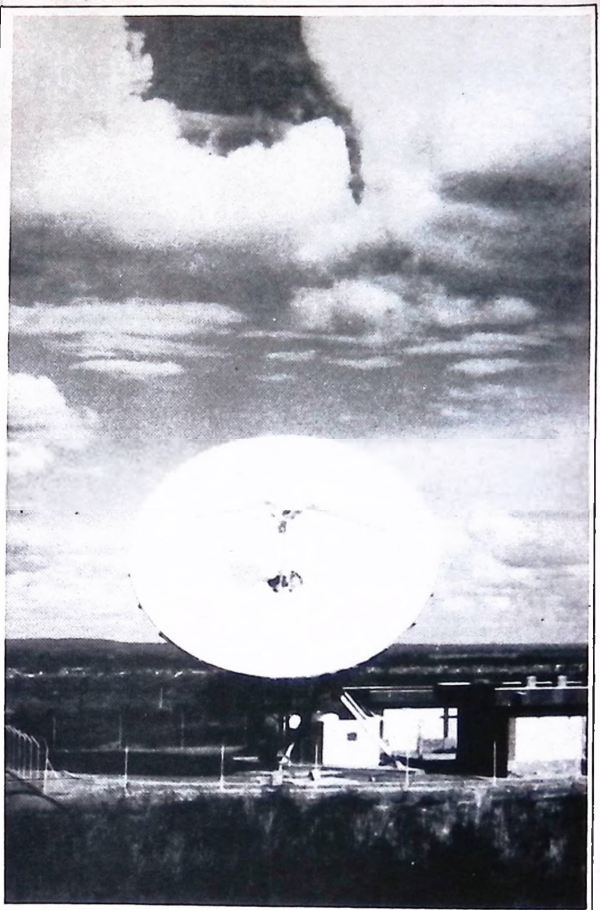
The Republic of Zaire is one of the first countries in the world to possess its own domestic satellite communications network. The system, which was recently inaugurated, gives Zaire access to all current types of communications: telephony, telegraphy, television and radio broadcasting.

Rezatelsat covers the entirety of Zaire's territory (2,345,000km²) and is adapted to the country's topography and distribution of its 25 million inhabitants. The network was designed, manufactured and installed by Thomson-CSF. It consists of satellite communications earth stations, microwave links, and radio and TV transmitters.

The 13 earth stations disseminated throughout the country and in permanent communication with an Intelsat satellite, together with the associated microwave links, ensure the interconnection between Kinshasa, the capital, and 17 major towns.

Variety of services

The Rezatelsat network will provide a wide variety of services: broadcasting the national TV programme from Kinshasa towards the most densely populated areas, and TV reports from regional centres; in the area of television, the Republic of Zaire has one of the most modern radio and television production centres on the African continent. This centre was designed and developed by a consortium of French companies.



A satellite telecommunications earth station of the Rezatelsat network in Zaire set up by THOMSON-CF.

Eighty-three trunk telephone channels using satellite communications and 170 microwave links replace the former radio communications. Thus, for the first time, the public at large will have access to the long-distance telephone service in a number of towns, either through operators or in semi-automatic operation.

Twenty-six telex channels including 15 by satellite. Turnkey implementation of the project had been entrusted in 1976 to Thomson-CSF as prime contractor, backed by a principal subcontractor: Telspace (a financial consortium formed between the CGE Group represented by CIT-Alcatel and the Thomson-CSF Group), Europe's leading manufacturer of satellite communications earth stations. a joint preliminary study of the system was made by three official French organisations: Sofrecom, EGT, and Sofratev, assisted by the French posts and telecommunications authority.

The sub-contractors have built 6,000m² of covered area, erected towers and masts totalling 1,500m in height, supplied 24 generator sets, laid 35km of medium voltage cables and 6km of multi-pair cables.

8,000m³ (2,000 tons) of material were transported between the various sites disseminated throughout the country. Often these sites were of difficult access and all means of transport were used: boat, train, aircraft, and even trucks. A specially chartered aircraft logged 2,500 hours for the transport of personnel and smaller equipment. Up to 50 resident technicians (including about 30 Thomson-CSF agents) were employed to complete the project. Some of them, working on their own, were in charge of maintaining the remotest stations.

American technology in West Africa

SEVERAL COUNTRIES in West Africa are choosing satellite communications and microwave links as methods to improve their communications and promote economic growth. Notable among these are Cameroun, Nigeria, the Republic of Chad and Upper Volta.

Pre-satellite age telephone systems often resulted in a two or three day delay in placing a call to a neighbouring country or another continent. Messages travelled over land on telephone lines to a nearby country equipped to transmit communications via satellite.

"Satellite communications," said Glenn H. Sacra, president of GTE International Systems Corporation, "offer these countries significant advantages to centralize message and video traffic, to attract and aid international business, and contribute to economic development."

Communications in Cameroun have improved considerably in recent years; the country has a multiple station microwave network carrying telephone and telegraph traffic from the nation's capital, Yaoundé, in the southern section of the country, to its northeastern neighbour, the Republic of Chad.

In Lanlate, Nigeria, approximately 100 miles north of Lagos two international earth stations are beaming telephone, television and data traffic via INTELsat satellite to the United States and Europe. Communications to and from Nigeria were transmitted by radio facilities, principally via international connections in London, prior to the installation by GTE of the first earth station in Lanlate in the early 1970s.The Republic of Chad, north of Cameroun and northeast of Nigeria, will be the third country in a microwave communications network linking that nation with Cameroun and Nigeria.

Upper Volta

A second West Africa nation employing an international satellite communications earth station is Upper Volta, the land-locked country northwest of Nigeria. earth station, in operation since Ja 1978, made possible for the first time telephone and telex communic between Upper Volta and the U States. Previously, telephone calls be that nation and North America relayed over land to Europe and then U.S. via satellite, resulting in noise int ence, delays and higher costs.

Advantages

Recent ad ces in communic especially sa ite technology, lowered costs facilitated the exte of telephone evision and data munication vices to develo countries.

Telecomm ations for the African natio re an important lin enter the ran of industrialised nat GTE consider elf to be playing a role in assisting hese nations toward goal.

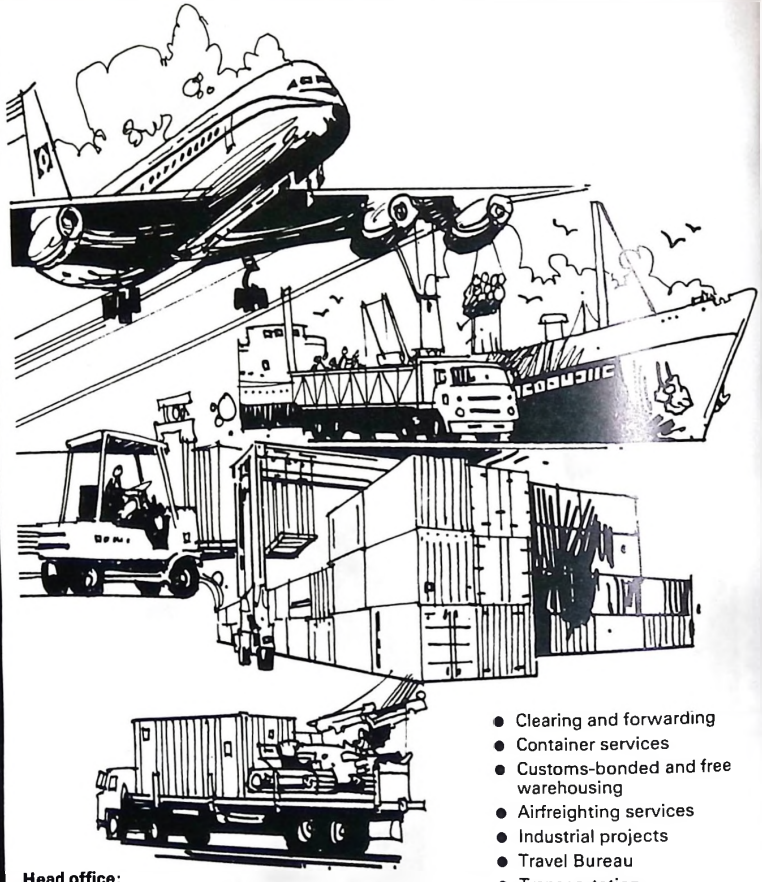
G'Bordolite earth station of the Rezatekar network in Zaire.

Spotlight on SWITZERLAND

Supplement to West African Technical Review January 198

Contents

TRIANA DOES IT ALL



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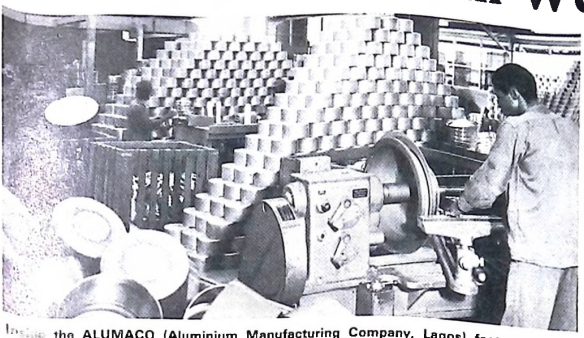

Inside the ALUMACO (Aluminium Manufacturing Company, Lagos) factory. Worker manufacturing cooking pans.

ON THE face of it Switzerland is not a particularly likely trading partner for a West African country. The stereotype sticks stubbornly in people's minds of the tiny landlocked country, where just six million people specialise in cuckoo clocks and hoarding gold, a land with no natural resources and many natural obstacles, a country neither historically nor geographically well placed to develop strong ties with West African countries. Yet in the last six years or so the level of exports to Nigeria – both visible and invisible – as well as investments have increased more or less steadily, despite a predictable, temporary decline in exports in response to Nigerian import controls.

Number one

This growth in trade, which makes Nigeria Switzerland's biggest market in Africa and second biggest supplier in Africa, is significant, even if African countries receive a relatively small share of Swiss Third World investments . . . In 1978 Swiss investments in developing countries constituted ten per cent of total investments abroad; of this SFr2.7 billion went to South America, SFr610 million went to Asia and a modest SFr290 million went to Africa.

Looking back over the past six years trade with Nigeria has certainly had its ups and downs. In 1978 exports to Switzerland fell dramatically to SFr118 million from SFr215 million in 1976. This slackening off of trade was evident in Swiss exports to Nigeria, but not until 1979, when exports to Nigeria fell to their lowest level – SFr 263 million – in the 1975–80 period.

Exports to Switzerland have now picked up considerably – figures for the first nine months of 1980 were SFr277.3 million, compared with SFr135 million for the whole year in 1979. Judging by the increases in level of activity of Swiss engineering and building firms in 1980 Swiss exports to Nigeria will definitely exceed those of 1979, although figures are not yet available from Switzerland; statistics drawn up by the O.E.C.D. (Organisation for Economic Co-operation and Development) confirm this – the monthly average of exports for the second quarter of 1980 was $23.47 million (SFr39.1 million) compared with $11.9 million in 1979 (SFr19.8 million).

Oil

Oil comprises a major part of Nigerian exports to Switzerland. Of the SFr136 million worth of exports going to Switzerland in 1979, 131 million was paid for oil. In practice not even these figures reflect the true amount of oil exported to Switzerland; much oil, consumed in Switzerland which is of Nigerian origin is refined outside Switzerland and does not, therefore, register in Swiss custom statistics. But despite the rapid rise in exports to Switzerland in 1980, Nigeria continues to sustain a trade deficit with its partner, but the gap shows signs of narrowing.

Nigeria reigns supreme in West Africa as Switzerland's number one trading partner. Ghana is its second biggest partner, in anglophone West Africa, but political events in 1979 cast a shadow over the business sector. However, experts now predict that the Ghanaian economy should be on a much stronger footing soon and there certainly appears to be a mood of confidence among international and national aid agencies and, in turn, exporters themselves. Swiss companies and financing agencies will probably be monitoring this improvement more cautiously than their peers in other countries before committing themselves in any direction. Caution and reliability are hallmarks of the Swiss businessman's approach.

But what can Switzerland offer West Africa? The answer is a great deal both in

continued

Imports from West Africa

Country	Year	Finished and semi-finished products	Energy	Capital equipment	Consumer goods	Total
Nigeria	1976	12,629,707	202,596,089	11,252	87,533	215,324,581
	1977	40,623,929	152,416,696	6,766	40,354	193,087,745
	1978	15,652,135	102,277,554	10,158	111,264	118,051,111
	1979	5,397,018	131,344,656	13,121	198,060	136,952,855
Gambia	1976	27,039,022	—	—	—	27,039,022
	1977	21,340,544	—	—	—	21,340,544
	1978	14,690,304	—	—	5,281	14,695,585
	1979	20,275,786	—	—	22,768	20,298,554
Sierra Leone	1976	20,692	—	—	3,065	23,757
	1977	49,261	—	—	2,010	51,271
	1978	1,442,458	—	—	660	1,443,118
	1979	129,843	—	1,878	32,845	164,566
Liberia	1976	2,069,317	—	214	25,149	2,094,680
	1977	522,793	—	2,090	32,284	557,167
	1978	657,900	—	—	45,660	703,560
	1979	1,679,221	—	14,200	19,533	1,712,954
Ghana	1976	30,936,331	—	100	135,142	31,071,573
	1977	24,085,959	—	480	34,709	
	1978	55,778,794	—	210	58,620	55,837,624
	1979	42,781,677	—	—	47,054	42,828,731

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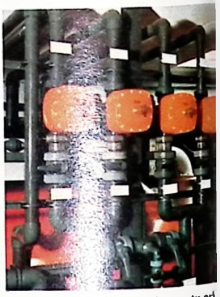

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schwarz

terms of skills and products. That 'tiny landlocked country' has always had to rely on its own ingenuity as opposed to any tangible resources, and the Swiss people have developed over the centuries into a a hardworking and inventive people. These qualities emerge in the types of products for which Switzerland has become renowned, for example, machine tools and precision engineering, pharmaceutical products.

Dependence

In an article on Swiss engineering products, Ernest Horat, Secretary of the Swiss Association of Machinery Manufacturers (VSM) speaks of "the traditional dependence on world markets, and therefore on international competition, is the key to the successes of the Swiss engineering industry; lagging in research and development would bring a serious decline in competitive strength and prosperity." (The country's rugged and complex terrain has stimulated the same level of research in the civil engineering sector).

Thus it is that among world exporters of machine tools Switzerland ranks fifth; moreover Switzerland is the second biggest exporter of textile machinery, still ahead of Japan despite the keen competition which the latter is putting up, and beaten only by the Germans. In the field of electrical equipment and installations, Switzerland is the world's tenth biggest exporter.

Switzerland's exports to Nigeria reflect her position as a world exporter. Top on the list of exports to Nigeria are non-electrical machines – a large percentage of these are textile machines; next comes electrical machinery, followed by optical and precision instruments. Watches, one of Switzerland's most well known product come fourth on the list, but as with textile machinery the market is fast being taken over by Japanese products!

Professional associations

In all its exporting activities Swiss companies are supported strongly by a wide range of efficient and active professional associations, all of which take a keen interest in their members overseas activities. Thus in its May bulletin last year the Swiss Society for the Chemical Industry (SGCI) quotes Peter Wirth of the Information Group for Private Business in Developing Countries who declares that "by establishing offices in the country the company previously exported to, the enterprise is far better placed in the market. Direct contact with its customers improves the company's chances of doing good business."

Peter Wirth goes on to say, "a recent questionnaire sent to Swiss firms revealed that opening new markets and securing old ones is the most important priority of Swiss firms. The fact that foreign markets can mean cheap wages was not considered an incentive for working in a developing country. For this is only important with products requiring a high labour expenditure – manufacturing in a developing country has obvious advantages; Switzerland is not exporting that type of product in any large quantity."

Geilinger is one of Switzerland's oldest manufacturing and contracting firms in the construction sector. Recently it assumed management responsibilities in a Nigerian steel group manufacturing semi-trailers and small steel structures, along with a 30 per cent shareholding. Pictured here, a worker at one of the plants Geilinger is managing.

Useful Information

Official holidays and business hours

January 1 (New Year), April 4 (Good Year), April 7 (Easter Monday), May 1 (Labour Day), May 26 (Whit Monday), August 1 (National Day), December 25/26 (Christmas).

Government and business offices, 0800–1800 Monday–Friday.
Banks, 0800–1230 and 1330–1630 Monday–Friday, plus extended hours on one day per week, generally Friday.
Business vacations are taken in June, July, August and February.

As business partners and industrialists the Swiss are innovative and flexible, but nevertheless cautious. Switzerland has a long tradition of free trade; it is a member of the European Free Trade Association (EFTA), along with Scandinavia, Austria, Finland, Iceland and, for the time being at least, Portugal, and thus it is committed to a policy of eliminating tariffs on goods manufactured in EFTA countries.

Banking support

Despite his cautiousness, the typical Swiss businessman is not inflexible and

continued

Exports to West Africa

Country	Year	Finished and semi-finished products	Energy	Capital equipment	Consumer goods	Total
Gambia	1976	71,854	—	42,187	1,231,931	1,345,972
	1977	92,133	—	41,613	795,935	929,681
	1978	9,344	—	21,981	352,262	383,587
	1979	83,688	—	45,891	188,641	318,220
Sierra Leone	1976	1,715,273	3,799	225,059	4,833,530	6,777,661
	1977	5,719,795	1,296	2,691,601	2,443,866	10,856,558
	1978	7,325,887	1,271	8,130,781	5,880,249	21,338,188
	1979	672,861	—	2,322,633	4,725,163	7,720,657
Liberia	1976	2,340,276	995	26,474,847	6,213,077	35,029,195
	1977	2,695,072	2,917	15,710,652	9,936,589	28,345,230
	1978	1,821,713	68	4,868,470	5,415,727	12,105,978
	1979	1,265,163	381	9,337,975	7,419,278	18,022,797
Ghana	1976	16,719,886	8,046	22,228,307	5,402,560	44,358,799
	1977	23,147,775	22,055	87,217,236	9,554,672	119,941,739
	1978	21,423,966	87,146	96,119,733	20,162,301	137,793,146
	1979	4,374,975	680	2,846,827	16,245,104	23,467,586
Nigeria	1976	97,709,208	125,993	89,546,481	86,705,274	274,086,956
	1977	122,464,820	76,609	153,889,298	115,305,903	391,736,630
	1978	109,701,696	273,167	171,106,402	140,326,516	421,407,781
	1979	93,960,779	88,405	79,908,421	89,210,370	263,167,975

Project financing – a Swiss speciality

IT IS scarcely surprising that the Swiss have found a way of blending their talent for financing with their skill at engineering in a formula geared to meet the needs of developing countries. The formula, Project financing has grown con-siderably over the past decade to be a successful method of implementing large scale projects in the Third World. In Switzerland there are two major companies which have made this branch of finance their speciality.

SIFIDA (the Society of International Finance for Investment and Development in Africa) was founded in 1970 with the aim of developing countries in independent Africa. SIFIDA hopes to achieve this mainly by assisting in the creation, modernisation and expansion of profitable industries; secondly, by using financial and technological resources of its shareholders; and finally by encouraging private enterprises to play a positive and acceptable role in Africa.

Aims

SIFIDA realises these aims by financing (wholly or in collaboration with others) new investments. This does not include financing working capital or re-financing debts previously contracted. The kind of projects that SIFIDA is interested in are profitable and preferably private projects in industry, agro-industry and tourism, but projects falling into other categories but, an important criteria for providing finance is the collaboration of SIFIDA's shareholders in projects put forward.

More specifically SIFIDA's involvement in a project will express itself in the supplying of medium and long term loans, granted in US dollars, with maximum three years grace; interest is either fixed or calculated with reference to the London Interbank rate, reviewable every six or 12 months. SIFIDA also demands a minority share participation in the project and representation on the Board, if it is supplying equity finance, along with periodical meetings with the management of the company in which it has invested.

Applying to SIFIDA

Applications should be submitted along with a feasability study (SIFIDA is prepared itself, to prepare on special request, feasibility studies to establish technical as well as economic viability of a project). If a feasability study is not submitted than project sponsors must give a complete project description plus information on sponsors, other partners, raw materials, construction and management, nature of the market which the project will serve, investment costs, profitability and nature of assistance required of SIFIDA.

SIFIDA has approximately 130 shareholders including financial industrial and commercial institutions from industrialised countries (Europe, North America, Australia and Japan) as well as from the Middle East. Many of these shareholders are well-known in Africa as consultants and exporters with considerable experience in working in West African countries. Joint venture investments involving SIFIDA in West Africa include aluminium extrusion and ceramic manufacture in Nigeria; two textile mills and a hotel in the Ivory Coast; timber processing in the Cameroun; and pineapple growing in Benin. SIFIDA is also managing or co-managing syndicated credits in West Africa. These are being used for the contruction of Garoua airport and the timber processing plant in Cameroun; the Bouake M'Bahiakro road programme and bore-hole drilling in the Ivory Coast; and in Niger, credits are being used for the thermal power plant, in the SONICHAR project (Société Nigeriênne du Charbon d'Anou Araren).

Public sector finance

By comparison Universal Engineering & Finance Corporation (UNEFICO) will undertake the financing of projects throughout the developing world, although the large proportion of projects it has got involved in so far have been in independent Africa. UNEFICO was founded in 1976; its major shareholder, the Swiss Bank Corporation, one of the most important Swiss banks, saw the need for a select team of specialists who could retain the flexibility and efficiency of a compact organisation and still draw upon the financial and industrial resources of a Swiss international bank.

With UNEFICO, priority is given to projects contributing to country's infrastructural development in the public sector – they are not necessarily in the manufacturing sector, but generally include such areas as agriculture, electrical power generation, transmission and distribution; water supply, sewage disposal and irrigation systems.

UNEFICO emphasises that it can supply a total package of financing and technical advice running through from project identification to project management to construction and management service.

Fishfarming

In West Africa the organisation has operated only in francophone countries so far, although that it is not a fixed policy. In Togo UNEFICO is involved in an agro-industrial project in the Namiele Basin. This covers 12,500ha with 2,500ha planned for irrigation by building an earth dam across a tributary of the River Oti. The lake formed by this dam will be used to develop a fish arming industry. Ten thousand na of the Basin will be used for cattle raising. The project will take four years. As well as arranging finance UNEFICO is in charge of setting up an experimental programme for agriculture and cattle; co-ordination of construction work and equipment supply; technical assistance and training; and finally project finance for future phases.

In Senegal the organisation is supervising and financing the establishment of a diesel power station. The power station will be designed to allow for future expansion and the first phase will have an installed capacity of 15mW. Transmission lines will be provided to connect the station to the existing grid system.

Power supply is the theme of another project in West Africa, but in this case power by water. A hydro-electrical power project in the Plateau area of Djambala and Koukouya is about to be built in the Congo. The hydro-electric station which will be situated on the river M'Pama will have an installed capacity of 7.2mW. The power distribution system will provide electricity to the town of Djambala and the neighbouring villages. The power station will be supplemented by a water supply system which will include pumping and treatment stations, watertowers and reservoirs.

Again in the Congo, but this time in the agro-industrial sector, UNEFICO is undertaking a turnkey project for the financing, design and construction of 15,00 tonnes cereal handling complex in Pointe-Noire. The complex will consist of 12 re-inforced concrete circular silos, each of eight metres diameter; a control tower containing elevators and weighting equipment; ship unloading and loading equipment with a capacity of 100 tonnes/hour; administrative building, workshops and quality control laboratory. The whole complex is linked by rail to the existing flour mill at N'Kayi and will provide the necessary cereals for total flour production to the Republic.

Project finance has an important role to play in developing the Third World by means of well co-ordinated and financially sound projects. Project financing companies such as SIFIDA and UNEFICO constitute important reference points both for exporters, along with expatriate consultants, and the Governments of developing countries. Undoubtedly their scope will increase as companies explore new markets and need the assistance of Third World experts to do this, or offset declining profits at home by operating more rigorously in overseas markets. ●

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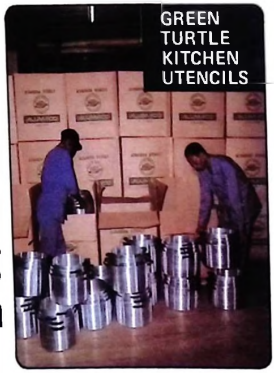


Alumaco pioneered aluminium manufacturing in Nigeria in 1960 with manufacture of Green Turtle Kitchen utensils.

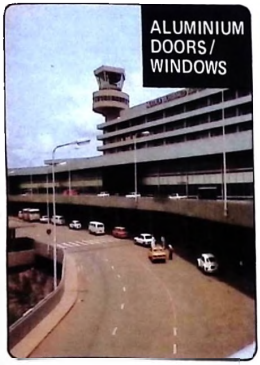
Realizing the needs of Nigerians quality aluminium products we diversified to the manufacture of aluminium doors, windows and roofing sheets building industry; prefabricated cold rooms for storage and aluminium refrigerated trailers and pick-ups for delivery.

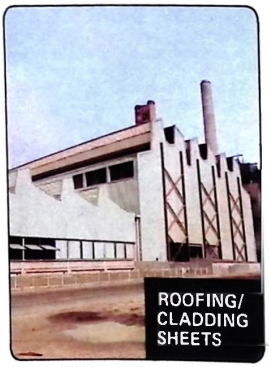
Our close association with Alusuisse the giant Swiss world renowned aluminium producers established in - has ensured the continuance in technology and training programmes the Company.

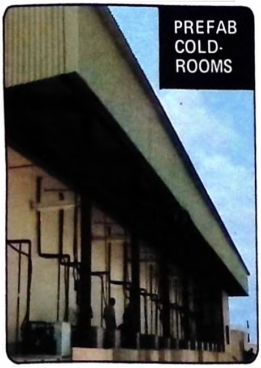
With two manufacturing plants at and Oshodi and our present Kaduna Enugu (and future Kano) sales offices well as our numerous accredited we have been able to ensure stable of our products to our various customers all over the country.

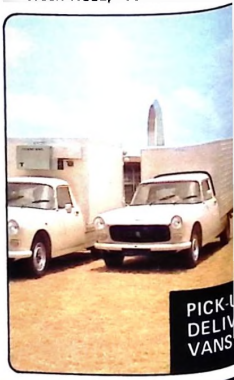
Not only has our existence created employment for more than 1,300 Nigerians; we have also gone public enabling many Nigerians to participate our continued growth.

We believe that in the years ahead our pioneering influence will lead us to providing much better products and services to the people of industrially developing Nigeria.









Aluminium Manufacturing Company of Nigeria Limited
32 Creek Road, P.O. Box 60, Apa

Circle No. 5 on enquiry card

Swiss aid

"Give a man a fish, and you feed him for a day. Teach a man to fish, and you feed him for a lifetime." This is one of the basic principles of Swiss aid – education is vital in helping those in developing countries to help themselves.

GOVERNMENTS IN the industrialised parts of the world realise that the establishment of a new international economic order – a more well-balanced one – is in the interests of everyone, not just those who are missing out now.

The decision to work towards this goal is an easy one compared with that of deciding just how to set about it.

In Switzerland, the system of aid for development is essentially based on decisions taken in 1976 and 1977. The first federal law concerning development co-operation and international aid was passed on 19 March 1976. It defines the general principles, the objectives, and the actual nature of Swiss aid for development.

Two organisations are basically in charge of putting the law into action. They are the Direction de la coopération au developpement et de l'aide humanitaire (Organisation for technical co-operation and humanitarian aid), known as the DDA, and the Office Fédéral des Affaires Economiques Extérieures (State office for external economic affairs), known as the OFAEE. The OFAEE is concerned with forming a political strategy towards development. In addition, the Département fédéral de l'intérieur (State department for internal affairs) is responsible for the donation of study grants in Switzerland to students from the Third World.

Living conditions

The 1976 law is based on a small number of essential principles. The Swiss aim to improve living conditions in developing countries by helping to put these countries in a position to carry out their own development by their own means. In the long term, they hope that the trend will be towards a better balance within the international community.

Support is given primarily to the most underprivileged regions and communities. Technical co-operation especially encourages rural development; improvement in the food supply, particularly in food crops for local consumption; promotion of crafts and cottage industries; job-creation schemes; and a continued effort to establish and maintain an even ecological and demographical balance.

'Coopération technique' is what the Swiss call the provision of qualified personnel and advisory experts, and of grants for studies and apprenticeships, while 'aide financière' means principally financial help for putting development projects into action – the equipment, materials and labour to construct roads to rural wells, for example. These two forms of assistance are complimentary and often go together in a single project.

Humanitarian aid is available to give urgent help to victims of natural disaster or war: food and supplies for emergencies are provided by the Corps suisse d'aide en cas de catastrophe (Swiss disaster relief corps).

International negotiations

An important, though less well known, aspect of Swiss involvement in the Third World is their participation in international negotiations, and work for the international organisations in their contact with the Third World: the Swiss are involved in commerce, investment, transfer of technology, markets in raw materials, customs duties, tariffs for developing countries, and other areas of international economics. The aim of this participation is to find a compromise between the demands of developing countries, who are hoping to modify international relations in their favour, and the interests of the Swiss economy.

Bilateral aid is concentrated in a relatively small number of countries; there is not enough money, nor enough personnel, in Switzerland to be active in all the countries of the Third World. In West Africa, the Swiss concentrate their activities in Senegal, the Sahel, and the Cameroun.

Their relatively high percentage of multilateral aid (40 per cent) shows the extent of Swiss involvement on an international scale.

On the technical side, it comes chiefly from members of the United Nations. The most important financial aid organisations are the World Bank, regional development banks and development funds.

An example of an international organisation in which the Swiss play a large part is the Red Cross. The Schweizerisches Rotes Kreuz provides advice and assistance for Red Cross branches in Burundi, Rwanda, Upper Volta and Angola, in setting up blood transfuion centres for local needs. 1,232,700 Swiss francs were spent on the centres for the period 1979/8.

continued on page 45

Economic and commercial support

The economic and commercial support extended by the Swiss is shown in a project currently being put into operation by the OFAEE, concerned with promotion of exports from developing countries to Switzerland. The object is to provide technical and financial assistance to enable representatives from developing countries to play a large part in important trade fairs in Basle and Lausanne. It is intended that the countries invited should participate several years in succession, thereby accumulating experience enabling them to penetrate certain areas of the Swiss market with a real understanding of that market.

Projects

Projects in progress at present in West Africa itself are extremely varied, but a brief consideration of a cross-section of them reflects Swiss aid policy in general.

Swiss craftsmanship is being employed – and has been since 1969 – in Abidjan, where, in the Centre Horloger Suisse d'Abidjan (Abidjan Swiss Watchmaking Centre), two-year training programmes are given to workers from the Ivory Coast and other francophone regions of West Africa. The centre is supposted by the DDA, and administered by the Ministère de L'Enseignement Technique et de la Formation Professionnelle (Ministry of Technical Studies and Professional Training) in the Ivory Coast.

The DDA is providing 'coopération technique' in a different project in Abidjan. Since 1978, three experts have been on the spot to advise on the preparation and follow-up of projects financed by the African Development Bank. They also evaluate the projects once completed. The DDA provided 1,725,000 Swiss francs for this service during the period 1978/1980.

Education

The emphasis on education has resulted in numerous literacy projects. 1,350,000 Swiss francs were given for such a project over a three-year period in the Tillabéry region of Niger, and 2,830,000 Swiss francs for a similar scheme in Benin. Lomé, Togo is the location for a new offset printing press to help towards a national literacy project, printing teaching material, newspapers and other documents in local tongues. The staff will be trained by two Swiss printers. The DDA has contributed 250,000 to this project.

A substantial sum of money is being devoted to the agricultural sector. In Monrovia, Liberia, the West Africa Rice Association is collaborating with the DDA in providing experts to carry out feasibility studies for rice projects in the region, and is also running intensive six- to eight-week courses, of a very specialised nature, on rice production, storage, and commercial usage. 1,560,000 Swiss francs were allocated here for the period 1979/82.

Young agricultural workers' training centres have been established in Upper Volta for children without school training or any other form of education. Essential practical skills are taught and information given according to the needs and background of the children. The DDA have given 2,430,000 Swiss francs towards this project.

In Guinea Bissau, 650,000 Swiss francs are being spent by the DDA on improving local milk production. European and African cattle are being cross-bred to develop a strain with a high milk yield, and improved fodder being fed to the animals.

The Food and Agriculture Organisation (FAO) recently announced a three millio Swiss francs grant from the Swiss Gover ment to West Africa. Two-and-a-ha million francs provided foodstuffs, and t remainder was used to send logisti experts from the Swiss Disaster Reli Corps.

In 1977, the Swiss spent a total of 286 million francs on development aid fro government funds. This figure had risen 343.7 million francs by 1979, and co tinues to rise. However, much financi restriction is necessary in the future, tec nical co-operation and humanitarian aid developing countries will remain an impo tant part of Swiss foreign policy.

Construction and civil engineering – quality and adaptability

THE SWISS reputation for skill in civil engineering dates back to the eighteenth century when Swiss engineers were being asked to work difficult building projects in many European countries. This skill developed out of the practical difficulties facing the Swiss in their own country in terms of improving communications. In a country full of mountains, gorges and steep passes, the Swiss had to develop the technology to build durable bridges, tunnels and roads.

Swiss success in civil engineering overseas and in West Africa, despite the comparatively recent appearance of the Swiss on the scene, can be explained by the fact that the Swiss are good at developing the right sort of engineering for the right project (this means in some cases bringing specialist Swiss made machines onto the job).

Recession at home

In the first stages Swiss civil engineers and contractors increased their activities in foreign markets in reaction to the recession which began to grip the Swiss building sector in 1975. The last six years have been years of exploration and reputation-building for the Swiss in West Africa. However, at the moment the Swiss construction sector shows every sign of picking up. One can, therefore, predict that the number of Swiss newcomers in the Nigerian, and other, construction sectors will decline in reaction to this. But this does not mean that work carried out by Swiss contractors will decrease; speaking from his office in Zurich Mr H. Schaer, Secretary of the Swiss Construction Industry Group said that those of his members working in West Africa now are committed to maintaining operations there; an improvement in the domestic market will not effect that commitment.

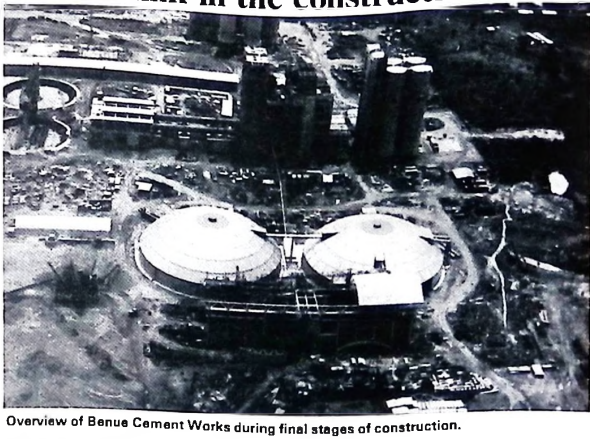
Ivory Coast

Founded in 1965, the SBI numbers among its members several building and civil engineering firms very active in West Africa.

For example, one member, Frutiger International has carried out turnkey housing projects in the Congo. On a larger scale, Bless Contractors Ltd. has achieved notable success in the Ivory Coast by participating in the construction of the Northern Highway, linking Abidjan to N'Douci. Agair in the Ivory Coast Ed. Zublin Co. Ltd. h .s completed two projects – the first in association with the architects, Thomas Leiterdorf & Goldenberg Associates, was for 15 three-storey and two nine-storey apartment buildings. Zublin took just 18 months to do this. The second contract, in association with the Societe Ivoiro-Suisse, d'Architectes Niavas-Hermes & Cie, was for the building of a commercial and business centre in Yamoussoukro; this was opened in the summer of 1979 and included an office block, theatre, ballroom, night club and shopping complex.

USSI (Union de Sociétés Suisses d'Ingénieurs Conseils et Architecture) is another professional organisation whose

Cement production – a vital link in the construction sector



Overview of Benue Cement Works during final stages of construction.

IN THE year 1976 Nigeria imported as much as 5m tonnes of cement to accommodate the needs of a rapidly expanding construction sector. The cost of doing this, the port congestion it caused and the fact that Nigeria has readily available most of the raw materials necessary for making cement, dictated that the number of cement production plants in the country should be increased.

But establishing a large scale cement production plant is by no means an easy task – it involves the installation of sophisticated technology and large scale structural engineering. In Benue State it fell upon Swiss General Contractors Nigeria Ltd. to build the plant at Yandev, near Makurdi.

SGC Nigeria Ltd. was founded to carry out a wide variety of civil engineering and construction projects. Its sister firm in Switzerland, SGC CH, was founded specifically as a consortium, using a wide range of different skills both on the construction and management side, to undertake overseas projects. Although a relatively young firm, SGC Nigeria already has two important contracts to its credit. The contract for the construction of the Benue Cement Company was its first contract; awarded in December 1976 the contract was valued on completion, and taking into account escalating costs, at ₦60m.

Structural work began on the cement plant in October 1977. By August of last year the plant was in operation. The plant was designed by the Swiss company Cementitia. The final stage of construction was speeded up with the help of Taylor Woodrow Mechanical and the Italian company S.O.I.N.I. The plant is equipped with sophisticated electronic equipment from Germany and Switzerland. By August 1980 after three years of construction the plant was already operating; it is capable of operating at a daily output of 3,000 tonnes. The type of cement produced is Lion Brand Portland Cement. As far as raw materials are concerned the plant is well supplied by lime from a nearby lime stone quarry; gypsum still has to be

continued

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Elnapress

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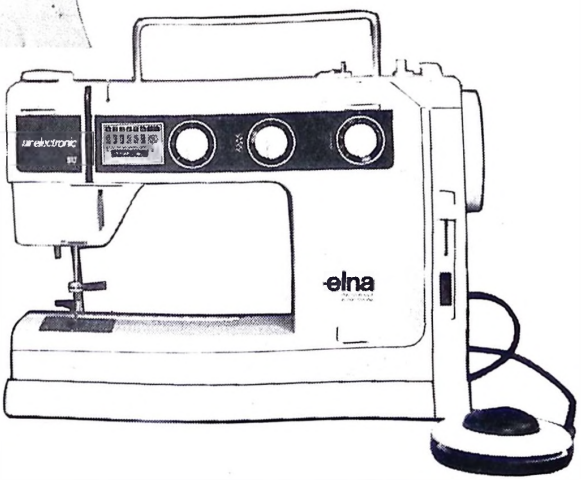
The vap-O-jet system developed by elna is vastly superior to oldfashioned ironing, as it steams and presses your laundry at the same time, at just the right temperature with a pressure of 45 kilograms. The fine spray is converted into steam, which penetrates and revives the textile fibres.

The laundry is pressed without friction. So even the most delicate fabrics won't be damaged. And no rubbing means no shine or stretching out of shape.

The pressing surface of the elnapress is up to ten times that of a hand iron. This allows you to press several smaller pieces of laundry simultaneously, in just one operation. You simply place the laundry on the board, as usual.



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Textile industry: Lagos, Nigeria, a highly modern weaving mill with 56 Sulzer weaving machines produces a versatile article programme.

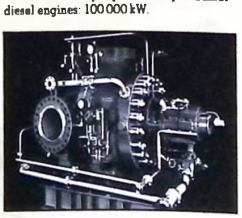
Hydroelectric power station: Escher Wyss has been commissioned to supply six vertical propeller turbines for a river power station on the Niger near Jebba, Nigeria.

Chemical industry: Work assembly of one of the Sulzer compressor groups for a nitric acid plant in Arzew, Algeria.

Generation of energy: Largest diesel power station in the world at Bong Range, Liberia. Total output provided by 11 Sulzer diesel engines: 100 000 kW.

Pulp and paper industry: Machine for the production of copy paper in the Basrah II pulp and paper mill, Iraq. In addition to acting as general contractor, Sulzer also supplied the paper machines, gas turbine, waste-heat boilers, air conditioning systems, evaporation plants, vacuum blowers, compressors, as well as instrumentation and control systems.

Foodstuffs industry: Shuwaikh Harbour, Kuwait. The cold store with its Sulzer refrigerating plant belonging to the Refrigeration Industry and Cold Storage Co. (RICSCO).



Crude oil and natural gas extraction: Sulzer injection pumps supplied to oil fields in Saudi Arabia for increasing the crude oil production. Power requirement 15 245 kW.

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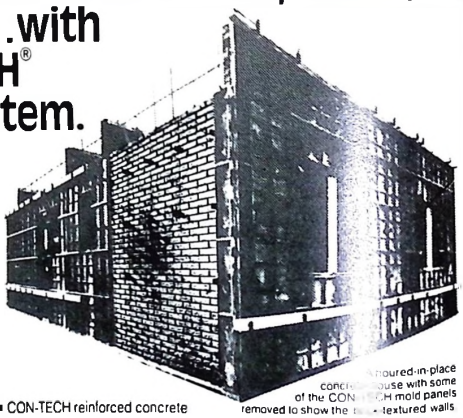

...houred-in-place concr... ...ouse with some of the CON-...CH mold panels removed to show the ...-textured walls.

Many houses can be built quickly with the CON-TECH system.

CON-TECH cast aluminum mold panels are positioned for the wall structure of an entire house. Ordinary concrete is poured into the molds and allowed to set. Then the molds are stripped away, leaving all the walls standing, ready for the roof — or another story of the structure.

A crew can normally produce a basic one-storey house structure in only 1 or 2 days, at a cost less than traditional frame or masonry construction.

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- A complete house is poured virtually all at once. No slow, costly piece-by-piece construction.
- The basic building material is ordinary concrete. No need for extensive inventories of many materials.
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- Use CON-TECH to build houses of any size or style.
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members are active in West Africa. Among them are such versatile, long established Consultants, Elektowatt and newer operators such as the architects, Burckhardt & Partners.

Current projects

Among the biggest current projects being carried out by Swiss companies in West Africa are the construction of the Benue State Federal Secretariat in Nigeria by Swiss General Contractors Nigeria Ltd. and the construction of a hospital in the Ivory Coast by a consortium comprising Bless Contractors Ltd., H. R. Schmalz Ltd. and Conrod Zschokke Ltd. This is a still at the planning stage and progress has been retarded by controversy over financing of the project.

SIA

Most of the professional bodies in the Swiss construction and civil engineering sector are members of the Swiss Contractors Association. Founded way back in 1897, the Swiss Contractors Association represents and safeguards the interests of the companies constituting the most part of the construction sector in Switzerland. The Association has some 4,400 members grouped in 15 local and regional sections which are largely autonomous consistent with the spirit of Swiss federalism. The Association also includes ten independent professional groups dealing with specific problems in various parts of the construction sector.

On an international level the Swiss Contractors' Association co-operates closely with the International European Construction Federation and with the European International Contractors. As far as overseas operations are concerned the Association makes studies of government economic and housing policies and relations with other companies and organisations working abroad, questions concerning social and labour policies of other countries, also with legal questions.

Skills

Specialist skills have made the Swiss successful in Nigeria and other overseas markets. Initially Swiss companies working abroad concentrated on hydroelectric schemes (including dams, generating stations, tunnels and penstocks). In all these types of projects they have perfected associated processes such as laying foundations, rock consolidation and using pre-stressed concrete.

Over the past few years Swiss companies abroad have extended the scope of their activities to include roads, bridges, airports, administrative and commercial building and industrial construction – in other words most types of construction, with the exception of low cost housing which Swiss companies tend to shy away from believing that they do not give them the scope to achieve the high quality which is the trademark of Swiss construction.

The Swiss have a smaller share of the market than their German speaking competitors in West Africa, the Austrian and the Germans, but then the Swiss have only been active in West Africa in any substantial numbers since 1975. Moreover, they have the advantage over their competitors of being bilingual – the francophone and anglophone markets in West Africa are still linguistically biased in business. With the continued economic bouyancy of both the Ivory Coast and Nigeria projects undertaken with the participation of Swiss engineers and contractors will increase, posing a challenge to Austrians, Germans and French!

Continued from page 47

reported.

The establishment of a major cement plant in Benue is not just an important event for the Nigerian building industry, but also an important landmark for the locality. Until the establishment of the plant there was no industry in the region. There are now 300 Nigerians working at the plant alongside ten expatriates. The plant provides therefore an important opportunity for young Nigerians living locally who are looking for employment in materials manufacturing but whom may not want to travel and leave their family to find the right job. The Benue cement project has not, however, only provided locals a chance to acquire manufacturing and management skills; in the beginning it gave many young people in the area a chance to find out about modern construction techniques for the first time thus; SGC Nigeria Ltd. responsible for a training programme which preceded the actual building stage to ensure that all workers were familiar with construction procedures.

Another aspect of training is plant maintenance. A cement production plant of the size and capacity of Benue must, if it is to operate properly, be well maintained. SGC's contract contains a maintenance clause and the consortium will be present at the factory, training Nigerias as maintenance managers, so that the latter will be ready to take over in 1981.

The second major contract to come SGC's way was awarded in June of last year. Worth ₦26m, the contract involves the building of the Benue State Secretariat. The architects are Archcon Nigeria of Kaduna in association with Norman & Dawbarn. The project is progressing satisfactorily – earthworks and site installations were completed and concreting begun in October of last year.

The future

As far as the future is concerned SGC Nigeria wants to build up its presence in Benue State. In this sense the company is affirming the government policy of stimulating industry outside Lagos and keeping to its own policy of undertaking projects above the rain forest belt – for the time being at least.

SGC certainly has a lot of confidence in the Nigerian market, even if it still displays the caution of the newcomer, anxious not to over-reach himself. Commenting on the Nigerian market scene, last year, SGC's civil engineering and general manager, Erich Uhlmann said "We believe Nigeria to be very promising economically and we expect another boom". One of the most obvious focuses for what has been called by others the mini boom is the new Federal Capital, Abuja. SGC Nigeria hopes that, having made its mark in Benue State, it can make some contribution to Abuja.

SGC Nigeria's scope and versatility make it a competent contractor in a building programme of such variety and magnitude. SGC's work is not confined to structural engineering or structural projects. Although, for the time being, SGC is not prepared to handle road building contracts, and excludes altogether low cost housing from its programme, it will undertake construction of all types of large structures such as cement plants, bridges and power plants, as well as three storey buildings, including offices, universities, hotels and hospitals, and specialist plants such as water treatment and waste incineration plants.

SGC Nigeria has its main offices on Victoria Island, but has plans to move to set up an office at Abuja.

Processing plant and equipment

Buhler-Miag Ltd. is an engineering company with headquarters in Uzwil (Switzerland) and a network of affiliated companies throughout the world. Their long-standing tradition of engineering expertise in process technologies covers fields of industry that are of importance to West Africa.

Besides the many flour mills and animal feed mills which Buhler-Miag have designed, built and installed in this area, there are several coffee and cocoa processing factories in operation in West Africa. To complete the range of this processing equipment, the manufacturer also offers up-to-date materials handling and storage systems – ship unloading equipment and storage silos for all types of grain and other materials.

In addition to these products serving the food industry, Buhler-Miag Ltd. are also suppliers to West African industry in general, with equipment for the processing of paints, soaps and detergents.

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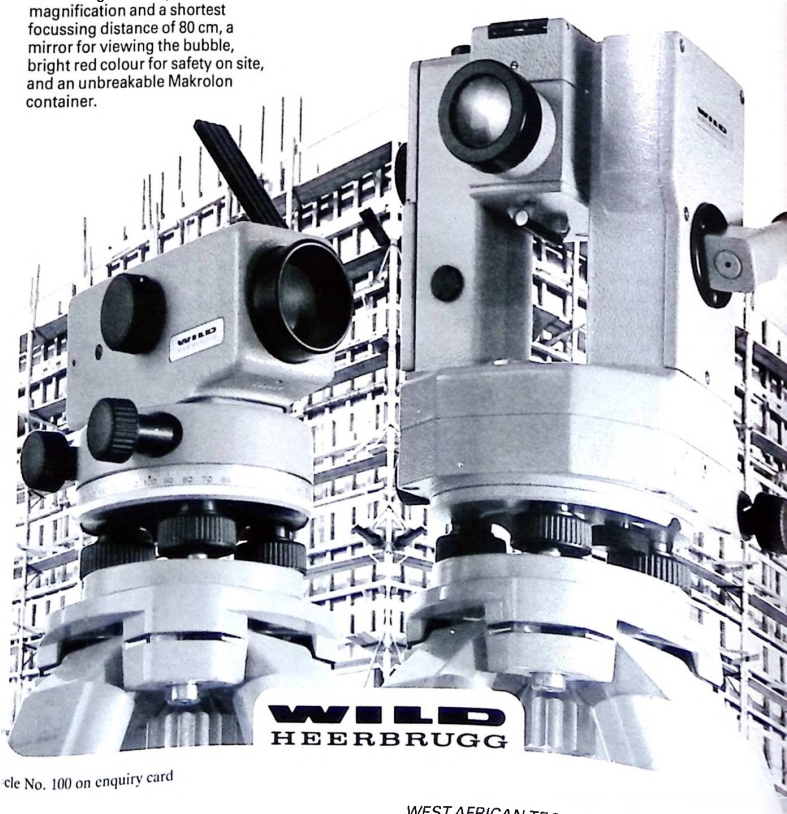


cle No. 100 on enquiry card

certainly prepared to compromise. As a highly federalised nation made up of Italian, French and German speaking people, Switzerland is itself an expression of compromise; as a neutral country it is well placed to trade with a wide variety of countries. There are other advantages of doing business with the Swiss; exporting from Switzerland is very well supported by a highly efficient banking system.

Export credit for medium or long term financing, backed up by the Swiss Federal Government's export risk guarantee is the principal lending instrument. As far as exports destined for developing countries and Eastern Bloc countries are concerned, non-recourse financing is assuming ever increasing importance. Working like the Export Credit Guarantee Department in the UK, special non-recourse financing companies buy claims resulting from shipments of goods (claims have to be made within a period of six months to five years); the exporter is then liable only for defects in merchandise delivered, and correct total of the claims – he is not liable for non-payment on the part of the importer.

Visible goods account for a substantial part of export from Switzerland, but invisible exports, such as transport services, clearing and forwarding consultancies, insurance and re-insurance, are increasing in importance. One the most controversial examples of Swiss services serving Nigeria is the Société Surveillance Générale (SGS) Inspection Services which has been monitoring imports into Nigeria aided by the notorious M form. Actually the M Form has lost a lot of its notoriety and exporters have stopped grumbling. SGS's work has been judged a success; it has done a great deal to control the abuses of the Nigerian export-import scene and generally introduce a measure of stability into the Nigerian economy.

The Swiss transportation Group, Triana, contributes considerably to invisible exports to Nigeria. Pictured here, a Triana vehicle transporting segments of pipeline to the Kaduna refinery, which was opened last year.

Joint ventures

Swiss companies have reacted enthusiastically and positively to the indignation decrees. In the construction sector companies such as BBC Nigeria Ltd., Vivid Construction Ltd., Kramer-Italo Ltd., Geodetic Surveys and Nigelex are all joint venture companies with Swiss shareholdings with an important and vigorous role to play; other companies like Roche Nigeria Ltd (pharmaceutical products) Olympic Packers (boxing plant) and Proxima Nigeria Ltd. (textile machinery distributors and agents) reflect the Swiss talent for making specialised products and machines. At the moment there are about 850 Swiss working in Nigeria all involved in making vital contributions to the infrastructural development of Nigeria. Market demand in Nigeria and the slack nature of domestic markets will ensure that economic relations between Switzerland and Nigeria will continue to expand. ●

Swiss companies active in West Africa

New Sandoz HQ in Lagos

The Nigerian dyestuffs and chemicals market is rapidly growing in sophistication and importance. Today's production methods in the textile industry are now in most cases equal to the highest European or US standards. Such an achievement is due to the Nigerian textile producers, manufacturers of machinery and equipment, and the suppliers of dyes and chemicals working in close co-operation with one another. Contacts begin with information on new fashion trends, how to produce them, and how to maintain the highest quality standards. At the same time, the search for increased productivity and safer production methods ensure that the flow of information is not one-sided; in many cases, new developments are prompted by enquiries from the market.

In a large-scale textile industry, many difficult and varied problems arise every day; in order to tackle these problems efficiently, the manufacturer must have a thorough knowledge of local conditions. It is also essential to have technical experts available on the spot, plus a network of sophisticated testing, research and development facilities.

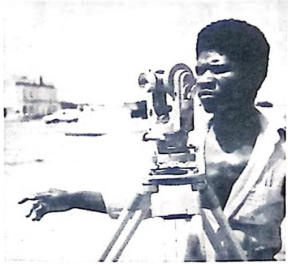
Fully aware of this interdependence of suppliers and manufacturers in Nigeria, Sandoz Limited have moved to new modern premises in Gbagada, near Ikeja. The four-acre complex now includes offices, testing laboratories, production facilities, and a spacious warehouse and efficient delivery service. The new development combines all the activities of Sandox (Nigeria) Limited in one centre, thus ensuring highest possible efficiency to the benefit of the industry served. Sandoz is demonstrating its confidence in the Nigerian economy and its willingness to accept the responsibility of a leading supplier to an important sector of the Nigerian industry.

Sandoz (Nigeria) Limited, Dyes Division, can be contacted at P.O. Box 3873, Ikeja/Lagos, Nigeria.

Accuracy perfected

Kern & Co. Limited is a Swiss company which has been manufacturing surveying instruments and drawing equipment for 160 years. Their present manufacturing programme includes levels, theolodites, reduction tachymeters, electro-optical distance meters, optical precision plummets, planetable equipment, compasses, technical pens, lettering and drawing templates, lenses for motion pictures, optical instruments for military use, and special optical equipment.

The company has recently completed making an informative film entitled



"Surveying and Water", in which the last part deals with surveying work for the construction of an irrigation system in northern Nigeria. Photogrammetry is being used in this project for the production of the topographical maps required in planning the vitally important networks.

Safety glass

Cattin machines, of La Chaux-de-Fonds, Switzerland, are manufacturers of machines which produce tempered safety glass which is used both in the motor industry and in the construction industry. The glass has extra mechanical resistance and a safety factor which causes it to shatter instantly when breaking.

Focus on U.T.C.

UTC NIGERIA LTD. was incorporated in Nigeria as a private company in August 1969 to take over the business hitherto operated by Union Trading Company Ltd. of Basel, Switzerland.

UTC commenced operations in Nigeria as far back as 1932 as general merchants and later expanded into a wider range of activity. The company now has 23 branches all over Nigeria, and through its investments and those of UTC, it has valuable links with various manufacturing organisations which include breweries, extiles, aluminium extrusion, ceramics, ar, tractor and truck assembly, car atteries and electrical supplies, services nd components. It also has in interest in al estate development, the construction dustry, and the manufacture of steel uctures, trailers and tankers.

UTC vigorously pursues its motto "to ve the industries that serve the nation" so special emphasis is given to the agriural field and rural development. The pany is well known for designing, plan- and executing turnkey projects for electricity schemes, water purification supply systems, and irrigation pro- Similarly it has supplied, installed and ained complete hospitals and health s. A newly established pilot farm agos already produces various types etables.

company is now organised into six as:

or division

the early 1930's this division has aling in various types of motor It now handles the sale and f different models of commercial

fork-lifts from Fiat and geot cars. It also rts for these vehicles as ent, generators, power tools and automotive products from Bosch; fully equipped workshops and workshop equipment from KSU.

Fiat commercial vehicles are known for the robustness of their construction and their powerful engines. They are designed to withstand the severest conditions and for all types of roads. Special vehicles featured here are the 682 truck, the 682 tipper and the 602. As for the farm tractors, UTC distribute eight models, from 64 to 115hp and also a full range of implements. There are four wheel drive options on every tractor. The various types of forklift units offer the following choice: Simplex Telescoptic, for use where overhead obstructions pose no problems; Duplex where height of lift must be combined with areas of low clearance, and finally Triplex combining minimum height of lift.

KSU designs and manufactures mobile workshops of all kinds. They build workshops trailers, workshops on truck chassis and convert vans into service vehicles to meet your individual specifications and needs.

Technical division

This division stocks machines for every line of production and processing. Together with Lister generators, Godwin irrigation pumps, Benford roadbuilding machines, Johnson outboard motors, Guilliet woodworking machines, Bühler feed mills, Schindler lifts, one could find virtually everything including fully-equipped hospital operating theatres.

The Nova range of self contained generating sets have been designed manufactured by Lister Power Pla response to customer requirements totally integrated power centre an Godwin pumps – that are used for engineering and general contra agriculture and fire fighting – are po by Lister engines.

Mobile welder

Engineering division

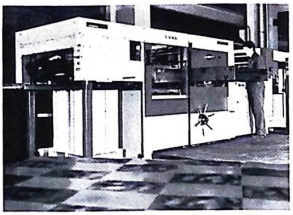
This division was established in 19 contribute to the development o country's industrial infrastructu specialises in the sale, installatio service of electric power generation, purification and sewage treatmen irrigation equipment, all with emph turkey projects. The irrigation depa sells and installs a wide range of sp and mechanical irrigation equi including that used for large proje corporating pumping plant and ground mains. Handmove irri systems can be designed to suit all t farms, crops and topography. The ment is flexible, and this versatility systems to be laid out according to quirements of the customer. Rough presents no problem for the Centr system, which offers the most co control package available, and a r control speeds to meet nearly every tion need.

Hardware division

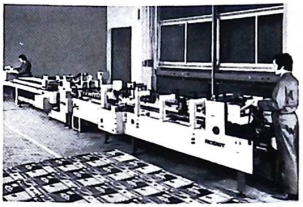
Through its 12 branches, this distributes a wide range of wood and metal working machines, hand tools, ironmongery, building sanitaryware, and industr agricultural equipment. In 19 facturing wing of the har was taken over by an asso – Nigerian Hardware In

From cardboard sheet to FOLDING BOX

As a leader in the field of machinery for converting paper, cardboard and corrugated board, Bobst is in a position to offer a wide range of equipment for almost every requirement
Bobst's technology links the Autoplaten die-cutter with the subsequent operation of the carton gluer to assist the converter in planning production from the printed sheet to the finished folding carton.



AUTOPLATEN die-cutters have enjoyed a world-wide reputation for many years for the range of packaging materials.
Built in various sheet sizes, the Autoplaten will cut, crease, emboss paper, cardboard or corrugated board.



Carton gluers are the second stage after the Autoplaten, processing conventional cartons or special packages, i.e. record covers, envelopes, pastry cartons etc.

Combined cutting and subsequent gluing lines are in operation in many countries and continue to run with complete reliability because of fine craftsmanship and a world-wide after-sales service organization. Bobst is a Swiss company exporting from the heart of Europe more than 97% of it's production. Technical assistance can be guaranteed without delay by associate companies or agencies in 80 countries around the globe.

For cutting, creasing, folding and gluing BOBST stands for outstanding technology and service.

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Street _____

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Att _____

Function _____

Please address to **BOBST SA, CH-1001 LAUSANNE (SWITZERLAND)**

Circle No. 16 on enquiry card

continued from page 56

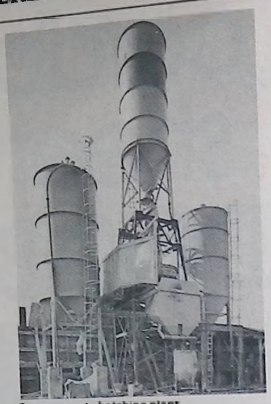
which the company provides management services. NHI manufactures, assembles, delivers and installs venetian blinds, aluminium facades, suspended ceilings, sun louvres, aluminium doors and windows, louvre windows and office partitions.

Textiles division

This division sells, amongst other materials, real handblock wax prints designed in its own design offices.

Department stores

One of the pioneers of modern and fashionable department stores in Nigeria, this division has department stores on Lagos Island and at Apapa, Surulere, Ikeja, Ibadan, Kaduna, Kano and Port Harcourt. These stores sell a wide range of goods and they have departments specialising in the best office equipment and electrical kitchen apparatus.



Brun concrete batching plant

Swiss expertise in many different fields

Cranes and concrete

Brun Engineering Company, of Nebikon, Switzerland, was one of the first Swiss enterprises to be active in the field of mechanized concrete batching. Today the company is a member of the Swiss Group and specializes chiefly in contractor's machinery and handling equipment.

Brun's manufacturing range includes hopper-fed concrete mixers for outputs from 6m³/h up to 22,5m³/h powered either by a diesel engine or electric motor to suit customers' requirements. Manually operated, semi-automatic or fully automatic dry or wet concrete batching plants with reversing drum mixers or pan-type mixers with outputs from 16m³/h up to 90m³/h as standard are also available, together with central ready-mix plants tailored to customers' needs. When designing the equipment due consideration is given to the various climatic and site conditions in which the equipment is to operate. Equipment has more than 20 years life expectation.

In addition to concrete mixers and plants, Brun's export range includes single and two-girder cranes, bridge cranes, overhead travelling stacking cranes, column and wall cranes: electric hoists on a modular assembly principle: lifting and tensioning strapes: and fire protection appliances. Within the Swiss Group, Brun can provide turn-key jobs including steel framed buildings and structures if required. A Brun technician can be made available to supervise the installation and starting of any equipment ordered, as well as the initial training of the plant personnel. As a considerable part of the equipment supplied works 24 hours a day, an after-sales spare parts division provides customers assistance in case of need.

Flexible education systems

Training is gaining more and more importance with increasing industrialisation of developing countries. Rapidly progressing technology calls for appropriate specialists. Modern manufacturing plants need trained personnel; this is a premise for economical manufacturing of quality products.

Training is not only necessary for skilled workers, but also for all management, administrative staff and, last but not least, sales executives.

It is not sufficient to provide countries on the brink of industrialisation with big new factories, equipped with the most modern technical material and machinery; it is also essential to carry out training of all personnel and mobile workshops providing for jobs in industry at all levels.

When planning training ce developing countries, Hildebrand it is vitally important to exar particular requirements of that consulting the authorities for inforn

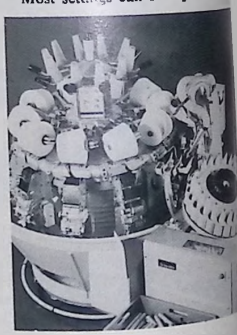
Hildebrand Engineering have a T Training Centre at Funtua, Kadur Nigeria.

Hildebrand Engineering

Schweiter-Coner CA 1

Schweiter, of Zurich, are manuf of textile equipment. Schweiter-Co capable of handling all staple fibre cotton, wool, manmades and blend count range 3m 7/1 – 170/1 (tex Equally varied are the packages cones (from 9°36′ to 3°51′ conica cylindrical packages, both of the different traverse length and diame well as chevres. CA 11 packag wound to suit particular purposes: the normal case, soft for dyeing, wa knitting cones. They are suitab warping creels, for doubling, twisting winding, weaving, for dyeing purpo as supply packages for knitting and machines.

Most settings can be adjusted cen



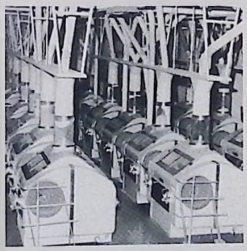
Schweiter-Coner

i.e. for all 10 winding positions tog and very quickly. This is shown changing over to a different lot of winding speed and clearer efficiency readjusted by turning a knob.

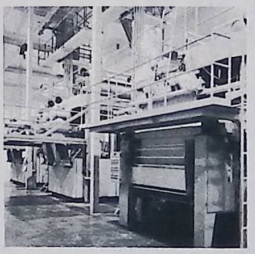
Schweiter-Coners take up very floorspace – only 0.6m² per spindle cluding attendance paths. They can up anywhere, even around pillars. Schweiter-Coners are delivered to customer as fully assembled winding and are run in with material of the ac production lot. In-plant transportation sents no problems for the mac measure only 1.6m in diameter and 1.4 tonnes. Maintenance of Schw Coners is performed in an exce efficient way. One 10-spindle unit at other is serviced successively, whic economical down time. While automatic coner receives maintenan others continue producing.

SERVING AFRICA'S FOOD INDUSTRY

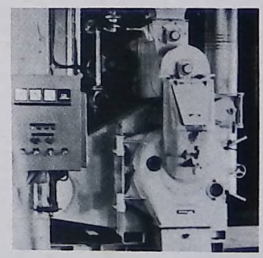
Buhler counts among the worldwide specialists in plant design. Also on the African continent there are a great number of food processing plants in operation built by us. We supply flour, rice and maize mills in every size; seed cleaning plants; pasta factories; special food manufacturing and cereals processing plants; vegetable-oil mills and animal-feed mills; malthouses and breweries; besides ship unloading and loading systems for bulk materials and general cargo as well as materials-transfer systems for ships and storage silos.



Four-roller mills grinding grain into flour or semolina



Buhler pasta extrusion presses for the manufacture of macaroni, noodles and spaghetti



In the animal feed industry, pellet mills are used for manufacturing high-density animal feeds

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Electrowatt's activities in West Africa

Electrowatt Engineering Services Limited is one of the oldest established companies in W Africa. Its activities are worldwide and extremely varied – from energy, industrial plant a structural engineering, to developments in irrigation and agriculture and environment technology. West African Technical Review takes a look at some of Electrowatt's proje

In 1976, Electrowatt Engineering Services Limited of Basle, Switzerland, were awarded a contract by the Federal Ministry of Water Resources, Lagos, Nigeria, to study the hydro-agricultural development potential of the Shemankar River Basin. The study was performed in close co-operation with the Water Resources Development Board, Jos, Plateau State, the Executing Agency on this project. A group of experts in various fields set up a base in Jos and a field office in the project area.

In order to identify the areas best suited for agriculture, rough maps were made of 300,000ha of land and semi-detailed ones of 10,000ha by means of inspections and ground profiles. Further surveys were made by agronomists, sociologists and engineers. Test bores at three likely dam sites provided initial data; available topographical maps were supplemented by aerial surveys and photogrammetry. Irrigation experts evaluated different irrigation methods and system layouts in order to find the most suitable.

These studies led to the proposed scheme for the irrigation of about 4,000ha of land. Four dams will store the water for four separate irrigated areas.

Dansak scheme

Work is in progress on the design drawings and tender documents for the Dansak scheme, which will be the first stage of development of intensive, irrigated agriculture in the Shemankar Basin. The engineering works will consist of a retention dam on the Dansak River; a diversion weir on the Shemankar River and a link canal to transfer water from the Shemankar River to the reservoir created by Dansak Dam; and a network of canals, pipelines and pumping stations to distribute water supplies to the irrigation service areas below the dam.

Those areas irrigated by gravity flow from the dam (about 6,700ha) will support rice crops; the remaining 1,700ha will be irrigated by sprinkler for the cultivation of maize and miscellaneous crops. The estimated cost of this project is US$51 m

Senega

Irrigation is the central factor in a agricultural scheme in which Electrow involved in West Africa. The Ni Basin in Se gal is the area selected project to develop the cultivation o crops, par larly rice, with the enabling Se al to reduce rice impo to contrib to self-sufficiency longer ter Electrowatt is pro special stu for development Basin, and ning an experimen demonstrat scheme for rice growi

The com y is also taking pa transport st within a very large p to ease nav ation of the Senegal which is at p sent navigable for o months of the year. It is hoped th making the river navigable through year, further development of agro and its dependent industries will be e aged.

continued on p

Soil preparation in the Upper Shemankar Valley.

continued from page 60

Hotels

With the development of the tourist trade and the large number of foreign businessmen now visiting parts of West Africa, the need for high-class hotels of international standard increases all the time. Electrowatt has been given the job of designing and putting into operation a 300-room hotel and conference centre in the provincial capital of Jos. The fact that the new capital of Abuja is in this vicinity holds out good future prospects for the hotel.

In 1978 the Gongola State Government commissioned Electrowatt to design a 200-room hotel in Yola, to find a hotel chain with an international reputation to operate it, and to take on the overall project management and site supervision. This is quite a challenge considering the additional difficulties to be overcome, such as those of communications, co-ordination, transport, manpower, and so on.

Companies involved in the later stages of projects initially put into operation by Electrowatt have many of their problems reduced thanks to detailed and professional studies made at the planning stage. ●

Above: artist's impression of the planned hotel in Jos. Below: interviewing a farmer.

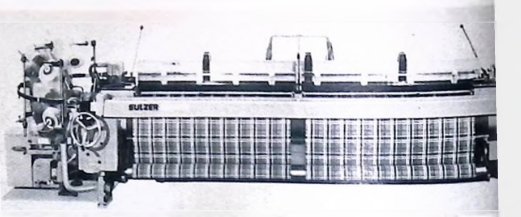
Sulzer in Nigeria

THE SULZER company and its affiliates are based in Winterthur, Switzerland. Their wide range of manufacture includes textile machinery, diesel engines, water turbines, gas turbines, process engineering equipment, refrigerator systems – in particular for cold stores and breweries, boiler plants, pumps, compressors, paper machinery and locomotives. These are the areas in which the Sulzer group will be particularly involved in Nigeria: a new company, registered under the name of Sulzer Nigeria Limited, has been founded there under the management of Mr Jean-Claude Godel, who was a Sulzer agent in the region for many years.

West African Technical Review takes a look at a few of the products and projects now being manufactured and carried out by Sulzer and by Escher Wyss, a member of the Sulzer group.

Sulzer Exports to Nigeria

For many years the Sulzer Group has maintained close relations with the Nigerian economy. The Swiss company supplies machinery and equipment for various industrial undertakings in Nigeria. Some 500 Sulzer weaving machines are operating in the textile mills of Lagos. For the Nigerian National Shipping Line Ltd., diesel engines of the RND76M type have been supplied, while stationary diesel engines are operating successfully in the Lagos University Teaching Hospital. Paper machines from Escher Wyss, Ravensburg – a Sulzer Group company – are installed in the paper mills at Jwopin and Jebba. An Escher Wyss salt washing machine has been operating since 1975 for the National Salt Company of Nigeria Ltd., (Nascon), Ogun State, supplying the most up-to-date industrial equipment the Swiss company is helping to establish a technologically advanced domestic industry in Nigeria, and furthering the country's economic progress.



Sulzer four-colour weaving machine equipped with a dobby.

Turbines for Jebba river power station

The National Electric Power Authority (NEPA), Nigeria, has commissioned Escher Wyss to supply 6 vertical propeller turbines, each with a runner diameter of 7.1m and an output of 102mW at a head of 30m. The river power station designed by the Montreal Engineering Company Ltd. (Canada) is to be built on the river Niger near Jebba, about 400km north of Lagos. It is scheduled for commissioning in 1982/3 and will improve the regional power supplies.

New testing magnet

The fabrication of intricate components, such as those for reactors, calls also for magnetic-powder inspection of the welded-in nozzles. Sulzer has developed an encapsulated electromagnet for such inspections.

This testing magnet, with adjustable supports and a hand grip at the side, is specially suited for the crack detecting of welded-in nozzles of magnetic materials. The new appliance has already proven its worth in the testing of reactor components like pressure vessels, pressurizers, and coolant pipework.

Pusher centrifuges with increased capacity

Escher Wyss has introduced a new type of pusher centrifuge with greatly increased performance into the market. The machine class is new type separator, for example, up to 55t/h crystalline KCl from the mother liquor at the "Marie" potassium mine near Staffelfelden, France.

Escher Wyss offers a comprehensive programme of machines for the whole field of mechanical separation of solids from liquids. The company has many years experience in the dewatering of crystalline and granular bulk products with centrifuges and the subsequent drying processes in fluid beds.

Treating soya beans in fluid beds.

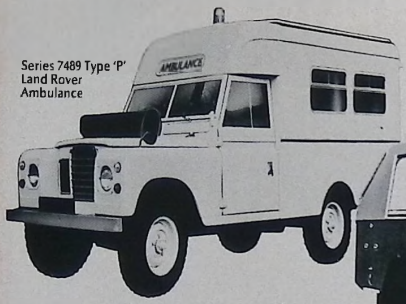
Processing plants for the foodstuff industry

Escher Wyss Limited engineers and builds drying, cooling and conditioning plants for foodstuffs derived from soya products. Treatment of soya beans, groundnuts or cocoa beans, for example, in fluidised bed not only facilitates a considerable improvement in the product behaviour but also in the product quality in the subsequent processing stages, such as sieving or shelling, pressing and extraction.

These plants are designed and built to meet the respective characteristics of the product. Ancillary equipment includes complete air treatment as well as exhaust air and control systems.

Pilcher-Greene

ambulances and fire appliand for specialist needs



Series 7489 Type 'P' Land Rover Ambulance

'Branbridge' Mark V8-engined Fire A

'Branbridge' Mark III Fire Appliance

Range Rover Type 'CS' Ambulance

Dodge 50 Fire Appliance

Bedford CF Dual Purpose Ambulance

Pilcher-Greene have over 50 years' experience designing and manufacturing ambulances and othe purpose-built vehicles, and are also the leading Brit exporters with some 90% of total production going customers outside the UK.

Our range of 4-wheel drive ambulances offers a wide choice of models, Land Rover or Range Rover based, with interior layouts which can be adapted to requirements.

Other Pilcher-Greene vehicles include a wide ra of 2-wheel drive ambulances and welfare vehicles. also build models to individual specification.

The 'Branbridge' range of fire appliances is base Land Rover chassis, and all are now available with th new V8 engine. Designed specifically for use against inaccessible to larger appliances, in difficult terrain where space is limited, the three models give a choi cab and equipment stowage to meet your needs. Ou Dodge 50 and Jeep-based appliances offer greater firefighting capability.

Let us put our experience to your use – with the vehicle for the job.

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Enquiries: General Supply and Distribution Agency Ltd, PO Box 1435, Kaduna, Niger

Circle No. 78 on enquiry card

DAF Commercial Vehicle

In 5.7m-wheelbase form the N2800 is intended primarily for tipper/dumptruck duties.

With its new N-series heavy three-axled chassis the Dutch company DAF Trucks fills a significant gap in its range of export models – a move which is expected to help DAF increase its market penetration in all weight sectors. Alan Bunting reports.

IN MARKETS like those in West Africa, European truck manufacturers depend heavily for their success on being able to offer a complete range of models. The big user, operating trucks of all weights, sizes and types can then simplify his spares and service arrangements. There is a counter argument of course, about putting all the eggs in one basket. But on balance, a manufacturer like Mercedes-Benz or Fiat, offering small vans and trucks of 1 tonne capacity or less, right the way up to heavy-haulage machinery carrier tractors able to gross 100 tonne or more, is in a strong marketing position.

Specialisation

However, there are many specialised transport concerns who run heavy trucks only. And their requirements are adequately met by those truck builders who concentrate on the upper end of the weight scale. DAF is one such company. (Others include Volvo and Scania from Sweden and Steyr from Austria).

Obviously, the "broad range" manufacturers are in no way inhibited about competing for the "heavy-only" operator's custom; DAF faces competition in export markets from a dozen or more rivals. Most of those rivals have in their ranges the kind of chassis which find particular favour in West Africa: heavy-duty units of a bonneted (as opposed to forward-control or "cab-over") configuration.

I have spelled out before in these pages the benefits of a bonneted layout. But it does no harm to recap. Many drivers feel safer with 2 metres or so of machinery "between them and the accident". In forest areas (and bonnets are almost universal for timber haulage trucks) such an attitude makes sense. Collision with a hefty tree can make a mess of a forward-control cab's crewspace.

Keeping the engine away from the crew also reduces heat and noise for the occupants. And there is more room for additional crew; up to four people can be accommodated fairly comfortably in the cab of the new DAFs.

A six-wheeler with a non-driven front axle is also less likely to become bogged down as the front end sinks into soft ground, whether mud or sand, if the truck is of bonneted form. This applies particularly where gross overloading occurs.

To start with, DAF is offering its N2800 bonneted heavies only in 6 by 4 form. The company's sales and marketing director David Mansell says the market research programme which preceded the development programme indicated that the extra traction capability of a 6 by 6 was rarely needed in practice. It seems likely anyway that the bonneted double-drive DAFs could become the basis for specialist all-wheel-drive conversions, particularly by Dutch companies like Ginaf and Terberg.

Because DAF had no existing bonneted cab suitable for heavies in the 32 tonne solo gross weight category, the company has gone to a competitor for one. The N-series cab shells are being purchased from Magirus-Deutz (now a subsidiary of Fiat). From the side and rear the DAF N2800 trucks look like their well-established Magirus equivalents. However the distinctive glass-reinforced plastics bonnet, which is being moulded for DAF by a Norwegian supplier, makes the newcomers

Continued

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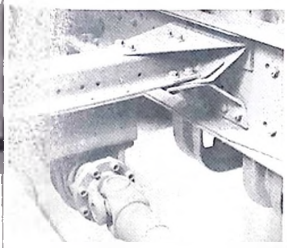
DELT

Circle No. 61 on enquiry card

readily identifiable from the front. The forward-tilting bonnet affords excellent access for maintenance and repair to the 11.6 litre DAF diesel engine which powers the latest 6 by 4 chassis. A pair of simple toggle catches secures the bonnet in its lowered position.

Two versions of the 11.6 litre engine are listed in the N2800 chassis. One is a straightforward naturally-aspirated unit developing 230bhp (DIN) at 2200rpm, the other a turbocharged and aftercooled derivative producing 320bhp. Both are well-proven power units which currently power DAF's heaviest forward-control F2800 trucks.

In answer to criticism that the air-air aftercooler (or charge-cooler) fitted in front of the vehicle's main radiator is vulnerable to damage in dumptruck or forestry transport applications, DAF says it intends to fit a high "camel catcher" grid-type front bumper on N2800s with the 320bhp engine. I should explain perhaps that a



Unusual crossmember attachment on the new F2100/F2300 forward-control export.

punctured aftercooler would mean insufficient air being drawn into the engine for the quantity of fuel injected. An ultra rich mixture would result, with black exhaust smoke and a severe fall-away in performance. Such damage could also allow unfiltered air into the engine. With this in mind, DAF fits an elaborate two-stage air filter to cope with a dust-laden atmosphere: a cyclone type in series with a conventional twin-element filter.

Drive from the engine is taken via a German ZF Ecosplit gearbox. The Ecosplit is an all-syncromesh design, readily handled, says DAF, by less-experienced drivers. There are eight main forward speeds plus an auxiliary splitter, making 16 ratios in all; bottom gear is 17.3 to 1 – low enough to cope with exceptionally high all-up weights. The 320bhp N2800 when supplied for use as an articulated tractor, is rated at 56 tonne gross. The 230bhp option brings that rating down to 42 tonne. As a solo 6 by 4 dumptruck or general-purpose heavy-duty machine, the latest DAFs have a 32 tonne gross rating.

I should hasten to add however that these weight ratings are purely nominal. The designers have recognised the fact that in many markets, particularly when working off the public highway, overloading is taken for granted. Mr Mansell points out that many users take the gvw to be the acceptable payload!

Accordingly, chassis frame strength calculations on the N2800 six-wheelers have been made on the basis of dumptruck body capacities up to 18cum on the long (5.7m)-wheelbase version. Other potential overload applications include tankers of up to 20,500 litres capacity general cargo bodywork up to 6.7m long and concrete mixers of up to 8cum.

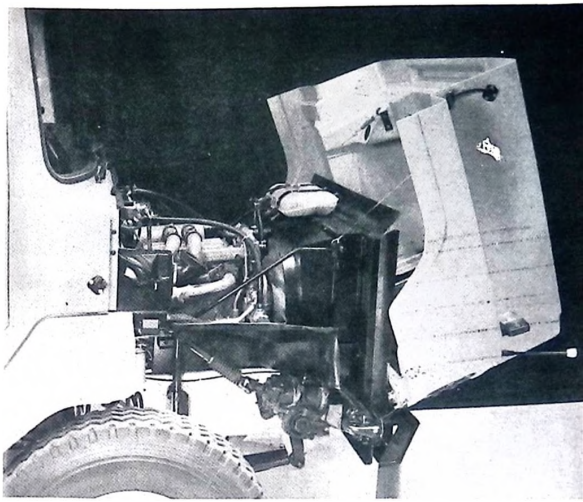
With such use (or abuse) in mind, DAF's designers set out to produce a chassis that put strength and ruggedness above the unladen weight considerations which in European and North American markets are vital if a truck is to be competitive.

Inside the main 310mm-deep, 9mm-thick channel-section frame longitudinals, DAF incorporates what amounts to a second frame: a 5mm-thick inner "sleeve", extending over practically the entire length of the chassis. Crossmembers are of top-hat section, with so-called saddle attachments to the longitudinals, giving the optimum degree of torsional flexibility.

As DAF had no sufficiently heavy-duty double-drive bogie in its existing range, the company "shopped around" for a suitable design and eventually settled on the Austrian Steyr 2698T assembly. It is purchased from Steyr as a complete bogie-and-suspension. The hub-reduction 13 tonne (nominal rating) axles each have a cross differential lock and the inter-axle diff is also lockable. The two-spring suspension allows high angles of articulation on rough ground; the springs are slipper-ended, axle location being the job of six radius rods.

Much of the tropical-climate development work on the new DAFs was done in the Ivory Coast, where the Dutch company enjoys a significant share of the heavy on-road truck market already. It is hoped that the N2800 will now give DAF an entree into other West African markets.

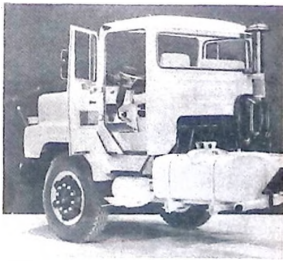
As well as launching the bonneted N-series DAF has also introduced new heav duty export versions of its forward-cont F2100/f2300 chassis. They differ fr existing European market F-series mod in having reinforced frames: chan "sleeves" at strategic points on three-ax models, top and bottom flange strip fitt



Forward-tilting bonnet affords easy access to the DAF 11.6-litre diesel engine.

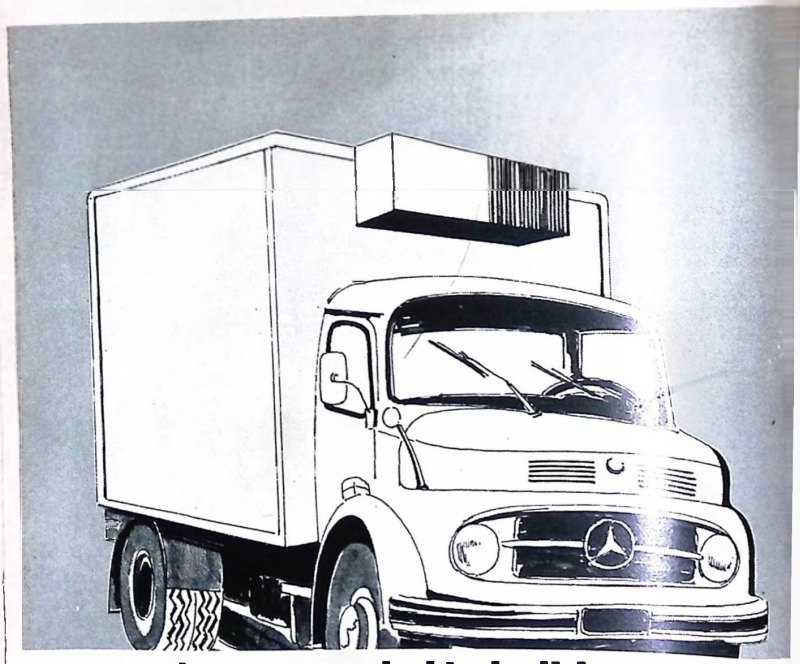
ing on two-axled chassis. The same type o crossmember as the N2800's has also bee adopted.

Auxiliaries like fuel tanks, air reservoir and batteries are relocated to giv improved ground clearance. Fuel tan capacity up to 525 litres can be specified 24in Trilex wheels are listed as option where ground clearance is expecially critical.



From this angle the Magirus ancestry is apparent.

The F2100/F2300 export chassis are powered by DAF's 8.25 litre diesel engine, either in 163bhp naturally-aspirated or 230bhp turbocharged/aftercooled form. Tropical climate engine specification includes elaborate air filtering (like the N2800's) and a large oil cooler. A cross differential lock is standard in the four-wheelers, and an inter-axle diff-lock (but no cross locks) in the 6 by 4s.



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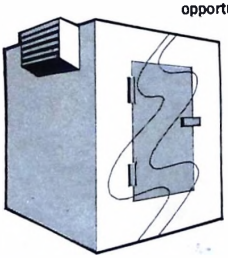

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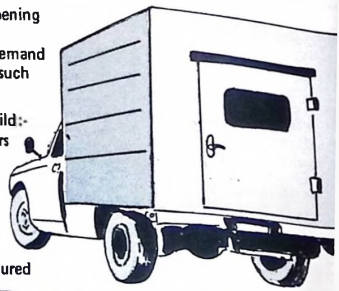

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Fluidised bed combustion

Dr. Israel Berkovitch examines a process, already widely used in various chemical industries, which is being modified and developed.

THERE ARE several advantages if coal – or other fuel – is burnt in what are called "fluidised" or sometimes "fluid" beds. First let us look at the concept of these beds. In Fig 1, the left column shows a pile (or "bed") of sand resting on a mesh. I call it S for a stationary bed. The right column shows what happens when air is blown through the bed at a sufficiently high rate. The whole bed is agitated and begins to

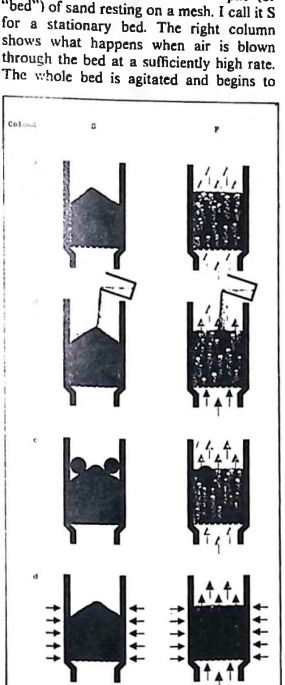


Fig. 1. Fluidisation of solids (NCB)

look like a boiling liquid. So this column is called F for fluid bed. Although it consists of solid particles, in many respects, the fluid bed starts to behave like a liquid.

The lower three pairs of diagrams illustrate this.

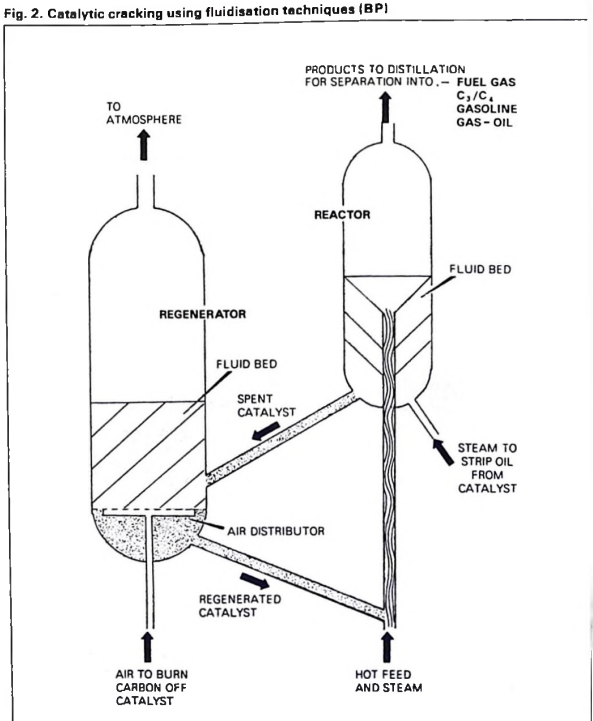
If you pour on to the bed a second solid also consisting of particles, like ground-up coal, this rests on the top of the stationary bed (b) in the S column. But it quickly gets mixed in to the fluid bed as shown under F. Then, if you put two bigger balls of different density on to the beds as shown in example (c), the stationary beds simply supports them on its surface; on the other hand, the fluid bed F, just like a liquid, lets the heavy one sink and the light one float. Finally, in the last illustration, (d), if the side arrows are heat flowing in, this heat flows slowly through a stationary bed S, so that there are big differences in temperature between the edges and the centre of the bed. But the fluid bed is very uniform in temperature due to the rapid mixing of the bed.

Where has the fluid bed been used? It has been applied in a number of process industries for chemical conversions but it has been most widely used in the petroleum industry for catalytic cracking, breaking down heavy distillates from petroleum into fuel gas, gasoline, gas oil and chemical products. Catalyst in the form of small particles is carried by the hot vapours of the heavy distillates mixed with steam into a fluid bed where the distillates are chemically broken down. During this reaction the catalyst gets coated with carbon. So used catalyst is made to flow, still in the fluidised condition, to another chamber called the regenerator where the carbon is burnt off. Then this regenerated catalyst, still fluidised, flows back into the ho stream of heavy distillate vapour and is re used. So, in this case, fluidisation is applied in two chemical reactions and also to re cycle the catalyst continuously. (Fig. 2)

How can this process be made tc improve the combustion of coal? When this approach is applied to burning of coal, the coal is fed in to a hot bed of particles which have already been heated by burning gas. The bed may consist of coal ash or silica sand and it is fluidised by a stream of air. Buried within the bed are tubes with water passing through them. The coal very quickly gets mixed into the bed and burnt. It produces heat at a high rate, but this heat is also removed very quickly, distributed through the bed and then through the tube walls to the water. The ash produced by the coal is removed at such a rate that the volume of the bed stays constant.

continued on page 75

Fig. 2. Catalytic cracking using fluidisation techniques (BP)



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continued from page 73

Usually the amount of unburnt coal in the bed at any one time may range between 0.5 and 5 per cent. The bed is operated so that its temperature is in the region between 750 and 950°c. This has several advantages. When coal is burnt at higher temperatures its ash is liable to begin to melt (or "sinter") and become tacky causing sticking to metal parts, alkali chlorides are liable to volatilize and attack cooler metal parts, and oxides of nitrogen may be formed polluting the environment. All these harmful effects are eliminated by the lower temperature for combustion.

There are further assets.

● the rapid rates of transferring heat mean that a given size of boiler can provide more heat than a conventional one, or alternatively that a specified heat requirement can be met with a smaller (and cheaper) boiler;

● combustion is little affected by the coal type, ash content or moisture. So a great variety of coals, including low grade, high ash coal formerly dumped as waste, can be burnt successfully;

● automatic controls can be readily applied and the control is more precise than in other methods of burning coal since in this case, the coal flows like a liquid and the bed temperature is so uniform;

● the sulphur dioxide that is formed during combustion from the sulphur can be "fixed" in the bed by adding limestone or dolomite which react with it forming solids which are removed with the ash and therefore do not escape to pollute the atmosphere.

All this has been well-established by pilot plants in the laboratory and then by relatively small industrial boiler installations. Fig 3 shows the essential features. To test the potential for much larger-scale application, a commercial-scale plant has been built at Grimethorpe near Barnsley, in the UK, operated by the National Coal Board, supervised and financed by the USA, West Germany and the UK. It operates under pressures of between 6 and 12 atmospheres. This gives yet a further advantage by resulting in improved heat transfer and even higher ratings for a given size of plant. Maximum output is 80mW of heat and the coal is crushed to a size maximum of between 6 and 1.5mm.

Through various industrial partnership arrangements, the Coal Board offers consultany advice in the design and building of fluid bed plants throughout the world. The Grimethorpe test facility is of course an advanced design which will provide steam for generating electricity and at a later stage also provide hot flue gas for gas turbines so that it will then work in a combined cycle of higher efficiency. It is now starting three years of working trials.

New Developments

This is an advanced system, only slowly being introduced into the major industrial countries but already new ideas are being tried out to make further improvements. For example if air is blown through the bed much faster, the particles in it are blown out and they are in a condition between that of the fluid bed and pneumatic transport. Dr. L. Reh of Lurgi says this further improves the advantages that have been listed above for efficiency of combustion and improving heat transfer. The particles of course must be trapped in a cyclone and returned to the combustion chamber. So

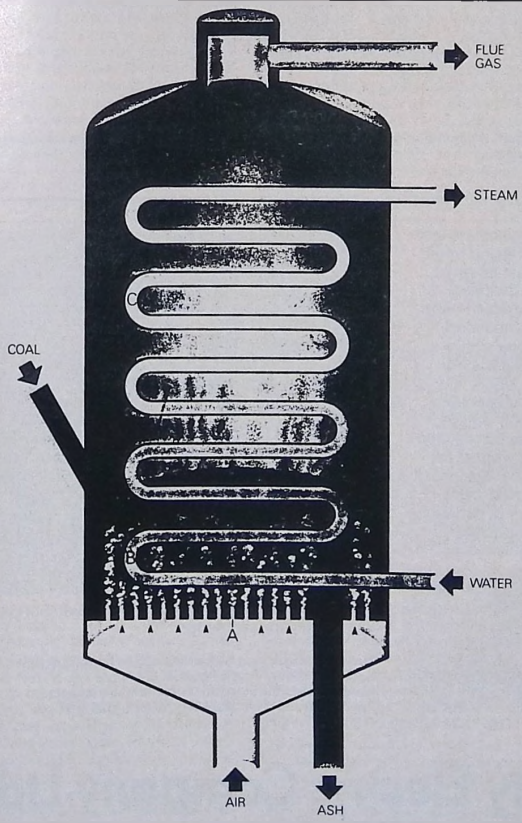

Fig. 3.

Features of a fluidised bed boiler

Fluidised bed boilers can operate at atmospheric or at raised pressure and have these essential features:

Distribution plate through which air is blown for fluidising (A).

Immersed steam-raising or water-heating tubes which extract heat directly from the bed (B).

Tubes above the bed which extract heat from the hot combustion gas before it enters the flue (C).

continued from page 73

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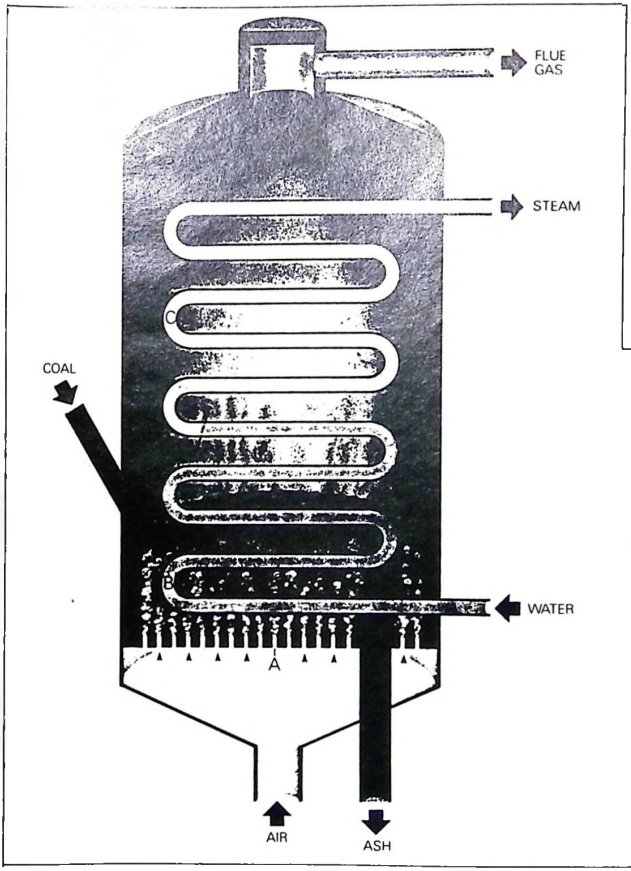

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Frozen Food Industry

The development of a frozen food industry is greatly to be encouraged as apart from the benefits of greater enjoyment of nutritious food it can act as a new impetus to farmers and others and provide rewarding employment to all involved. The efforts and initial costs of developing such an industry may be great but may be amply repaid in time in increased prosperity. This – the first of a series of articles regarding the operation of a frozen food industry – deals with many general aspects and basic considerations.

IN MANY [illegible] the benefits of frozen food are [illegible] and keenly appreciated, [illegible] for the enormous growth of [illegible] food industry over a decade or [illegible] in many countries may be [illegible] briefly: traditional foods [illegible] convenient, easier-to-cook and more appealing form; foods obtainable throughout the year that were previously only available during the comparatively short season of harvest; foods that are produced at a considerable distance – even overseas – in a fresh condition not previously attained; a wide variety of ready-to-cook foods that obviate any preparation at home, but are ready for instant cooking and serving; additional economies result from bulk buying and fewer journeys to supermarkets and shops to buy food.

In some countries such benefits are enjoyed by the great majority of people; in others by a comparatively small number at the upper end of the income bracket; but in practically all countries the market in due course becomes ever wider due to industrialisation, opportunities for better-paid jobs and other factors so that items of food once considered luxuries tend to appear more and more frequently on the table. Also, as in the case of all products, the greater the market becomes, the lower the costs of production and distribution so that considerable reductions in price may be possible.

In some tropical countries where food is more prone to be impaired by the warmth of the climate or to be contaminated by disease-bearing flies and other insects, frozen foods provide an additional benefit that is beyond price: having been packaged and frozen as soon as they have been prepared, and kept in a frozen state until served, they are unaffected by climate or insects and remain clean, fresh and uncontaminated. Also it happens fortunately that quick-freezing is especially suitable for preserving meat, poultry and fish, which are rich in protein, an essential in a well-balanced diet.

It must be stressed that because all operations in a frozen food industry have to be highly co-ordinated for greatest efficiency in operation, it is necessary for there to be within the country primarily a comprehensive and reliable infrastructure – including an adequate and well-maintained system of roads to permit rapid transport, an ample and safe water supply, a reliable public electricity supply and the availability of labour that is efficient, conscientious and dependable and easily trained. If in some regions these services are lacking, the situation may be improved, for instance by the provision of a base-load or stand-by generator for supply of electricity and by the sinking of boreholes for water; and a suitable labour force may be built up by incentives and the attractions of higher wages and a better life.

Pre-fabricated cold store.

How frozen foods started

Some of the benefits of frozen food have been known for many years – even for centuries to the Eskimos in the polar regions. But the frozen food industry owes its origins to an American named Clarence Birdseye, who was a biologist, trapper and

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How frozen foods started

Some of the benefits of frozen food have been known for many years – even for centuries to the Eskimos in the polar regions. But the frozen food industry owes its origins to an American named Clarence Birdseye, who was a biologist, trapper and inventor. He was on a hunting expedition in the frozen wastes of Labrador towards the end of the First World War, and he found that the bodies of fish that had been caught and caribou that had been hunted and killed, and left in the open air, froze very rapidly in the intense cold; and having been frozen for months and then thawed, they still tasted fresh and tender.

Birdseye realised that he had made an important discovery, and though the process of refrigeration had been discovered this was not suitable for quick-freezing which is necessary to preserve meat properly and is only possible if the food is divided into small portions, allowing the heat to be rapidly extracted. But in about 1929 Birdseye began to freeze food rapidly in small consumer-size packets, in a plate freezer of a type that is still in use today. In so doing he laid the foundations of the frozen food industry, which has grown to such large proportions.

Quick-freezing and refrigeration

There is a basic difference between refrigeration and quick-freezing – with the emphasis on "quick". Food contains a large quantity of water in which is dissolved a considerable amount of mineral salts and protein; when the food is refrigerated the temperature is not lowered to freezing point, but nevertheless the cold slows down the growth of micro-organisms so that the food remains safe for a time. But in freezing, as implied, the water in the food freezes, though this takes place slightly below the normal freezing point of water (0° Centigrade or 32° Fahrenheit) due to the presence of the dissolved substances. If freezing occurs too slowly, however, there are likely to be unfavourable mixings of the various mineral salts as these become concentrated in the remaining water.

For several complex reasons, therefore, it is vitally important for the temperature to pass as quickly as possible through the range at which ice is formed within the food. Hence the description of the process as "quick freezing". At the low temperature the micro-organisms have almost

ceased to function and so the food remains safe and when thawed is unimpaired in colour, texture and taste so that it is barely indistinguishable from completely fresh food.

Of course, quick-freezing is not the only method of preserving foods. For many years methods of saturating the foods in liquids such as brine, vinegar or sugar syrup were used. As is known, spoilage by micro-organisms can also be prevented by heating the food, and if afterwards the food is packed in a sterile and sealed container such as a jar or a metal can it will keep in good condition for long periods. The method of dehydration to preserve food is also used extensively to make it less attractive to micro-organisms which need moisture for their survival. Several methods of dehydration have been evolved to preserve various types of food, and to restore them to their original form water has to be added.

These methods are very successful and in wide use but quick-freezing is an improvement in that it has virtually no effect on the flavour, texture, colour and nutritional value of the food and the food when unfrozen more closely resembles the best fresh specimens of a variety of foods.

The cold chain

In order that quick-frozen foods shall retain their quality and appeal right until they are served at table, it is obviously necessary that they are stored and transported under the correct conditions and the temperature never allowed to rise above an acceptable level. This is attained in practice by a system which has become known as the "cold chain", which exists right from the freezing plant to the home of the consumer.

The desirable conditions to be attained and maintained throughout the cold chain are described in detail in a highly practical and informative booklet produced by the **UK Association of Frozen Food Producers** (1 Green Street, Grosvenor Square, London W1Y 3RG), entitled UKAFFP Code of Recommended Practice for the Handling of Quick Frozen Foods. The booklet first makes recommendations regarding raw materials, processing and quick freezing and the primary cold stores to which the produce is transferred immediately after quick freezing and stored possibly for months. Then it describes transport in bulk by a trunk transport system to secondary or distribution cold stores, and the conditions required in the trunk delivery vehicles are described together with the means by which they are achieved. Then consideration is given to the conditions relating to the secondary cold stores which is virtually a depot where products are stored for a shorter period until they are delivered to supermarkets or shops by radial distribution vehicles.

These vehicles differ from those used for trunk transport in that they usually carry a smaller quantity of the products for a shorter run, during which stops may be frequent, and consequently the construction of the vehicles differ as do the methods of maintaining cold conditions. The display and storage of quick frozen food in retail premises is dealt with as is the storage of such foods in the home. Additionally, reference is made to packaging, handling methods, measurement of temperatures as well as safeguards to be taken against failure of the main electricity supplies.

Co-operation of farmers

It is important to stress that in practice the successful operation of a quick-frozen food industry goes back considerably further than the beginning of the cold chain; in fact, it commences with the cultivation of the crop or the rearing of the animals that the farmer will send to the factory to be converted into frozen food.

In most regions it is desirable that maximum opportunities and encouragement be given to small farmers because so many people normally live and work in rural communities and do not always utilise marketing opportunities. To enable a farmer to operate fully towards the development of a quick-frozen food industry, every effort should be made for him to be supplied with adequate supplies of seed, grain and fertiliser when required, and in all cases close supervision will be required to ensure he makes the fullest use of them.

The development of a frozen food industry can be of great benefit in many kinds of farming. In cattle raising it can greatly increase the market for meat, an extra appeal of quick-frozen food being that it consists of only lean meat and no bone. Close attention must be paid to the health and welfare of the livestock and every effort must be made to eradic tsetse fly by aerial spraying and biolog control and by the provision of suita vaccines for common livestock disea and epidemics. Every facility a encouragement must be given to the ca breeder to enable him to get his animal the market quickly, safely and without l drance.

Pig breeding can also benefit fron frozen food industry as there is a w demand for the various types of meat p ducts from pigs. It is essential, of cou that the pigs receive adequate food supplementary materials – that is, the

Peas being carried along a cushion of icy air through a freezing tunnel and fr individually.

quantities of the foodstuffs supplied and livered must be actually fed to the anir and not diverted elsewhere. Great op tunities are afforded to the poultry bre by a frozen food industry as chic appeals to a wide section of the c munity.

In many countries the frozen industry has grown to great size due to numerous attractions of the final prod But the provision of adequate quantitie fish is dependent on the existence of s cient suitable fishing craft and availab of all auxiliary equipment and mate including power units, fuel and lubrica oils as well as nets and hooks. The plant quick freezing should preferably be v close to the landing jetty and the fish m be conveyed there with minimum of de and under suitable cold conditions. stands to reason that there must be av able adequate skilled manpower for all processes and operations involved, incl ing maintenance of plant, and close sup vision may be necessary.

The advantages of air-cooled diesel engines in hot climates

With air-cooled diesel engines which can provide power outputs from 2 to 370kW (3 to 500hp), **Deutz Engines Limited,** the UK subsidiary of the parent company KHD, has the largest available range of air-cooled power units in the world. There are engines to suit all types of industrial applications, from a low horsepower one-cylinder naturally aspirated vertical engine, to the exhaust-turbo-charged and water-cooled 12-cylinder V unit for portable power unit for hydraulic pump or welding set, to the fully enclosed power-unit for construction site; and of course engines for trucks, private motors, and inshore boats.

Air-cooled engines have a number of worthwhile advantages in hot climates over those cooled by water. The most obvious point is that since no cooling fluids are required, there are no radiators, pumps, thermostats and hoses to cause the well known problems of leaks and blockages. The high velocity of cooling air on air-cooled engines prevents the formation of dust deposits which could reduce the cooling efficiency. Also, the arrangement of the cooling air and the fins on the cylinders and cylinder heads, is such that air-bags cannot occur and thus, nor can dust deposits. In the hot, dusty atmosphere on say a construction site, the radiators of water-cooled engines are liable to clogging by dust.

Air-cooled engines are not as affected by either high temperature or by a change in those temperatures as are water-cooled engines. This is because the temperature of their cooling surface is about 70°C higher than that of water-cooled engines and, therefore, the performance of an air-cooled engine will remain constant despite environmental temperature changes.

The amount of cooling air required by an air-cooled engine is actually between 35 and 50 per cent less than that required by a water-cooled engine. Since the air requirement is less, it follows that the air-supply and exhaust cooling air ducts can also be between 35 and 50 per cent smaller than on water-cooled engines. This is a decisive advantage where mobility is required or silent working is essential, since the unit can be installed in a sound-proof enclosure.

An air-cooled engine will quickly reach its optimum working temperature and can thus start work almost immediately. The fast warm-up period, besides allowing work to start straight away, reduces the effects of cylinder wall condensation, thus avoiding the problem of high wear rates due to "cold" corrosion.

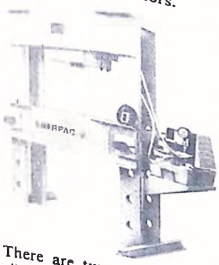
The Deutz range of air-cooled engines is built in families around a modular parts concept. This means that all the engines in a particular family share many common parts. Typically, cylinders, heads, pistons, and bearings are common to all the family and allow for interchangeability of up to 75 per cent of parts. This enables the user to rationalise his stock of spares and thus save some money. The modular design concept, which allows an individual cyclinder to be removed without disturbing its companions, also means easier access to a fewer number of parts, and leads to a faster completion of servicing. Consequently, air-cooled diesel engines can be back at work much faster.

Two types of combustion system are offered, the more conventional direct injection system which is widely applicable for all outside equipment; and the optional two-stage combustion, which, by burning the fuel/air mixture twice in the special cylinder head, reduces the exhaust emission to an exceptionally low level. This is therefore suitable for use, for instance, in underground mines, warehouses, etc.

Mini genetract

The mini genetract, an electric tractor driven generator, is a new product from **Ringrose Electrical Co., Ltd.,** It has been designed and built to meet the demand for power requirements of a small farm, nursery or a small holding.

It has many applications. It can be used for a contractor's plant, demonstration and service vehicles, for farms and horticultural services, as a power source for lighting, heating, electric motors power tools, refrigeration plants, welding, plants etc., It can be installed permanently in a shed, garage or building. For portable use, a specially designed chassis is available with category I or II mounting to fit all tractors.



There are two basic models available: R/5/15 KVA output single-phase 50 cycles; R/6/36.25kVA output three-phase 50 cycles. Genetract alternatives are constructed in accordance with BS 2613 and are self-exciting, self-regulating, fan ventilated, drip proof with heavy duty bearings. This type of alternator is suitable for all kinds of applications and requires minimal maintenance. The construction is compact, with good wave form and suitability impregnated for use in tropical climates.

Hydraulic press

Enerpac announces a new 200-tonne, H-frame hydraulic press (BHP-20253) with fixed head and adjustable bed . . . ideal for high-speed production punching and pressing operations, as well as for maintenance applications.

The cylinder is a double-acting, solid plunger design model, featuring built-in safety valve to protect cylinder from overpressuring and bro- plated plunger to improve loading resistance and to longer life. The cylinder h- stroke of 330m and a diameter of 133mm.

Remotely controllable po is provided by a two-st electric pump featuring au matic operation, built-in o load safety valve, extern located relief valve, and a no level rating of less than decibles. Upon request, ot power units are also availa An optional Program Con Centre is offered for press au mation.

Pipe and tube cutt

The new Ridgid no. Plastic Pipe and Tube Cutte the latest addition to the fan of pipe and tube work products manufactured by **Ridge Tool Company,** s sidiary of Emerson Elec Company.

The 138 is designed to through a wide variety plastic, rubber, neopre vinyle-type hose, and pipe tubing quickly and accurat making it ideal for use in industrial, electrical, au motive, marine, and plumbi applications. Its capacity ran from $\frac{1}{8}$in to $1\frac{1}{4}$in (3 to 38m and assures fast, clean cuts t can be joined threaded, cemented to assure positi leak-free fits on non-metal pipe or tubing material.

The 138 cutter delive strong cutting strength with simple one-hand operation. T light-weight aluminium housi includes a safety blade gua and a spring-loaded bla return latch to provide for sa storage.

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

Sewage treatment

A compact easy-to-install sewage treatment system offered by **Clearway Systems Ltd** is built on modular lines, enabling it to cater for the needs of communities ranging from 20 to 25,000 people. It is claimed to require only 15 to 20 per cent of the space required by trickling filter systems of equivalent capacity and to operate on 10 to 15 per cent of the energy requirements of conventional extended aeration systems.

Called Bio-cel, the system is designed to operate automatically with little maintenance of sufficient. It consists of single [illegible] contained biological treatment plants installed [illegible] ground level with only the unobtrusive 200mm high plastics cover visible above ground, enabling the system to be used in residential locations. Being completely enclosed, the units also operate silently, are odourless

and do no attract flies. The smallest unit is 2.5m long × 1.5m wide x 1.7m deep and can process sewage from a group of 20 to 36 people; the largest measures 6.7m long × 2.3m wide × 2.4m deep and treats sewage from communities of up to 750 people. The modular design concept enables any number of additional units to be installed as and when required to keep pace with the needs of a growing community.

Each unit arrives on site completely assembled, ready for connection to electrical and drainage or other services and its low weight-to-size ratio eliminates the need for deep excavations or heavy foundations. The corrosion-resistant oblong steel treatment tank incorporates a biological filter pack consisting of a series of 1.2m or 2m diameter rotating plastic discs which support the aerobic bacteria responsible for the biological reduction of the sewage or other effluent. The discs are assembled in the form of a continuous spiral on a motor-driven horizontal shaft positioned at a level which allows some 40 per cent of the area of each disc to be exposed above the effluent level in the tank. Bacteria on the discs are thus alternately submerged in the effluent and exposed to the air as the discs rotate. The continuous spiralling motion of the discs, aided by gravity flow, drives the effluent from the inlet end of the tank to the outlet end, while ensuring uninterrupted contact between effluent and bacteria on the disc surfaces. The spiral disc configuration achieves biological oxygen demand (b.o.d.) loadings of 16g/m² of disc surface – nearly double those obtainable on conventional separate plate disc systems, the makers say.

Suspended solids in the biologically treated effluent are physically removed by an automatically initiated and controlled drum filter consisting of a perforated drum over which a filter cloth is attached. Effluent passes through the cloth to the inside of the drum from where it is discharged via an outlet pipe, leaving solids trapped on the surface of the cloth. They are removed by a low power pump operating via a cleaning head which extends over the full width of the drum and then recirculated to the primary tank for settling and eventual removal. The filter cloth is normally changed every 15 to 18 months.

Treated effluent leaving the tank can be used for sub-soil irrigation as an alternative to other forms of disposal. In areas of water scarcity the system can be extended to improve the final effluent for re-use as flushing or washing water. The primary settlement tank used with the system can be either constructed locally or supplied in pre-fabricated form by the firm.

"Dustcatcher" floor mats

The mats are intended to hold down dust and contaminants in clean rooms, semiconductor and computer installations, chemical and pharmaceutical plants, hospital surgery rooms, avionics and military decontaminated areas – or any other facility where a dust-free atmosphere is vital.

The PTS mats, produced by **Spirig/Switzerland**, have almost the same adhesive feel as pressure tape, but they offer one major advantage: any soils collected from shoe soles, equipment or atmospheric settling are easily washed off with a damp mop and a slight detergent solution. As soon as squeezed dry, clean PTS mats revert right back to their original tackiness. Once down on the floor, regular mopping is all that is needed to keep the mats functional.

Because the mats have an elastomeric base, their resilience permits carts and other vehicles to be wheeled over them without causing permanent indentation. Even high unit-pressures from wheels cause no identation or lasting damage to the PTS mats. On the other hand, peel-off paper-type floor mats reduce the functional area that can effectively pick up soils from shoes. Once grooved, all sheets stay deformed until a new pad is installed.

Rail guide wheel system

The **Gradall Division** recently announced the availability of an improved rail guide

For further information please circle appropriate number on card fac

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Constructed in heavy gauge stainless steel with easily removable strainers, units are produced with four or five headers with jets for all sizes of wide-necked bottles and with optional pre-rinse section. All units can be adapted to customer's individual requirements.

Drive motor is ½h.p. and two 2h.p. centrifugal pumps are incorporated. Total water consumption is 270 litres (60 gal.) per hour or 900 litres (200 gal.) per hour when a pre-rinse section is added. Steam consumption is 12.5kg (180lbs) per hour.

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All feature ratchet headgears, but can be equally supplied with Sellstrom's "Pipe-Liner" headgear for welding overhead or in other unusual positions.

For further information, contact **Union Trading Company of Nigeria, Ltd., 26 Wharf Street, P.M. Box 1010, Apapa, Nigeria**

Pipe & cable locator

A new and more versatile version of the Radiodetection GPR 404 pipe and cable locator has been launched by manufacturers, **Electrolocation Ltd. of Bristol.** The new all-purpose GPR instrument is claimed to offer 5 detection modes, to be lighter and easier to handle, and to include as standard equipment many previously optional features and accessories, including USG "Boost", and a remote earth connector.

Applications for the new Radiodetection GPR 404 are said to include: sweeping a site for buried utility lines, tracing buried metal pipes and cables, tracing non-metallic pipes, drains and sewers and pinpointing blockages, locating "lost" manhole and valve covers, estimating the depth of utility services, pinpointing water leaks as small as 300 galls/hour, cable identification, cable fault location, electromagnetic pipe-wrap evaluation, general sub-surface survey work.

The new GPR 404 employs twin-coil search antenna system. The receiver has two "search" modes, useful for "sweeping" an area for buried utility lines. In one of these, the receiver detects the 50/60Hz energy present on power cables and nearby metal pipes. In the other, the FR mode, the receiver picks up the radio transmission signals normally re-radiated by mains power and telecommunications cables and continuous metal pipes.

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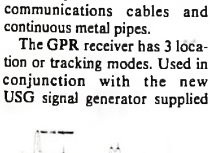

as standard equipment, the receiver will detect USG signals applied to metallic services either directly or by induction from the surface. The USG signal frequency can be either 3.2kHz or 22kHz depending on ground conditions and location requirements. Used together with any of a range of 5 different radio transmitter probes the receiver will also accurately track non-metallic drains and pipes and pinpoint blockages and water leaks.

The new GPR 404 can be supplied with a wide variety of optional accessories, including extra probes, specialist signal injection and earthing equipment and 3 alternative antenna attachments. Previously optional equipment now supplied as standard includes a "boost" (increased signal strength) feature on the USG signal generator, a 100 metre remote earth cable and reel plus rechargeable batteries charger.

Komatsu forklift trucks

With consolidation of 5 and 6-ton types, Komatsu lift trucks offer higher p specifications to meet div fied user needs.

FD50(5 nd FD60(6 powered b rect injection- Komatsu 95 diesel eng FD50H 60H di injection-ty suzu 6BB1 engines of S , and FG5 60 78-PS line engines providing owerful, s work.

The lifting ed of the ranges from nm/s (FG 360mm/s (FD H, FD50 maximum t elling s ranges from 5 to 28 (forward) and to 27.5 (reverse). The ximum l height is 3m bu the use high mast allows stable wo to 5m for the 5-t type and 4.5m for the 6-t type with reduced load. A mast of view (Free View Mast) c equipped.

Lift truck

An entirely new wide mast and carriage, design give optimum direct for vision combined with good peral vision for safe wor with attachments, has introduced by **Bonser Engi ing Limited of Glltbro** Nottingham, for its LS5 rough terrain lift truck. driver has a virtually obscured view of the end o truck's lowered fork and edge of wide attachments.

Available in duplex form lift heights of up to (6096mm), good visibi through the mast has achieved by positioning displacement lift-rams out the mast rails, and the hydra service hoses along the rout the lift chains.

A full free lift of 8 (220mm) is available on all heights for ease manoeuvrability in areas restricted headroom and overall design of the mast such that there is minimum of load centre.

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Sewage treatment

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Called Biospiral, the system is designed to operate automatically with little maintenance and supervision. It consists of one or more self-contained biological treatment plants installed below ground level with only an unobtrusive 20cm high plastics cover visible above ground, enabling the system to be used in residential locations. Being completely enclosed, the units also operate silently, are odourless

and do no attract flies. The smallest unit is 2.5m long × 1.5m wide × 1.7m deep and can process sewage from a group of 20 to 36 people; the largest measures 6.7m long × 2.3m wide × 2.4m deep and treats sewage from communities of up to 750 people. The modular design concept enables any number of additional units to be installed as and when required to keep pace with the needs of a growing community.

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Rail guide wheel system

The **Gradall Division** recently announced the availability of an improved rail guide wheel system for models G-440 WE and G-660 WE "wide frame" Gradall excavators. The "wide frame" undercarriage features improved balance and stability, streamlined design and center-mounted cab.

The addition of two pairs of railroad guide wheels to the standard G-440 WE or G-660 WE adapts the Gradall hydraulic excavator to rail travel. Steel guide wheels are mounted on hydraulically operated frames which permit the wheels to be lowered for rail travel and retracted for normal road travel. The guide wheel frames are welded to both the front and rear of the "wide frame" carrier. Guide wheels have positive pin locks in both up and down positions. The controls for the guide wheels are located on the front and rear sets of rail wheel frames. There are an electric switch and hydraulic valve to raise or lower the wheels.

Traction for travel and braking on the rail is provided by the inside rear dual tires. When traveling on the rails the Gradall can be driven forward or backwards from either the carrier cab or the upper-structure cab. It will travel forward from carrier engine up to 20 miles an hour on the rails and up to 55 miles per hour on the expressway.

The front guide wheels oscillate for travel on the track. Oscillation locks automatically when brakes are applied in remote mode for digging, and unlock when remote brakes are released.

The rail guide wheel system allows the G-440 WE or G-660 WE to travel over-the-rails for right-of-way maintenance. It is ideal equipment for cleaning and shaping drainage ditches as well as grading and building up roadbed. Dirt, brush, rock, vegetation and abandoned ties are cleared.

Gradall hydraulic excavators are also used to repair railroad grade crossings. With telescoping boom and tilt, they easily excavate and lo asphalt, planks, treated timbe ballast and rip-rap.

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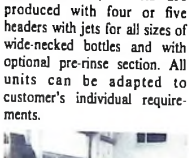

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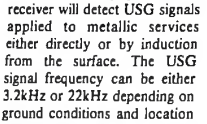
The new GPR 404 employs twin-coil search antenna system. The receiver has two "search" modes, useful for "sweeping" an area for buried utility lines. In one of these, the receiver detects the 50/60Hz energy present on power cables and nearby metal pipes. In the other, the FR mode, the receiver picks up the radio transmission signals normally re-radiated by mains power and telecommunications cables and continuous metal pipes.

The GPR receiver has 3 location or tracking modes. Used in conjunction with the new USG signal generator supplied



as standard equipment, the receiver will detect USG signals applied to metallic services either directly or by induction from the surface. The USG signal frequency can be either 3.2kHz or 22kHz depending on ground conditions and location requirements. Used together with any of a range of 5 different radio transmitter probes the receiver will also accurately track non-metallic drains and pipes and pinpoint blockages and water leaks.

The new GPR 404 can be supplied with a wide variety of optional accessories, including extra probes, specialist signal injection and earthing equipment and 3 alternative antenna attachments. Previously optional equipment now supplied as standard includes a "boost" (increased signal strength) feature on the USG signal generator, a 100 metre remote earth cable and reel plus rechargeable batteries and charger.

Komatsu forklift trucks

With consolidation of 5- and 6-ton types, Komatsu fo lift trucks offer higher po specifications to meet dive fied user needs.

FD50(5t) and FD60(6t) powered by direct injection-t Komatsu 4D10 diesel engi FD50H and 60H dir injection-type Is u 6BB1 di engines of 80PS nd FG50 60 78-PS gasol engines, providing a p erful, stu work.

The lifting sp of the fo ranges from 340 /s (FG6(360mm/s (FD50 FD50). T maximum trav ing sp ranges from 25. o 28kr (forward) and 25 27.5kr (reverse). The max um lift height is 3m but, t e use o high mast allows sta le work to 5m for the 5-t typ and up 4.5m for the 6-t type withou reduced load. A mas of be view (Free View Mast) can equipped.

Lift truck

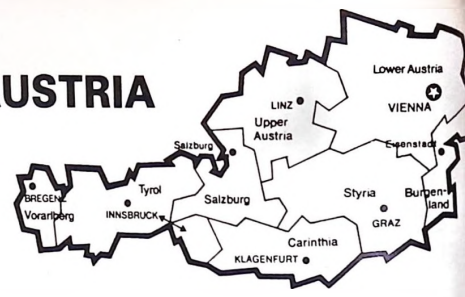
An entirely new wide vi mast and carriage, designed give optimum direct forwa vision combined with good pe pheral vision for safe worki with attachments, has bee introduced by **Bonser Enginee ing Limited of Giltbroo** Nottingham, for its LS55S rough terrain lift truck. Th driver has a virtually un obscured view of the end of th truck's lowered fork and th edge of wide attachments.

Available in duplex form wit lift heights of up to 20f (6096mm), good visibility through the mast has bee achieved by positioning th displacement lift-rams outside the mast rails, and the hydraulic service hoses along the route of the lift chains.

A full free lift of 8½in (220mm) is available on all lift heights for ease of manoeuvrability in areas of restricted headroom and the overall design of the mast is such that there is minimum loss of load centre.

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

AT THE KADUNA INTERNATIONAL TRADE FAIR 1981



AUSTRIA AT A GLANCE – FACTS AND FIGURE

Form of government: democratic federal republic, consisting of nine federal provinces (Burgenland, Carinthia, Lower Austria, Salzburg, Styria, Tyrol, Upper Austria, Vienna and Vorarlberg).

Population: 7.5 million.
Population density: 90 people per sq. km.

Area: 83,849sq.km.

Federal capital: Vienna (population: 1.6 million).

Currency:
Austrian Schilling (AS)
June 1980: US$1=AS12.58
June 1980: Naira 1 =AS21.95.

National product (current prices)

	1978	*1979*
	AS billion	
Gross domestic product (GDP)	836,5	914,3
GDP per capita (AS)	(111.409	121.853)
Private consumption	468,5	510,9
Public consumption	154,7	165,5
Gross domestic fixed capital formation	209,4	228,3
National income	612,8	676,0
National income per capita (AS)	(81.615	90.094)
Imports*	294,9	346,5
Exports*	295,2	335,7

	Annual rates of change in % at constant prices	
GDP	1,0	5,1
Private consumption	−2,2	4,7
Public consumption	3,5	3,0
Gross domestic fixed capital formation	−4,7	4,2
Imports*	−1,4	11,1
Exports*	6,1	9,1

*Including the errors and omissions of the balance of payments added to the foreign balance.

Labour market

	1978	*1979*
	in 1.000	
Working population as a percentage of total population (1979):		appr. 44%
Employees as a percentage of working population (1979):		appr. 84%
Employees	2.758	2.774
of which employed in industry	623	623
Unemployment rate	2,1	2,0

Prices

	1978	*1979*
	Annual rate of change in %	
Consumer prices †1976=100	3,6	3,7
Wholesale prices †1976=100	1,0	4,2
Import prices	1,1	5,7
export prices	1,3	4,2

IMPORTANT ADDRESSES

In Nigeria
Austrian Embassy:
Western House, 8-10 Broad Street, Block "A", 11th floor, Lagos, POB 1914, Telephone: 63 76 05, 63 66 01, Telex: 21285, TelAdr: Austroamb.
Office of the Commercial Counsellor at the Austrian Embassy:
Western House, 8-10 Broad Street, 7th floor, Lagos, POB 1217, Telephone: 63 68 27/28, Telex: 21285, Cable: Austrotrad Lagos.

In Austria
Embassy of Nigeria:
1030 Vienna, Ungargasse 46, POB 262, Telephone: 72 66 85/87, Telex: 131583, Cable: Nigerianemb Vienna.
Afro-Asian Institute in Vienna:
1090 Vienna, Türkenstrasse 3, Telephone: 34 46 25.

Balance of payments

	1978
	AS billion
Goods: exports	276,1
Goods: imports	331,9
Trade balance	−50,7
Tourism	32,9
Services, net	30,5
Current balance	−0,3
Capital balance	−3,1
Official currency reserves	3,1

Austria's major trading partners (1979)

	Imports	*Exports*
	Shares in %	
EC countries	64,1	
COMECON countries	8,8	
EFTA	8,4	
US + Canada	3,6	

Austria's foreign trade with Nigeria (1979)

AS million	*Imports*	*Exports*
Total	1.090,0	8
The most important commodity groups:		
Food	48,6	
Crude materials	1,9	
Mineral fuels, lubricants and related materials	1.038,2	
Chemicals	—	
Manufactured goods	0,2	25
Machinery and transport equipment	1,0	50
Miscellaneous manufacturers	—	4

Banking industry:

Market shares in % – 1979	*Total assets*	*Credits*	*Total deposits*
Savings banks incl. GZ	24,8	25,9	31,0
Joint stock banks	34,3	26,9	21,1
Raiffeisenkassen*	17,3	16,5	20,5
Volksbanken†	5,1	5,5	7,2
Provincial mortgage banks	5,4	9,8	2,3
Others	13,1	15,4	17,9
	100,0	100,0	100,0

*Agricultural banking co-operatives.
†Trade banking co-operatives.

Austria at the Kaduna International Trade Fair 1981

THE THIRD Kaduna International Trade Fair, this very ambitious new event on the West African commercial scene, forthcoming in mid-February, will itself host a "newcomer": although with regard to Austria, the country we are going to talk about, this expression is true in a very limited sense only. It will be her first appearance at this fair, however, as far as the people of Nigeria is concerned, Austria's foreign trade can proudly look back at more than twenty years of experience. Needless to mention that she is going to make her début at the Kaduna Fair as impressive as can be, with a large official group exhibit comprising some twenty companies, as well as the individual pavilion of Messrs. Steyr Nigeria Ltd, this most prestigious result of Austro-Nigerian industrial partnership. With such massive presence – and the trade balance figures only confirm the overall impression – it may not be deemed inappropriate on the eve of the fair to reflect on the development of Austro-Nigerian trade relations.

After two world wars which, apart from their devastating effects presented a threat to Austria's very existence as a state, the country's economy had to start virtually from the scratch. What happened then until the late fifties was a development which her wealthier and more powerful neighbours tend to refer to, with a subtly envious undertone as the "Austrian miracle". Thus Austria's recovery and hence her growing interest in overseas trade relations coincided somehow with Nigeria's stepping into independence. So, at a time when Nigerians began to take commercial activities into their own hands, Austria was ready and prepared to venture into this West African market. The beginning was fairly modest, with a small-scale exchange of goods and the establishment of a Trade Department by the Austrian Federal Economic Chamber at the Austrian Embassy in Lagos. Although during the sixties the trade volume between the two countries did not show any significant increase, this formative period was none the less important. It helped to create an atmosphere of mutual understanding by getting to know each other.

But then, in the early seventies cash began to flow into Nigeria from her oil-wells, thus raising her purchasing potential and enabling her to embark on diversified commercial and industrial projects as well as infrastructural development and communication facilities. There, amongst the giants of the industrialised world, both of East and West, vying in bigger and better offers, little Austria quietly stepped up her activities despite overwhelming competition, beating others here and there by greater flexibility and individual service. Indeed, so well did she that by 1976 her exports to Nigeria rose to an impressive ₦81.8 Mio. With the subsequent restrictions imposed by the Nigerian Military Government on imports of various consumer goods this figure naturally had to come down as it happened in other cases as well. Yet, in Austria it was quickly understood that this measure was really designed to channel funds into other directions: development projects and long-term investments that would eventually turn out profitable business. Nowadays Austrian businessmen are again to be found travelling up and down Nigeria, presenting themselves under a new image: as partners and suppliers of technical know-how rather than as simple salesmen.

As a business partner, Austria has always had a certain attraction for Nigeria. For here was a small country, politically neutral and able to dictate her own policy within the framework of international relations. Combined with it are the rich potential of a fully industrialised nation plus domestic stability. Even at times of worldwide economic recession Austria managed to raise her industrial growth rate and to maintain full employment. Her present Gross National Product of A.S. 915 Bill. (₦40 Bill.) compared to A.S. 107 Bill. in 1955 (₦4.6 Bill.) which works out to a nominal GNP of A.S. 121,000 (₦5.260) per capita, as well as her low inflation rate (3.7 per cent in 1980) put Austria well above the OECD average. Five per cent of her earnings come from the primary sector (agriculture and forestry), compared to 46 per cent from the secondary sector (industry, commerce, power).

Within the tertiary sector tourism contributes a remarkable 8 per cent, another 23 per cent resulting from exports. With a relatively small domestic market foreign trade is of vital importance to the country's economy and is therefore being given top-level attention. Austria's biggest trading partner is the Federal Republic of Germany, followed by Italy, Switzerland and the United Kingdom. Trade with East Bloc countries figures prominently, too. Altogether, trade with European countries makes up 83.7 per cent of her imports and 85.2 per cent of her exports. In the African trade, Nigeria is now heading the list accounting for a third of Austria's imports and a quarter of her exports for the whole continent. Within the first ten months of 1980 Nigerian exports to Austria rose by 49 per cent (₦55 Mill.), Austria's exports to Nigeria by 179 per cent (₦81 Mill.).

Finished goods, both in the consumer and capital sectors make up 63 per cent of Austria's total exports, followed by 24 per cent semi-manufactured goods, with raw materials and energy standing at 10 per cent and foodstuffs at 4 per cent. A breakdown of Austria's exports to Nigeria, for instance, direct or through joint ventures and consultancy services, pictures the scope of possibilities which this trading partner has on offer. Whether in the transport and vehicle industry, electrical engineering equipment and material processing machinery, or in the construction field (steel plants, power stations, irrigation systems, hotels, hospitals, etc.), or in the supply of various consultancy services, Austrian companies have proved their efficiency and have gained repute for the quality of their products. The Austrian group exhibit at the Kaduna Fair will present a typical cross-section of her industrial performance.

Since healthy trade relations only work with two-way traffic, Austria is equally interested in exploring new sources of supply. As far as Nigeria is concerned, oil and cocoa form the bulk of her exports to Austria and are in fact responsible for her favourable trade balance. The Nigeria exhibition at the last Vienna International Trade Fair drew attention to her agricultural products and handicraft articles.

G. A. Richter, The Commercial Counsellor, Austrian Embassy, Lagos.

THE COMMERCIAL COUNSELLOR

Mr G. A. Richter
Austrian Embassy, Lagos

Mr G. A. RICHTER is the Commercial Counsellor at the Austrian Embassy in Lagos.

He has been in this service for the past 14 years, and enjoyed postings to Denmark, Japan, Great Britain, Indonesia before coming to Lagos in early 1978. The Heads of these Commercial Sections or Trade Commissioners (in cases where the Commercial Department is not attached to the Embassy) usually serve sometimes up to 8–10 years in a country allowing thus a thorough knowledge of the markets concerned as well as the possibilities in building up long-lasting business contacts.

But the Austrian system differs considerably from that of other countries whose foreign trade and economic interests are being looked after by governmental representatives mostly attached to the diplomatic missions.

It is 30 years now, since the Foreign Trade Organisation of the Austrian Federal Economic Chamber came into existence. At the end of 1946 four Austrian Trade Commissioners and six Honorary Delegates were operating in ten countries.

Today it is a network of 84 offices (32 in Europe, 17 in North and South America, 14 in Africa, 19 in Asia and one in Australia) which serves some 4,000 Austrian exporters, who can contact directly both the trade representatives abroad or the area desk officials in Vienna.

They fulfil a variety of indispensable functions for small- and medium-sized firms, from alerting them to sales opportunities to finding agents for them to give advice about how to secure export credit guarantees. What is particularly important is the long period these specialists spend in their areas. While diplomats usually stay two or three years in a country, Austrian trade representatives usually spend up to eight to ten years in one place, thus providing Austrian exporters with an intimate knowledge of the business structure and easy access to the decision-makers. The more backward or more dictatorial the country is, the more indispensable the trade delegates become for a businessman coming from distant Austria.

Without red tape and diplomatic protocol, the trade delegates act as representatives of the economy and as highly qualified service outfits for businessmen. They can of course rely on the assistance of the Ministry of Trade when trade agreements are negotiated with the countries where they are on duty.

Every week almost 7,000 Austrian companies receive a weekly foreign trade news bulletin from the Chamber. If they express interest, they also receive free of charge regular market reports and studies as well as a comprehensive report, revised annually, giving essential information about 150 countries. A new computerised information and data system stores 23,000 product headings supplied by 5,000 Austrian exporters and 2,300 importers from Austria.

This year, the Economic Chamber has further expanded its activities aimed at helping small and medium-sized firms, from alerting them to sales opportunities to finding agents for them to give advice about how to secure export credit guarantees. What is particularly important is the long period these specialists spend in their areas. While diplomats usually stay two or three years in a country, Austrian trade representatives usually spend up to eight to ten years in one place, thus providing Austrian exporters with an intimate knowledge

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This year, the Economic Chamber has further expanded its activities aimed at helping small and medium-sized companies in the increasingly sharp competition in foreign markets. Thus the Chamb now provides up to 50 per cent of the co for a market research study provided c tain conditions are met. The Chamb itself, or more precisely its speciali including trade delegates transferred ho after a tour of duty abroad, will increa the number of market reports provided companies. If at least five companies co bine forces and dispatch a salesm abroad, the Chamber can pay up to 50 p cent of the travel expenses. The forei language publication serving export pro tions can receive per company and y annum a subsidy equal to 2,000 pound Other measures involve help for cover the costs of interpreters and copyi machines as well as the dispatch of te nicians and engineers to fairs, provid these do not take place in neighbouri countries.

In general all these activities are be taken in close co-operation with the Co mercial Counsellors (or Trade Comm sioners) in order to foster the relations w the respective trading partners. It is t instrument which contribu largely to success Austrian business can enjoy the Nigerian market.

Since the commencement of the tra relations between the two countries almo 17 years ago the pace of economic operations has increased considerably. 1979 Nigeria became the fourth bigg Austrian export market overseas with trade volume of Naira 95 Mio, then t Austrian exports amounted to Naira Mio.

In the early stages the main pattern Austro-Nigerian economic relations w the bilateral exchange of goods especia in the consumer field. Later on this w followed up by Austrian exports of hea machinery and capital goods, like ele trical and hospital equipment, turbine printing, wood and paper processin plastic extrusion machinery as well as turn key projects. The joint Austro-Germa steel-plant in Warri is the latest achiev ment.

It is worthwhile mentioning that Au trian activities are not only confined to th supply and supervision of the above men tioned goods and plants but that they hav spread considerably in the field of joint ventures with Nigerian partners. Apar from the biggest undertaking in this direc tion, a truck assembly plant in Banch which went into production in July last year. Austrian-Nigerian joint-venture already exist or are being considered in the fields of textiles, electrical equipment, furniture, building, iron and steel and stationery industries.

Furthermore Austrian consultants are active in the Nigerian pipeline-, cement-mining, airport- and hotel industry.

Mr Richter is optimistic about the result of these efforts. "Iam convinced that these continued efforts in fostering the bilateral economic co-operation between Nigerian and Austrian business partners will bear fruits and enhance the two-way flow of know-how, services and goods to the benefit of both countries".

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The Steyr-Puch "Pinzgauer" is absolutely tops in the field of all-terrain vehicle engineering: extreme cross-country mobility, which can only be surpassed by tracked vehicles, a lively road speed of up to 120 km/hour, high useful-load capacity in combination with a low deadweight, ease of operation, the front-wheel drive, the all-terrain gear reduction and the differential locks (100%) in both axles can all be engaged on the go. It is available as a 4x4- and 6x6-model in various styles and options.

World champion rifles are not created overnight. They are the proud result of a long and superb tradition of engineering – a tradition, to be precise, which goes back all the way to the year 1864. It is since then that the name Steyr has been a synonym for precision rifles. Today Steyr turns out what is by far the most advanced military rifle, viz the "Army Universal Gun" (AUG). The interchangeable barrel, its short overall length and an optical sighting system that has been integrated into the carrying handle are the special characteristics of this weapon. In addition Steyr also manufactures a submachine gun and a sniping rifle of internationally unsurpassed precision, a 9-mm automatic pistol is currently in preparation.

Steyr has been an iron- and steelworking centre for 500 years. For more than half a century Steyr has also engaged in the manufacture of automotive vehicles and in their constant technical development and improvement. It is small wonder, therefore, that the Steyr-"Kürassier" Tank Destroyer has time and again proved to be the winner in toughest competitive tests both in Austria and abroad. Its narrow design breadth, high fire power, excellent manoeuvrability also in rough terrain and its top speed of 68 km/hour convince even hard-boiled experts.

Steyr-Daimler-Puch AG

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World-Wide Success through Innovation

STARTING FROM Austria, the LD-process (VOEST), and as an advanced development the continuous casting process have provided a new basis for steel manufacturers the world over. Still today, turbines for river power stations used in all countries of the earth are built in accordance with the principle of the Austrian Kaplan. The advanced development of the modern tube turbine would have hardly been possible without Kaplan's pioneering invention. Innovation in Austria, the transposition of a new, independent idea into practical commercial utilisation, is not aimed at securing fleeting success but proceeds on the solid basis of an old and reliable tradition. The procreator of an idea has at disposal the relatively firm ground of research promotion offered by the research promotion fund of trade and industry.

But innovation is not confined between limits neither as this is not just a sphere large-scale enterprises may afford. In practice, cases have become known where a single creative plant operator was able to score considerable results with the assistance of one sole test engineer. As an indicator it may be taken for granted that 50 per cent of all research expenditures occur in companies employing less than 3,000 persons. Although about 40 well-equipped co-operative research institutes are not concerned with product development proper for competitive reasons, they provide, however, solutions to numerous preliminary problems which on account of research cost could not be tackled by small and medium-sized companies all by themselves.

So, for instance, problems arising in the field of processing and material application are in many cases solved in common for a whole line of industry. To the numerous specific tasks set belong for example applied research in the sphere of insulation materials for electrical engineering, the examination of corrosion problems or testing aeroplane models in air-conditioned wind-tunnels.

Applied in practice with success was, for instance, electrical osmosis for unwatering masonry. A project of topical economic significance, resulting from the intensive co-operation between University and Economy, is a solar energy-powered snow melting and warm water generating plant situated in the Otztal Alps. This type of co-operation is being constantly intensified. Universities and practice achieve through exchange of ideas, and in part also by means of quite specific task assignments always new solutions fit for economic application.

The success of production directed to innovation becomes apparent by a favourable trend of exportation also in periods recession. Thus in 1979, Austrian exp registered an increase of about 17 per As to structural quality of goods a t towards products of high grade ca clearly noted. A growth above average recorded with exports of finished prod particularly in the range of chem vehicle construction and mecha engineering.

There is no doubt that individually companies won first rank positions foreign markets which spare no a cation of resources to turn new ideas commercial products. Midwife is her many cases the market itself with its m layered requirements or needs arising u special conditions.

High rates of growth could, for insta be materialised by the firm Heid of Lo Austria which became internation known for developing and manufactu computer controlled machine tools. exportation share has reached to almost 90 per cent of the total sales. In line of "machine tools" Heid supply spe turning machines to the international craft industry for making jet engine ments, to the energy economy for ma facture of steam and gas turbine parts. to the crude oil indust for lathe worl bore crowns and pipe bells. A particul high increase of sale could be achieve the field of silage and seed installati Emphasis was here on construction large-scale plants abroad, particularly the developing countries.

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continued from page vi

Also the company Chemie Linz was in a position to report a noticeable increase of its sales figures, resulting mainly from exportation. The enterprises applying more than three per cent of its total sales to research and development activities exports to 94 countries. Sales are shared by Europe at the rate of 85 per cent and of 15 per cent by overseas countries. The biggest success obtained by the company through intensive research work originated from completely new cultivation results of various useful plants grown on a novel type of fertiliser.

More than 90 per cent of its total production is shipped abroad by the metal works of Plansee & Co KG in Reutte. Included in the production range of this company are, amongst others, refractory alloys supplied in form of semi-finished and finished elements also used in astronautics.

Maschinenfabrik Andritz owes its top position in technical development not only to the creative faculties but also to the many-sided industrial experience of engineers working within a well-co-ordinated team.

For the strength of their own development Doka do Brasil, a subsidiary of Doka in Amstetten (Umdasch Industrie Gesellschaft) was awarded the order for implementation of sheeting work to be carried out at the world's largest hydroelectric plant at Itaipu, Brazil. The company, assisted by a specially developed method, is able to provide sheeting quicker, better and at lower cost to structures made from liquid concrete.

Fundamental success resulted from products and methods related to environment protection and recycling. So for instance the electric slag remelting process VEW for steel ingot-making (Vereinigte Edelstahlwerke AG), the recovery of hydrochloric acid from pickling (Ruthner Industrieanlagen AG) as well as the Ruthner-Neolyt process.

Regeneration and pickling installations of Maschinenfabrik Andritz are operated amongst others in India and Brazil, sprinkling installations of the firm Bauer in Africa and Central Asia, plants for the fermentation industry are supplied in co-operation by VEW and Vogelbush to Latin America, North and East Africa and to Tunisia.

The formulations leading to success include specialisation and compliance with very specific orders. Efficiency rate is increased by correlating an already proven offer and its adaptation to the new customer requests. The image of a specialist applying each time afresh flexible engineering faculties to individual commissions consolidates with each new order carried out successfully while competition thins out in terms of quantity even if more potent, though, with respect to quality.

Actually, the Austrian exportation industry is about to open up a new market: China, a market made up of nine hundred millions. The first seed storage installations "Made in Austria" are assembled there, delivered last year by Maschinenfabrik Heid. Austria's specialists in railway engineering, famous for their track packing equipment, Plasser & Theurer, have also established contacts with China so as to use the chances this country, with its enormous distances, offers to suppliers of track construction machinery.

The success of Austrian companies on the world market secured against always better, stiffening competition, is not only due to their high engineering qualities but also to their reputation of strict adherence to delivery dates agreed upon.

An interesting success fell to Austria's share at the Technological Transfer Show, Tech Ex 79, in Atlanta, Georgia, USA: the first prize for the best technological development amongst all 3,700 exhibition items from more than 40 countries was awarded to a macrosonic wire-drawing installation presented by the Physical Research Institute, B. Langenecker. This unit is suitable for drawing wires of 10 to 12mm diameter at a speed of 25m/sec in only six drawing stages to a diameter of 1.8 to 2mm as against conventional methods requiring 12 to 14 drawing stages for the same operation. ●

Austrian

Consulting Engineering

AROUND 900 engineering offices dealing with over 80 specialised technical fields are now in existence in Austria, having qualified with one of the most stringent tests for a certificate of competency that have to be passed in the whole of industry. Analogous to the structure of Austrian enterprise as a whole, about five per cent of these are large firms, while over 90 per cent are middle- or small-sized firms. However, taken as a whole, these make up a major economic factor in the region of AS40,000 million. There are not exact statistics for the share of planning in export but an acceptable lower limit of volume can be taken to be about AS10,000 million. This export share of project work is certainly capable of considerable development, but it must not be forgotten that this "export" is only given its appropriate place in Austrian foreign trade policy in recent years, while this had happened much earlier in other countries. Countries which suffered earlier from a drop in the export of goods did much to encourage the export of knowhow, with a view to the supply of goods connected with it.

In Eastern Europe the consulting engineering office are promoted by the state; but also the countries traditionally known as "project engineering countries" such as France have been intensifying their presence above all in the Third World for decades, which gave a good start to their countries' exports of goods and services. As a neutral country, Austria will have an import part to play here in future. There has always been plenty of technical know-how in this country – what was missing, was the realisation of the necessity to take it to foreign markets. But now Austria is catching up, aided by the high quality of her consulting firms as well as her neutral position in international affairs. The strong nationalism of the former colonies and of several oil-producing countries draw them towards political neutrality when deciding on planning. One thing is certain: the demand for quality will have top priority everywhere in the future. But there are ever-decreasing chances for the purely architectural sector, since the countries of the Third World are in a position to provide what they need themselves; the need to catch up is on the industrial and factory sector, which must come from outside. The same is true of the field of supply and domestic technology. Since nowadays a good 90 per cent of all exported projects can be offered in connection with complete planning, there is now an increasing number of small consulting firms which have organised themselves into new companies and bidding partnerships especially for foreign markets.

And the positive experience of Austrian consulting engineers abroad is not the least factor leading to the steep increase in the numbers of those in this branch. The anachronistic division of engineering into industrial planners and consulting engineers has long been overtaken by project work. More and more consulting technicians and architects are founding consulting companies, partly in order to qualify for the help of the foreign trade organisations of the Federal Economic Chamber.

The trend to neutral consulting engineering and away from production-dependent business planning has become the general rule all over the world. The future will bring a challenge for the high standard of Austrian technology and big chances for the industries to carry out the projects. ●

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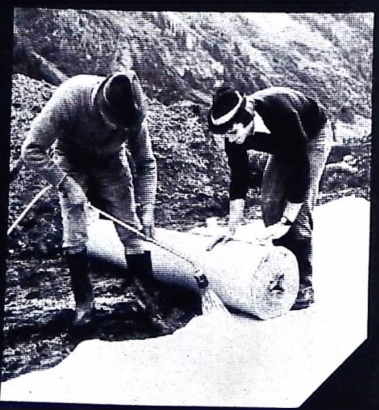
This means:
Less overlap and thus cost savings – no specially trained expert staff and no special equipment – simple welding by means of flamers (butane gas burners).



Polyfelt TS Properties:
- Distinguished filtering properties
- High-degree permeability to water, both vertical and in the fabric plane
- Good flexibility
- Anti-pollution – no decomposition products
- Simple welding
- Unlimited resistance to all climatic influences

Polyfelt TS – proved to be highly efficient in all fields of construction

A-4020 Linz, Austria
St. Peter-Straße 25
Telephone (0732) 591
Telex 021324

CHEMIE LINZ AG

AUSTRIA

*Where joints are formed by overlapping, they require an additional overlap width.

Polyfelt TS

Circle No. 15 on enquiry card

Austria – World-Wide Custom Tailoring to Industry

AIR-CONDITIONING equipment made to measure for use in railway carriages, developed and manufactured by a company specialising in ventilation and air-conditioning engineering (Ing. Walter Fischer & Co.) has closed a market gap. The activities in the field of research and development carried on by this enterprise are not only streamlined for precision but also aligned with the problem of heat recovery, geared already to the future. The installations can be made according to individual requirements, and provide heating cost savings up to 80 per cent.

Antivibration couplings are the special product of a Salzburg company (Dr Ing. Geislinger & Co), being in demand the world over. 99 per cent of the overall production is earmarked for exportation. Licences were granted to corporations in China, Japan, France and the USA.

Leading car makers of Europe have spotted Austria as a subcontractor able to fill their supply requests fast and to the point. Actually close on 150 Austrian companies manufacture amongst other items car radio, tyres, belts and diecast aluminium parts.

Austria has been distinguishing herself as the custom tailor to the world's industry. Predominantly, small and medium-size firms are known to strive for success in that particular field. Their production facilities are flexible enough to comply with special demands, they are quite ready to go places for a personal contact, to ferret out and capture for themselves still existing market gaps. Where capacity would hardly do for quantity production, ideas and original designs step in to open up international market potentialities. More than one half of all research expenditure is borne by companies employing less than 3,000. A relatively high percentage is even met by firms who keep less than 100 dependents on their payroll.

High exportation growth rates were recorded by a mechanical engineering firm (Heid of Stockerau) concentrating chiefly on machine tool equipment. Practically 90 per cent of total sales is earmarked for exportation. Amongst other goods, the company ship to international aircraft industries single-purpose turning machines for making jet engine parts, to energy supply companies for building gas and steam turbines, and to the oil industry for turning processes on bore-crowns and pipe bells. An especially hefty increase of sales could be achieved in silos and seeds installations. Emphasis was here in providing large-size systems to foreign countries. Exports in this branch went mainly to development countries.

Co-operation is of prime interest. So for instance two Austrian mechanical manufacturers (Heid and Hutter & Schrantz) have drawn up plans for pooling their experience in the field of plant engineering, expanding and underlining their presence stronger than before on foreign markets. Amongst others, new markets pinpointed so far are Nigeria, Kenya and Indonesia.

On the basis of a co-operation agreement between Steyr-Daimler-Puch AG and the Yugoslavian manufacturers of agricultural and building equipment Pobeda, the latter ones will produce under a Steyr licence small tractors having an output of less than 35kW and large tractors of more than 110kW.

In all probability, co-operation activities with Mercedes and BMW will witness an expansion inasmuch as the List-Steyr-BMW diesel engine is supposed to substitute as early as from 1981 the BMW-developed motor, and presumably boost significantly the annual output of the cross-country car designed together with Mercedes.

Amongst the most recent successes in the automotive field should be listed the supply contracts concluded with the car-makers Citroën, Renault, Peugeot and Chrysler by Miba-Sintermetall AG of Vorchdorf, Upper Austria, for sintered metal forgings able to withstand extreme loads. This company has taken up only recently series production of that new development.

Of interest is also the caustic acid regeneration plant for Belgium, so far the largest installation adapted to the Ruthner spray roast-reaction process ever mounted in an industrialised country of the West. Their new premises can handle 20,000 litres per hour of used caustic acid, and assure completely waste water-free operation of pickling lines. Order value: 52 million Austrian shillings.

Not only in Europe but overseas as well have become widely known developments materialised by the firm Vogelbusch. So, for example in Cuba waste materials of the sugar industry are processed in plants designed and assembled by the Austrian company; also on the Philippines, Vogelbusch are called upon to plan and finish projects of that kind. By developing a special yeast cultivation equipment, the microbiologists of the enterprise succeeded in turning to helpful use whey obtained in considerable amounts from large-size dairy plants. Converted into a highly nutritive fodder additive, the material may replace less valuable fish meal.

Also in the furniture-making field, Austrian manufacturers, despite all their independent fancy of design, willingly submit for example to the bearing of requests from abroad. A stimulation to seek individual forms is to be set by the Austrian State Award for Furniture conferred in 1978 on the firm of Brüder Niklas for the "Square System", a multi-purpose dwelling space equipment of up-to-date concept.

A government distinction has been granted also to the firm Fredrich Deutsch, Metal Works, of Innsbruck, whose products are shipped to countries of the globe. The company offer die-cast products of high size-precision. Their semi-finished products are available for all branches of industry. Manufacturing is completed according to drawings supplied by the purchaser, as per models or samples. The firm have an experience of long standing in making cutting and punching tools, covering the full range of simplest to highly intricate finish.

Austrian Industry

the Service of Transportation

THE AUSTRIAN transportation service belongs to the dynamic business and industrial groups that are able to supply a large variety of widely distributed impulses to the national economy. Austria, having the function of one of the important turnstiles available to west and east-bound transportation throughout the Continent, commands a dense network of communication lines which make the country accessible as far as to the most remote Alpine valleys and further high up to the glacial regions. The layout of the major lines have been arranged in such a way – for the benefit of tourism developed here well above the average – as to lead through sites of delightful landscapes without detracting anything from the beauty offered by their view. The favourable geographical location of the country and the well conceived road network established are substantial factors of European continental traffic.

The principle underlying the system of Austria's communication arteries is quite apparent from parallelwise constructed east-west running lines along the Danube and the longitudinal mountain thrusts of Alpine valleys, interlinked by communications to North and South that cross the mountain ridges between Central Europe and her Mediterranean area.

Austrian Airlines, one of the world's most experienced carriers in European east and southeast traffic, fly from Vienna to the most important Levantine commercial and tourist centres, and to all capitals of the comecon area. The basis of Austrian air traffic are six passenger handling airports. The largest thereof is Vienna-Schwechat.

Operating 3,440 cable railways, towing and chair lifts, Austria tops the list of all winter sport countries in Europe. Investments of the Austrian ropeway business division hit a ceiling of about 500 million Austrian shillings per year.

In agreement with such dynamic progress of the Austrian transportation industry are the products manufactured and developed in its sphere of influence. So for instance was the world's first clutch-controlled chair lift developed by the firm Doppelmayr. A safety seat for infants, similar to child seats in passenger cars, was conceived and is marketed by Josef Swoboda Workshops of Traunsein for use with chair lift systems. Climb assisting equipment of most-up-to-date engineering have become a much sought exportation item for all mountaineous countries on Earth.

In the field of mechanical conveying equipment the firm Plasser & Theurer won world recognition by their developments. The Diesel locomotive Jenbach for difficult mountain railways also a typical Austrian achievement sponsored by the national Alpine requirements.

1,733 kilometers of water routes which 838 kilometres are navigable convey six million tons of goods. Austrian Danube ports. Austria, connected to inland waterways exclusively, has a shipyard fully occupied with a further thousand million shillings worth of orders and able to gain continuously new orders in filling special orders.

A considerable increase was recorded in the sales of a company (Swarovski Wattens) which manufacture amongst items to serve safety on railways, road and airport areas (Swarovski Reflex). The firm of Manfred Swarowski in Amstetten has started special plant for the production of microscopically small glass beads for reflecting road construction materials in Japan, Canada, the USA and USSR.

A wireless emergency call pillar, ing traffic participants to contact the relief services in extreme situations on roads having no cable network connections, was developed by Elin-Union. The pillar is powered by a built-in rechargeable battery and can be installed at any desired place.

AUSTRIA

HYDROTECHNIK

WASSERAUFBEREITUNG
INGENIEURBÜRO FÜR VERFAHRENSTECHNIK

WATER TREATMENT
CONSULTING ENGINEERS

TRAITEMENT DES EAUX
BUREAU D'ÉTUDES TECHNIQUES

HYDROTECHNIK ENGINEERING LTD. AUSTRIA, ONE OF THE LEADING AUSTRIAN CONSULTING AND ENGINEERING COMPANIES IN ALL FIELDS OF WATER TREATMENT AND WATER PURIFICATION, HAS DEVELOPED WATER TREATMENT PLANTS FOR DRINKING WATER PURPOSES, COMPACT, PREFABRICATED AND FITTED IN CONTAINERS, WHICH MAY REQUIRE A SIMPLE FOUNDATION AND A FAIRLY STABLE ROAD FOR TRANSPORTATION TO SITE. THE EQUIPMENT IS ASSEMBLED READY FOR OPERATION BY THE MANUFACTURER AND IS SUPPLIED IN THREE ISO-STANDARD CONTAINERS.

DEPENDING ON THE RAW WATER QUALITY ACCORDING TO WHO-STANDARDS AND THE SIZE OF HYDROCOMPACT® UNITS THE CAPACITY OF PURIFIED AND TREATED WATER VARIES BETWEEN

20 M³/H (APPROX 4400 IMP GALL./HR)

AND 200 M³/H (APPROX 44000 IMP GALL./HR

WITH STANDARD EQUIPMENT

THE FOLLOWING PROCESS STEPS ARE PROVIDED FOR THE STANDARD VERSION TO REMOVE SUSPENDED MATTER AND BACTERIA

- LOW LIFT PUMPING UNITS
- PRECHLORINATION (DISINFECTION) OF RAW WATER
- FLOCCULANT FEED SYSTEM
- FLOCCULATION WITH AGITATOR
- SEDIMENTATION WITH SLUDGE REMOVAL SYSTEM
- CLEAR WELL
- HIGH LIFT PUMPING UNITS
- PRESSURE TYPE SAND FILTRATION SYSTEM
- CHLORINATION SYSTEM FOR FILTERED WATER
- HYDROPHOR UNIT.

THE HYDROCOMPACT® SYSTEM IS A HIGHLY FLEXIBLE WATER TREATMENT PLANT AND CAN EASILY BE ADAPTED TO FIT IN WITH OTHER PROCESS STEPS ACCORDING TO FURTHER REQUIREMENTS.









HYDROCOMPACT®

COMPACT WATER TREATMENT PLANT

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A-5020 SALZBURG-AUSTRIA
ALPENSTRASSE 54

POSTANSCHRIFT / MAIL ADDRESS / ADRESSE POSTALE
A-5033 SALZBURG-AUSTRIA
P. O. BOX 62

TELEPHONE : (6222) 22472, 25313
TELEX : 633821 HYDRO A
TELEGRAMM : HYDROTECHNIK SALZBURG

OR TROUGH THE COMMERCIAL COUNSELLOR AT THE AUSTRIAN EMBASSY

Circle No. 50 on enquiry card

Arid Zones – a Challenge to Agriculture

Arid Zones – a Challenge to Agriculture

IN THE sphere of agricultural equipment, Austria has to face tought international competition. This fact does not only call for technical perfection but motivates also to ferret out special requirements and possible market gaps. For the particular demand from arid zones – a constant challenge to agricultural engineering – has been provided a number of custom-tailored products aimed precisely to fill such market gaps, and which have become an export-ation hit already.

So far instance Maschinenfabrik Andritz was able to book considerable success abroad. A particularly steeply rising trend (+ 50%) has been noted in orders for pump construction projects. Irrigation pumps are supplied amongst others to the Sudan, the Ivory Coast and the Iraq.

The firm Ochsner ships pumps to chemical installations erected by VOEST-ALPINE in Egypt and Algeria.

Large-size irrigation projects for savannahs located in Cuba, Tunisia and the Ivory Coast were implemented in cooperation by Bauer-Voitsberg and the Durit Works Kern & Co.

Installations of agricultural engineering could be delivered by Andritz together with Waagner-Biró to the Ivory Coast.

The pipes and pumps manufacturers Rudolf Bauer, having obtained international fame amongst others by developing quick-fitting pipe unions for sprinkling plants, are celebrating their 50th anniversary this year. Amongst the most successful novel developments of this company should be listed the automotive sprinkling engine "Constant Rain" and the new Centre-Pivot sprinkling system fit for use on wide areas. Always increasing in significance in this field is the establishment of production premises for company-owned developments.

High export figures were reported also by Garvenswerke in the production of water conditioning plants. The company ships abroad more than 50% of its production, supplying about 50 countries in the world. Future markets are considered to be located in the Near and Far East where problems of water supply become constantly more pressing. A syndicate of firms headed by the company Hydrotecnik of Salzburg concluded a contract for irrigation with the Iraqi ministry for an amount of 300 million shillings to cover the supply and assembly of water towers an conditioning plants at the Dujaila Industrial Complex. The Austrian carries a volume of 100 million shilli

An artificial pasture with a capacity of 10 tons was made for L means of a process developed Institute of botany and Food Scienc Veterinary University of Vienn system permits the production of fodder in the glass house, indepen weather effects within a period of on days.

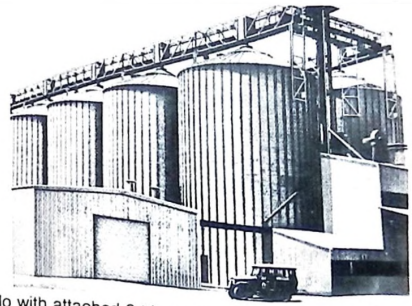
Negotiations on a contract for a project in Jorda are being carried VOEST-ALPINE AG. The produc mineral salts fro the Dead Sea is c ned, with ultim e conversion of which in turn is ntended for the b fertilizers.

Vietnam wishes to modernize he culture at the o kest possible ra staked her lot on Steyr tractors with she intends to w the battle again shortage of food supplies. 1,500 ty 60hp each – especially fitted to rice c tion – are delivered to that trade p together with the relevant service lations.

THE HEID - HUTTER & SCHRANTZ GROUP
Member of the industrial group of Creditanstalt-Bankverein AG
Creditanstalt-Bankverein AG: Bank number 1 in Austria.
Main share-holder: Republic of Austria.
This industrial group employs 65,000 persons,
executes 15% of the total Austrian export.

HEID MASCHINENFABRIK HEID AG
HEIDEC GesmbH Engineering, consulting, trading.

HEID builds and supplies individual machines and complete plant for processing cereals, pulse, small seeds (grass, flowers, vegetables), coffee, etc., as well as for the production of seed grain. The "nucleus" of this programme is a range of high-duty allsteel machines for pre-cleaning, cleaning and grading, backed by a full range of up-to-date installations and devices for reception, handling, drying, weighing, storage, transhipment, evacuation and control, such as required for the automation of factories of the kind. In addition the manufacturing and delivery programme comprises turn-key plants for the production of animal feeds and irrigation installations.



Storage silo with attached 2 t/h-seed processing plant (Libya).
Capacity: 32 000 t Handling capacity: 60 t/h

MASCHINENFABRIK HEID AG A-1015 VIENNA AUSTRIA

H+S HUTTER & SCHRANTZ
Hutter & Schrantz AG

H+S Product Program:

Planning, manufacturing, supply and erection of:

1. Steel structure for
— manufacturing plants
— ware-houses
— office-buildings
— and others

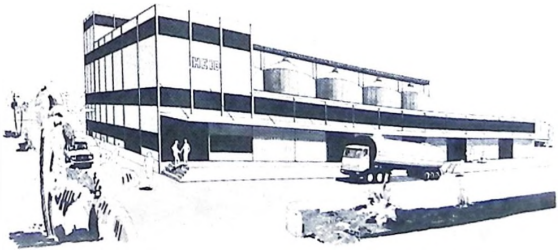
2. Turnkey plants for manufacturing facilities for precast ceiling beams

3. Storage technique for large warehouses, for example spare parts storages for factories.

4. Plants for fences, doors, etc.

5. Complete poultry farms of various sizes.

Furthermore supply of screens, sieves, conveying wire belts and paper machine wires (both metal and synthetics).



Feedmill, output 10t/h, Zagazig-Egypt.

HUTTER & SCHRANTZ AG A-1061 VIENNA AUSTRIA

Representation in the Federal Republic of Nigeria:
EROYA ESTATE MANAGEMENT CO LTD
ESTATE OWNER AND INDUSTRIAL CONSULTING
PO Box 160 YABA, Nelson Street, Yaba Lagos State Phone 86 06 90

Circle No. 47 on enquiry card

AUSTRIA at the 3rd International Trade
(February 14–22, 19

CHOOSE AUSTRIA AS YOUR RELIABLE AND COMPETITIVE TRADING PARTNER

Visit the Austrian group exhibit comprising the following Austrian companies:

1. Austroplan:	Consulting and contracting for a wide range of industrial, social & infrastructural projects
2. Alpenvelour:	Fez gent's caps
3. Dietzel:	Univolt plastic conduits and fittings for electrical installations
4. Elin Union:	Water meters
5. L. Engel:	Automatic die-casting machines for processing thermoplastics duromers and elastomers
6. Futurit:	Traffic signalling equipment
7. Goerz:	Laboratory and precision instruments, portable laboratory potentiometer recorders
8. Haas:	Machines for the manufacture of wafers
9. Hollstein u. Fuhrmann:	Bakery ovens & Biscuit Productionlines, Agricultural & Crop Protection equipment
10. O. Karla:	Perfume sprays, toilet sets, Petit Point souvenirs, pocket sprays
11. Krammer:	Gate valves, house connection slide valves, throttle valves, ball valves
12. Miba:	Slide bearings for high capacity motors
13. Oeswag:	Conical double-lead screw extruders, regenerating installations, mould manufacture of pipe fittings
14. Pea Pichlmayr:	Electro-acoustic installations, amplifier installations, hotel equipment
15. R. Prinz:	Engine and electric driven chain saws
16. J. Prutscher:	Laboratory and office furniture
17. K. Seidl:	Sanitary fittings, outfits
18. Semperit:	Conveyor belts, V-belts, hoses, accumulator boxes, combs
19. Tyrolit:	Aluminium oxide and Silicon carbide abrasive products, diamond and CBN abrasive products, elastic abrasive products
20. C. Walter:	Automative and hand tools

FOR FURTHER INFORMATION PLEASE CONTACT
THE COMMERCIAL COUNSELLOR AT THE AUSTRIAN EMBASSY
8–10 Broad Street (Westernhouse), P. O. Box 1217,
Lagos, Tel. 63 68 27/28, Telex 21285 oelag ng

Circle No. 8 on enquiry card

Vest African
CONSTRUCTION

ncluding Focus on
Mining and Quarrying in West Africa

Rutile mining
Materials handling
in open-cast mining
Gold initiative
in Ghana
Custom-made
crusher

West African CONSTRUCTION

Ivory Coast highway sector project

The World Bank announced at the end of last year the approval of a $100 million loan to the Government of Ivory Coast for a highway sector project.

The loan, the first of its kind in West Africa, will finance a substantial percentage of the foreign exchange costs of the 1981–3 highway investment programme and will assist the government to improve highway sector planning and co-ordination to ensure that only high-priority projects are carried out under the present policy of restrained public investments. Maintenance operations will also be reinforced through further training.

The realisation of the development objectives of the Ivory Coast will depend, among other things, on the continued availability of a reliable and efficient highway system. This project, with a total value of $166 million, will give special emphasis to the strengthening of pavements of existing roads and to effective utilisation of the road maintenance equipment and resources.

The Government of Ivory Coast will contribute $66 million towards the cost of the project.

Civil works and equipment eligible for financing will be procured through international competitive bidding in accordance with the Bank guidelines for procurement. Contracts for equipment, materials and supplies costing less than $100,000, e.g. research equipment, teaching materials and road maintenance equipment for training, may be awarded on the basis of local competitive bidding using procedures acceptable to the Bank up to a total of about $600,000.

Plasticiser dam construction

A British chemical manufacturer has supplied more than 50 tonnes of a special hot climate plasticiser to the Oyan River Dam project in Nigeria.

The Cormix Division of Joseph Crosfield & Sons Ltd, UK, manufacture a product which was originally designed for the high ambient temperatures of the Arabian Gulf. Cormix P4, as the product is called, counteracts the rapid drying created by the climatic conditions and giving a concrete of better durability, combined with superior strengths.

The work on the £35 million Oyan River Dam at Ikeja, 5km from Lagos, was commenced in June 1979 and is now about halfway through its anticipated three years' duration. While the dam itself is to be of earth construction, 22,000m³ of concrete are required for the four-bay Ogee spillway and a further 69,475m³ of structural concrete will be used in adjacent structures.

Cormix have so far shipped 214 drums of Cormix P4 to Nigeria under orders from the main contractor, George Wimpey and Company (Nigeria) Ltd; Ogun Oshun River Basin Development Authority is the client and Tahal Consultants (Nigeria) Ltd of Ibadan are the consultants.

New dealer for Thwaites

Afrotec Technical Services Nigeria Ltd of Isolo Industrial Estate, Lagos, has been appointed by Thwaites Engineering Co. Ltd, UK, to sell and service their full range of dumpers in Nigeria.

The Kaduna International Trade Fair (February 14-22, 1981) will mark the launch of Afrotec's representation, where they will be exhibiting a total of eight Thwaites machines, ranging in size 750kg to 5,080kg. These will include units new to the country, the Alldrive of 2,032kg capacity featuring an ea and simple articulated chassis desig the Alldrive Giant – the largest d currently available from Thwaites which has outstanding off-hig performance.

British a... for Sierra Leo

The Brit... Secretary of Stat... Foreign and ...ommonwealth Affa... cently made ... offer of £3.5 millio... aid to Sierra ...one, from Britain's ... aid programm...

He made the offer in London ... Siaka Stevens, President of Sierra L... when he was visiting the UK in Nove... It is hoped that the new aid grant w... spent in the next three financial yea... development in the transport sector.

Possible projects to be financed w... Bailey bridging to link up rural feeder ... and the purchase of roadmaking ... ment, imported from Britain, for ... road construction.

The current emphasis of British aid ... technical co-operation, mainly in the ...

CONEXPO '81

No other US industry group has sustained a series of trade shows and expositions of the increasing scope and magnitude through the 20th century as has the American Construction Industry Manufacturers' Association (CIMA).

In January of this year the construction industry from America and abroad gathers together to form CONEXPO '81, which is being held at the Astrodomain complex in Houston, Texas.

The exhibition spreads through Houston's Astrodome, into the Astrohall and Astroarena, and out onto the surrounding pavement in the form of outdoor exhibits. It will display the largest assortment of construction equipment ever assembled at one location anywhere in the world. It will attract upwards of 100,000 attendees from the North American continent and from all over the world.

Manufacturers have through the years geared their "latest" models for introduction at the show. New products, latest improvements, recent developments, and experimental ideas have all been unveiled in CONEXPO showcases.

Including the Astrodome, the Astrohall the Astroarena, exhibitors have at their dis... more than 500,000 sq ft of indoor space, ported by the most modern and sophisti... show facilities in the world. Hundreds of t... sands of square feet of outdoor space will be available. Unlimited floor loading in ce... areas will support the heaviest of equipm... With the Astrodome's 208ft ceiling clear... almost any type of exhibit can be displayed.

Shuttle buses will carry passengers from ... accommodation to the exhibit halls in min... while Houston's network of roadways and ... ways permit easy access to the Astrodo... facilities from any direction.

There are 24 co-operating associations ... their member companies) who are working ... CIMA in staging this show. These associat... and their member companies have been get... ready for CONEXPO '81 for three years. ... CONEXPO '81 has in store display of ... latest, most innovative construction equipm... available in the world today. The organisers ... that it is impossible to forecast what ... attendance will be, but no one will be surpr... if it exceeds final expectations.

manpower assistance such as supplementation of salaries of British staff in the public services and the country's university. Britain's training programme currently finances about 100 trainees in the UK annually.

Caterpillar lays off workers

Slumping sales have led Caterpillar to lay off about 9,500 workers in America for a week in January and temporarily shut down three plants in Europe. Already 5,400 employees in America have been indefinitely laid off in plants extending from Minnesota to Pennsylvania.

Shutdowns and lay offs have been attributed to a slack market, but sales will be higher than expected, mainly supported by the more buoyant foreign markets.

West Africa is just one of these markets and Caterpillar distributors in Nigeria, Tractor and Equipment have reported brisk business for the year ending.

Thwaites Alldrive Giant – see previous page for details of new dealership.

Cement works upgraded

A contract to extend and improve the Sokoto cement works owned by the Northern Nigeria Cement Company has been awarded to a German-Swedish consortium comprising O. & K. AG (handling the technical side of the contract) and Nordag Thomas & Partner KG (handling administration): Cementa AB will be engaged in the commercial and technical management of the cement works.

Once enlarged and re-equipped the plant will have an annual capacity of 600,000 tonnes of cement. The plant will be finished in three years time.

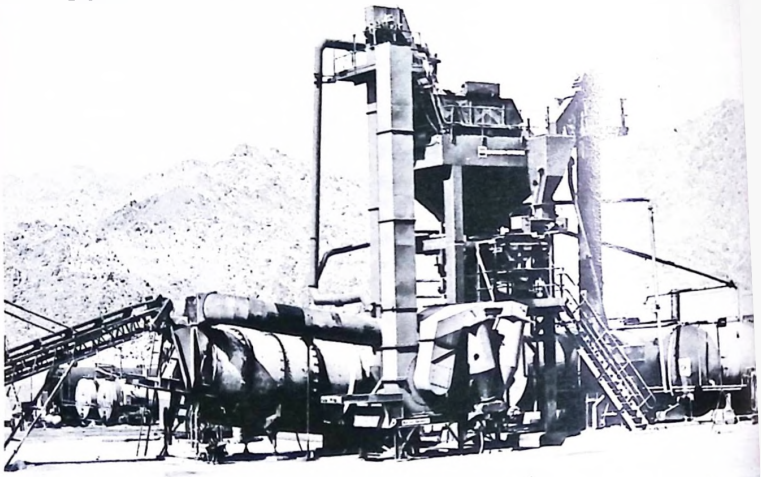
Pumps for Nigeria

Destined for domestic water supply duties and use by construction companies, 24 **Megator** pumps have been despatched to Nigeria under a contract worth over £24,000. The pumps were ordered by Zuloh Services (Nigeria) Ltd, of Enugu, sole agent for Megator industrial products throughout Nigeria.

All the pumps are of the sliding-shoe type, with super-suction performance and ability to run with a dry suction line. The Nigerian order includes sets with capacities up to 83l/min, and total heads up to 75m, and each set is driven by a Petter AA1 diesel engine.

BA-BATCHPACS®

give you Barber-Greene quality...at a surprisingly low cost.



If you need a reliable, quality batch plant in the 1000 to 2250 kg batch size range, it will pay you to consider a Barber-Greene BA Series Batchpac.

Very economical to own and operate, versatile BA Series plants offer everything you need to produce specification asphalt, bitumen macadam and tar macadam mixes at rates up to 180 mt/hr. Compact unit construction permits fast erection. And clean, simple design provides excellent access to key components... assures quick, easy maintenance.

Barber-Greene can tailor a BA Batchpac to meet your exact requirements, with a broad range of options and accessories. Included are a filler silo, fines weigh hopper, remote scale... and more.

Learn how you can put a BA Batchpac to work for you... at a very affordable price. Ask your dealer for an illustrated brochure or write Barber-Greene Overseas, Aurora, Illinois, U.S.A.

Barber-Greene do Brasil Ind. e Com. SA • Barber-Greene Europa, B.V. •
Barber-Greene England Ltd. • Barber-Greene Canada Ltd.

BARBER-GREENE

Circle No 11 on enquiry card

THE MAGIC OF SEATTLE

by Noel Moffet

"SEATTLE" is an Indian name. It is said that the small band of lumbermen who, in 1851, built a steam sawmill on Puget Sound were so surprized to find the Indians friendly that they named the village which quickly developed there after a local chief; apparently he charged them 16,000 dollars for the privilege of using his name.

Today the Indian connection is still there, at least in names: Sammamish, Skykomish, Snoqualime, Spokane, Klapachie, Enumclaw, Tatoosh, Nanaimo, Quimichan, Tsawwassen, Yakima.

Once established, the town grew slowly but steadily. Its population in 1870 was 1,107 and in 1880 3,533. The hinterland's huge forests and navigable rivers ensured the success of the lumber industry; a plentiful supply of fish in the region's lakes and rivers encouraged the development of a salmon and canning industry; and the discovery of coal to the east and south laid the foundations of a lucrative mining industry.

Tacoma, 25 miles to the south, had become the west coast terminus of the Northern Pacific Railroad – the first transcontinental railway to reach Puget Sound. A spur line connected Seattle with Tacoma and in 1893 the city became the west coast terminus of the new Great Northern Railroad. Thereafter Seattle grew very quickly and in 1896 she developed a lively overseas trade, particularly with Japan and China.

The great Klondike gold rush really put the city on its feet and around the turn of the century she became an important commercial centre, the mining prospector's outfitting post and fun palace, and the port to which he shipped his gold. Subsequent strikes in Alaska gave further impetus to the city's growth, helped to develop her coastal trade with Canada and encouraged her infant shipbuilding industry. In a short decade 200,000,000 dollars in gold passed through her hands; half of it stayed in her coffers, providing her with an economic breakthrough and a big increase in population.

In 1910 an important Alaska-Yukon-Pacific exhibition was held in Seattle and her future growth and prosperity were underwritten by building America's first municipally-owned hydro-electric plant and by securing an abundant water supply from Cedar river in the Cascade mountains, 26 miles away.

By 1914 the city's population was a quarter of a million and it soon rose to 300,000 as a result of a big increase in her foreign trade, following the opening of the Panama canal, and a big increase in her ship-building activities during world war I.

The post-war period was one of moderate prosperity followed by stagnation, depression and unemployment. But world war II brought about a great boom, with shipyards and the aircraft industry playing important roles. For some years Seattle built more ships then any other north American port and today 40,000 of her citizens are employed by Boeing whose order-books, it is rumoured, are full for the next twelve years. It looks as if Seattle and Houston – at the extreme north-west and southern edges of the US continent – will go on booming for some time to come.

Expo

The great World's Fair of 1962 was a measure of Seattle's economic strength and a yardstick by which her architecture and her culture could be judged. Built on a 74-acre site just a mile from downtown it attracted huge crowds and gave the city some of its finest features: the Space Needle – a very tall, elegant, open structure with a circular, revolving restaurant and a public viewing platform at its highest level giving magnificent views of the city and its surrounding waters and mountains); a fast, elevated monorail connecting Expo with downtown; some splendid pieces of contemporary sculpture; and a fine group of new buildings which provided the metropolis with a worthy civic and cultural centre.

Seattle certainly has its share of wet days and cloudy skies; but its climate is

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continued from page 103

mild and gentle (unlike other parts of the north-west Pacific region) and the rain gives it more than its share of greenery; everything grows well, even luxuriantly, here. Its gentle climate is the result of its setting – one of protection and great natural beauty.

Site

Like Amsterdam and Vancouver Seattle is penetrated by water. She is built on a narrow neck of land between fresh-water Lake Washington and salt-water Puget sound. Somewhere along the ship canal which connects the two fresh changes to salt and the three million salmon who make the journey every year know that the sea is near.

Park

Asked to design a public park which would somehow overcome the noise and disorienting intrusiveness" of a major traffic intersection, Laurence Halprin decided to use noise to fight noise. The centre point of his park is water – thousands of gallons of it cascading, tumbling, cascading down over huge cubes of concrete, creating an exciting turbulence which successfully drowns the roar of the traffic. And, between the waterfalls, there are green oases, with grass lawns, seats, trees and flowers, and clinging plants pushing their soft green fingers down to the freeway itself.

Another of Seattle's central parks succeeds in a different way. When the old riverfront gasworks, perched on a small hill overlooking the harbour, were no longer needed the City Council decided to demolish the buildings and create a small, badly-needed public park in their place. A local sculptor, fascinated by the Heath Robinsonian shapes of some of the gas-works structures, persuaded the council to leave them there as great, free-standing sculptures-in-space, soaring upwards from a simple, grass-covered base. The result is Gasworks Park, one of Seattle's pride-and-joys and a very popular tourist attraction.

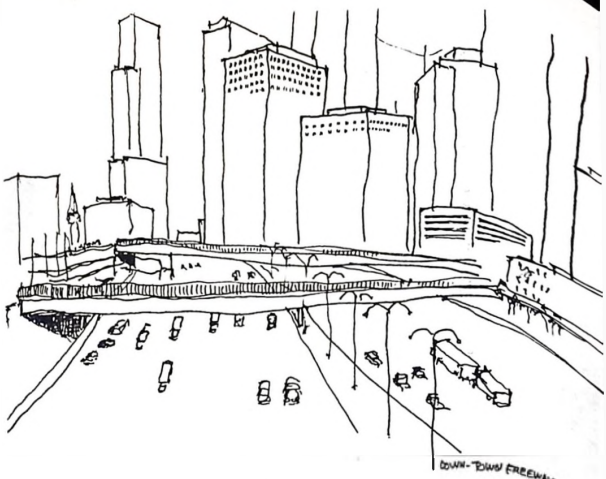
Square

Pioneer square is where the pioneers landed and the first lumbar mill was built.

Seattle's oldest buildings are here, recently rescued from decay and neglect and given new, contemporary uses. Here are little cafés and bars, sophisticated boutiques, professional offices and students' condominiums. Some of the traffic has been enticed elsewhere and a pleasant pedestrian precinct created of character, charm and considerable sophistication, with a successful inter-mingling of old and new. Here too is the strangest of waterfalls, in its own tiny park, sealed off from its neighbours by a high wrought-iron fence.

Street

Broadway forms the eastern boundary of central Seattle. It is an interesting street, with fashionable shops and boutiques, and with small, exclusive, ethnic cafés and



DOWN-TOWN FREEWAY, SEATTLE

restaurants – a kind of urban ridge, with glimpses of sea and lake, and steep streets tumbling down to waterfront and university. Here too one finds sinister bars and night-clubs, old timber houses with walled gardens, and elegant little art galleries. It is a busy, bustling, leafy street, full of Chinese, Japanese, Vietnamese and Koreans, a successful mixture of rehabilitated old buildings of character and quality and well-designed new ones slotted in between them. Here one is reminded that only the Pacific ocean separates Seattle from the Far East.

Broadway passes through the Capitol Hill area which contains most of the city's high-density flats. Here live students from the University of Washington and Seattle's Community College; here the street becomes gayer, brighter and noisier, the prices lower; the teenager is the chief customer here.

Seattle is a city for the gourmet. In Broadway and in some of the short streets leading off it he will find the best the north-west has to offer: oysters, clams, crab, barbequed salmon, borscht, Reuben sandwiches, caramel-flavoured goat's cheese, strawberry short-cake, California wines. Seattleites love their food.

Magic

There are people who will talk to you of "the magic of Seattle". If indeed the city has a magic it must surely be compounded of the smell of conifers and salt water, strange mysterious light, seafood, sudden change in level, swift car movement, the mingling of old and new, the clash of east and west, coloured lights reflected in water.

Future

But Seattle's magic is in danger of disappearing when one thinks of the future. The full order books of the Boeing Airplane Company and the Weyerheauser Lumber Company mean prosperity and expansion for Seattle and Tacoma. Now 25 miles apart they are both served by the same Sea-Tac international airport. Also between them are Boeing and Weyerheauser and, happily, a splendid, extensive forest – a lung for both cities and a playground for their citizens. Inevitably they will grow towards one another – it is already happening – and one day combine to form a linear city 25 miles long. Should it be allowed to happen? Can it be stopped? The planners say they are not strong enough to resist the powerful pressure from land-hungry developers who have their eye on the forest; and Weyerheauser itself, one of Seattle's biggest employers of labour which has made its millions from the felling of trees in large numbers, has recently built itself a giant new HQ at the edge of this particular forest.

Lagos

Some would say that Lagos too has its magic, compounded perhaps of ingredients different from those of the queen of the north-west Pacific. But the urban dilemma of both cities is not very different.

Seattle allowed the car and the freeway to slice the city into long, thin ribbons and to destroy the pedestrian scale which she used to enjoy. Now, belatedly, she is making determined efforts to come to terms with the car and to restore at least some areas of the city to the pedestrian.

Sooner or later Lagos will have to do the same. Already her traffic problem is frightening; already the car is responsible for the destruction of the Marina which used to be one of the loveliest streets in the world.

It is hoped that the building of Abuja will relieve some of Lagos's intolerable congestion. With Nigeria's continuing growth and prosperity, however, Lagos will also expand and prosper. It will have to come to terms with the car and create new, pleasant, urban spaces where the pedestrian will be king and the child will be safe. ●

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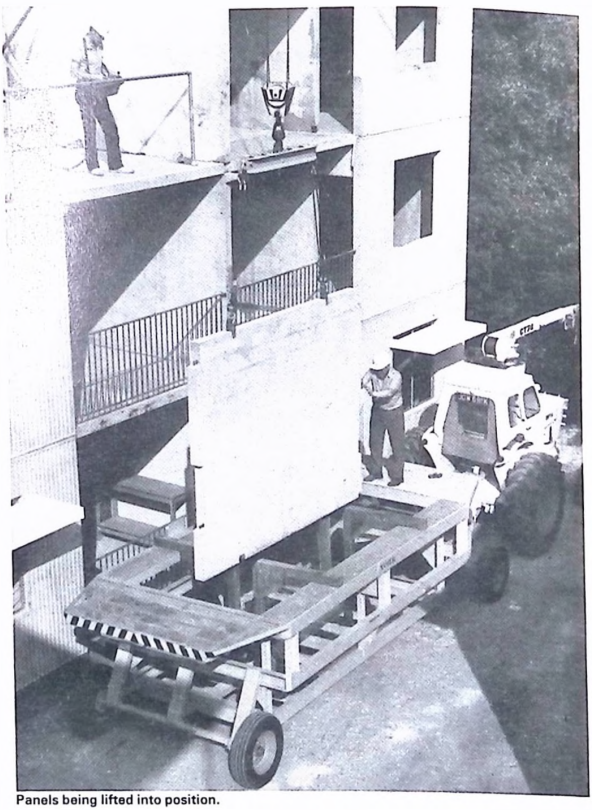
Systems building

Last month's article touched on a precasting scheme carried out by Stelmo in the Caribbean, and it is worth having a closer look at this project because it illustrates the sort of advantages which can be found with such systems.



Panels being lifted into position.

IN ORDER to overcome an acute shortage of housing and to move people out of shanty towns, the government instigated a plan to provide a development of 1,500 precast concrete homes.

All of the structural elements needed to build the single-family houses were manufactured at a plant a mere 200m from the edge of the development. Stelmo planned the four acre installation and furnished all of the equipment necessary for carrying out the work. The output capacity of the plant was three houses a day; this broke down into one component being produced every six minutes on each of three production lines – two of which were used to make wall panels and one to make roof panels.

Mobile plant

In order to achieve this impressive rate of output which totalled 242 precast elements a day, each of the three parallel production lines was served by its own self-contained mobile plant that ran on an independent track system over the long rows of satisfactory moulds.

Each plant was made up of a concrete distributor machine – which worked all three lines – a concrete placing, vibrating and screeding machine, a tube placer/extractor machine for making hollow core components, and a stripping crane.

The wall lines consisted of 83 moulds each and the roof line 76 moulds. A central mix batching plant supplied concrete to the distributor machine as it moved back and forth between the three lines via a transfer track system. The whole system was designed to be flexible in order to obtain product versatility as well as to facilitate ease of handling. Wall panels were produced in four different sizes, roof panels in two widths with an allowance for tapering thickness. Units could be made either hollow or solid.

To accommodate the motorized equipment that handled the production tasks, there were two sets of double track for each line. One set was used by the concrete distributor and the placing, vibrating and screeding machine which straddle the bed. The other set ran along the bed and was used by the tube placer/extractor machine. In addition, one rail of both of the track systems was used by the stripping crane, enabling it to span the production line plus the area used by the tube machine.

Thus the gantry crane had plenty of room to remove the cured panels from the forms and load them vertically on special trolleys which could then be taken by wheel tractor to a storage area. Each function of the line – setting up a form, pouring, stripping – was timed to a six minute cycle. Construction of the units sounds like simplicity itself; a continuous groove was formed along the perimeter of the pumped concrete foundations and the panels dropped in to this groove and sealed with grout. Linked by a tongue and groove connection when installed side by side, the panels were finally bolted together.

Training

As well as setting up precasting plants, Stelmo has also undertaken contracts which have involved the training of operatives to such a standard that they are able to set up and run plants in their own countries. One such training programme involved the erection and running of a complete precast concrete production plant which meant that subjects covered had to be comprehensive and included the likes of electric motor servicing.

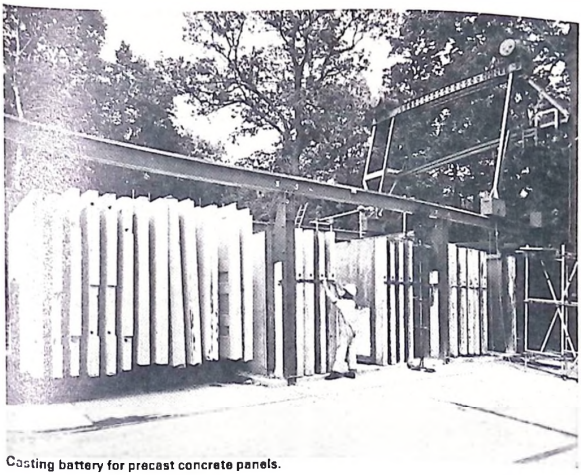
The training programme was essentially practical, each discipline of the trainees covered its own particular aspect of the plant, but all received a thorough grounding in precast concrete technology to give a broad appreciation of the project. Once the groundwork had been done the trainees erected, commissioned and operated a precast concrete production unit at a training centre. This involved bringing together a range of plant and equipment, marrying it up and actually producing concrete

continued

products. In this way the trainees were able to familiarise themselves with every aspect of the plant, from setting up to full working conditions. The climax of the training was the temporary erection of a four-storey structure using precast concrete elements manufactured on the production plant.

Battery casting

Another system which bears more detailed consideration is Crendon Concrete's Brecast. Originally researched and developed by the Building Research Establishment, the original concept of on-site vertical battery casting was first introduced in the early 1960s.



Casting battery for precast concrete panels.

In more recent years this technique was further developed into a fully comprehensive precast concrete housing system, closely integrating the architectural, structural design, production and erection requirements.

The system now combines the original expertise with the practical and commercial experience of **Crendon**. What is offered now is a broadly based precast concrete housing service encompassing both technical and manufacturing activities.

A range of quality standards can be accommodated within the system package including "single skin" concrete panels for low cost application, "sandwhich" panels where improved insulation is required, a choice of external panel finishes, structural designs for seismic and cyclonic conditions, a choice of "open" or "closed" jointing techniques, and alternative methods of production.

Feasability studies

The company will undertake feasibility studies to establish the suitability of the Brecast system to meet the client's needs and a complete range of technical services can be included in the system package.

These services include architectural design – site planning and co-ordination of all services; structural design – calculations, working drawings, joints, connections, panelisation and on-site supervision; training – on-site or in UK factories for client management, supervisors and operatives; production – design, specification and panel erection procedures including manning levels and building tolerances.

On the plant and equipment side, Crendon will provide full details and specifications of all plant and equipment, obtain standard "off the shelf" items, through their own or the client's resources, as well as non-standard items, and shipping arrangements can be made if required. Construction and commissioning can take place under the guidance of Crendon specialists in accordance with an agreed programme.

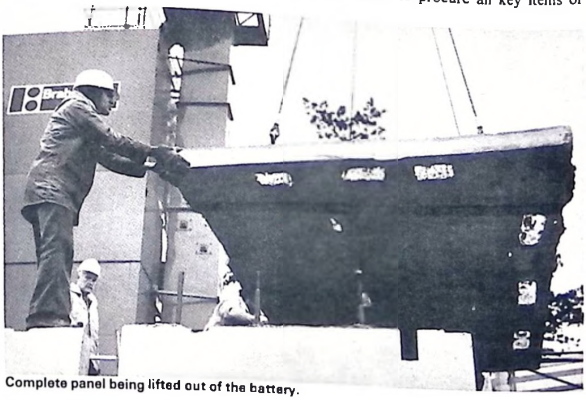
In addition to the Brecast system, Crendon offers frame systems. The CB4 Frame system is essentially a beam and column framework widely used and particularly suitable for industrial and office building. It is a design of proved structural performance in accord with CP110 and its use allows an infinite variety of elevational treatments, including two-storey arrangements and multi-span complexes. Spans can be anything from 6 to 25 metres, or even wider spans up to 40 metres where half beams post-tensioned on site are used. Bay sizes can be varied but a standard six metre module is the most economic. Unobstructed floor areas are increased by using valley beams in place of intermediate columns in multi-span buildings.

The VP 16 Portal Frame systems allow for single spans up to 24 metres. Multi-span arrangements and lean-to extensions are also available. Rafter overhang extensions can be provided in place of guttering where this is the local practice, or for use as a covered loading bay.

As with the Brecast system, a number of services are available on a worldwide basis. Feasibility studies include factory or site production requirements, plant and mould recommendations, management and manning levels plus technical control procedures. The company will also assist in preparing cash budgets, forecast profit and loss accounts, asset schedules and balance sheets to satisfy the requirements of banks and investors.

Accuracy

The most appropriate plant and equipment including the quality and accuracy of the moulds governs the whole success of the precasting operation. Crendon will use its experience to procure all key items of plant and equipment thus ensuring manufacturing quality.



Complete panel being lifted out of the battery.

The Crendon structural service dovetails with professional services so that almost any variation on standard frames can be accommodated and provision made for the fixings required to accept virtually any cladding system, windows, doors or other special architectural features required by the designer or in keeping with local surroundings.

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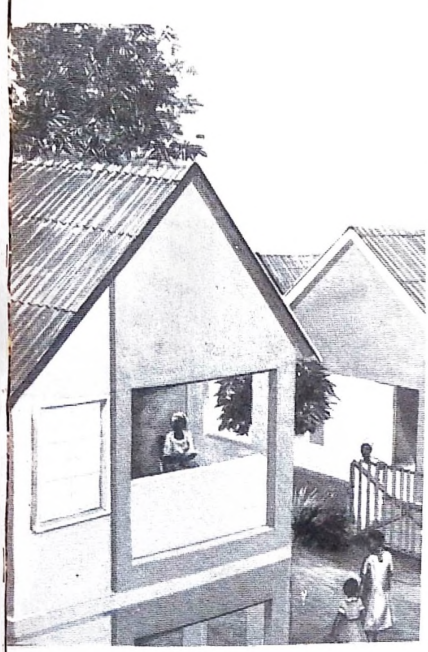

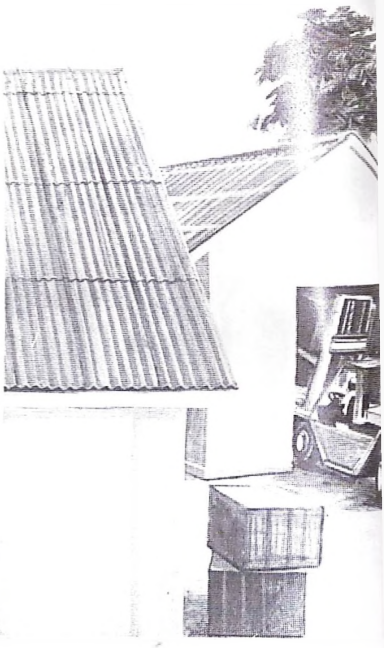

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CONTRACTOR'S FINANCE

In the fifth article of our series on contractor's finance, Derek Miles discusses the importance of cash flow planning and control for the survival and prosperity of a business.

WHEN BUILDING contractors are asked about their aims and objectives as businessmen, I find that the most popular answer is "survival" or "to stay in business" followed shortly by "to make a profit." Some amalgamate these answers, because they believe that they are bound to stay in business if all their contracts are profitable.

Unfortunately they are wrong. Certainly it is true that no businessman can stay in business indefinitely while making losses. But the converse statement does not hold good. In West Africa, as elsewhere in the world, there are numerous examples of contractors amassing large order books – made up of contracts based on comfortable unit rates which should show a profit – but ending up in bankruptcy or liquidation when their cash runs out. These businesses came to a sticky end as a result of "overtrading" or trying to cope with more work than they had funds available to finance.

Cash crisis

The sad thing is that many of the firms that meet their doom through overtrading are otherwise well-run, with competent technical and managerial staff and modern tools and equipment. Yet when the cash crisis comes, there is no time to capitalise on these strengths. Bankers will require a reasonable length of time to consider an additional loan or an extension of overdraft facilities, and private investors will usually be even more cautious before putting money into a business which is obviously in trouble. Meanwhile the cash crisis will cause the same kind of shock to the organisation that a heart attack causes in a human being. The cash – the life blood of the enterprise – will stop flowing, with the result that merchants will cut off supplies because previous accounts have not been paid and staff will start looking for more secure jobs if salary and wage payments fall into arrears.

Sometimes, even at this late stage, an "emergency operation" will prove successful. But again the analogy with medicine holds good, for prevention would have been much better than cure. Planning and control of cash flow is just as important as budgeting for profit, and these two aspects of financial management must receive equal emphasis if an enterprise is to survive and prosper.

Cash flow forecasts

Information is only worth having if it is available in time to influence decisions. So cash flow forecasts should be prepared before the contractor sends in his bids for major contracts, so that he can check in advance that he will have sufficient working capital to finance the work at every stage. Discretion really is sometimes the better part of valour, and it would be better for a contractor to miss the opportunity to carry out a contract than to take it on and find – too late – that his firm would run out of money as a result.

The principle of cash flow forecasting is quite simple. It is just a question of working out how much money goes out of the business and how much comes in. If, at any particular time, more money has come in than has gone out, the cash flow position will be positive and the contractor – and his bank manager – will be happy because his bank account will be in the black. But if, as is usual on building contracts, payments are quite a lot greater than receipts in the early stages, there will be a cash flow deficit and additional funds will have to be found to finance the work until payment is received from the client.

Separate cash flow positions

The building contractor's business is usually made up of a fairly small number of large individual contracts, so it is best to work out a cash flow projection for each contract separately. The overall position for the firm can then be obtained by adding together the separate cash flow positions (either positive or negative) on each contract at any particular time.

It is convenient to tabulate the figures for ease of calculation, and a simple example of the form that the calculation might take is shown below. It is always best to set down figures neatly when calculations of this kind have to be made, as much time can be lost due to mistakes when the figures are scribbled on a piece of paper. This applies particularly when additions have to be made horizontally as well as vertically.

	Payments	Receipts	Cumulative Payments	Cumulative Receipts	Cash Position
	£	£	£	£	£
January	200	–	200	–	– 200
February	750	–	950	–	– 950
March	1,050	600	2,000	600	– 1,400
April	1,100	1,000	3,100	1,600	– 1,500
May	900	1,400	4,000	3,000	– 1,000
June	850	1,000	4,850	4,000	– 850
July	400	1,200	5,250	5,200	– 50
August	100	850	5,350	6,050	+ 700

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International Construction Equipment '81

Organisers of the International Construction Equipment Exhibition '81 claim that this year's exhibition (23–28 Feb.) will be the world's largest indoor display of equipment used in construction, public works and municipal services. The exhibition follows hot on the heels of its American counterpart, Conexpo '81 (whose organisers, incidentally, also claim to be running the biggest show ever to date), and there can be no doubt that, like Conexpo, International Construction Equipment '81 will be the biggest of its kind, with exhibitors from the UK, West Germany, Italy, France, Finland, Sweden, Ireland, USA, Japan, The Netherlands, Belgium, Switzerland, Denmark and Czechoslovakia. The biggest stand (1,358m²) will be taken by the West German IBH Group.

The largest piece of machinery being exhibited by **Priestman** will be an entirely new crane, which will be unveiled by Priestman for the first time at the exhibition. Two key machines from the company's range of hydraulic excavators will also be shown: the 11 tonne Mustang 108S and the 17 tonne Mustang 168S. With two years of production behind it, the Mustang 108S has proved to be a success with a strong sales record at home and abroad.

In the larger size range, the Mustang 168S is the most recent hydraulic excavator to be launched by Priestman, at 17 tonnes and featuring a 1,100 litre bucket. Designed on similar lines to the proven smaller model, the Mustang 168S has been produced to meet demand for a medium sized excavator for general purpose contracting, pipeline work, drainage, scrap handling, and plant hire. Once again ease of operation and maintenance – aim to keep overall costs down.

As a Company in its own right, Taperex Ltd (the Priestman subsidiary) sells slew rings for countless applications across the world. The construction of the Taperex slew ring will be shown.

Priestman Lion 25. An entirely new model in this range will be shown at the exhibition.

New Godwin 36 x 24 Mark III "Goliath" mobile primary crushing plant, equipped with apron plate feeder and long-length discharge conveyor.

Concrete batching plant

Of the five machines being shown on the **Goodwin Barsby** stand three are making their first appearance at a European exhibition.

The new 36 by 24 Mark III "Goliath" mobile primary crushing plant has a vibratory feeder and medium-length discharge conveyor. (Choice is offered of alternative apron plate feeder and of long or short conveyor). Built for either fifth wheel or full trailer towing, embodying many design and specification advances aimed at maximum output with economical operation, site-to-site mobility, reliability and operator convenience and safety. It is powered by Caterpillar 3306T diesel engine developing 128.6kW (170bhp) at 180rpm. Belt-driven alternator powers feeder and conveyor electric motors.

A new constant rate weigh belt feeder is now incorporated as standard in aggregate feed units of the Goodwin range of "TurboMatic' drum mixing asphalt plants. This new 100 tonnes per hour continuous belt weighing feeder can be employed with equal success on other stone or sand weighing and feeding applications.

In TurboMatic plants, each feeder is linked into a computerised control console providing totally automatic selection and control of each feeder on any of up to 100 mix specifications. The computer also permits memory storage, call out display or paper print-out of individual or total feeder throughput tonnes. It additionally provides continuous digital display or paper print-out of individual or total feeder throughput tonnes. It additionally provides continuous digital display of feeder speeds. Facility is incorporated for a totally over-riding manual control on each feeder by adjustable control of feeder speed.

The "Mixabatch" is a completely self-contained mobile batch coating plant for patching and paving also on display. It has an optional hand spraying unit for coating surfaces with hot bitumen.

McConnell Power Arm 8, demonstrating self-levelling capacity – a useful attribute in trenching work. The PA8's tilting king post and hydraulic stabilisers ensure vertical trench sides despite sloping terrain.

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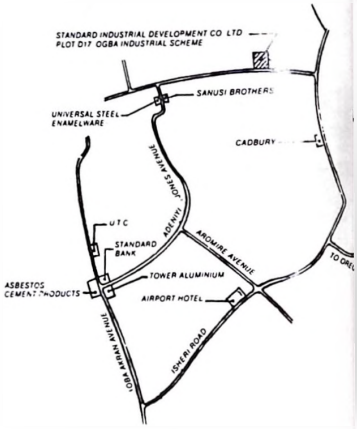

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Generators

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Special features will include the new Allam built generating sets, designed for the Bosch distributor network, and offering British engines for the first time on the range, coupled to Bosch alternators.

T[illegible]-RS heavy duty hydraulic rock-s[illegible] which can be equipped with a 3.5 c[illegible] (2.7m³) clam-shaped bucket – the n[illegible]ubit of Ruston Bucyrus Ltd.

[illegible] on show for the first time at N.E.C. w[illegible] special plastic pipeline fusion tools p[illegible]ced by Fusion Equipment Limited, w[illegible]n are powered by Allam generating s[illegible] and extensively used by the Gas industry and pipeline contractors. The new Allam/Bosch G.800 generator, made in Germany for the small tool, domestic and leisure markets, will be on display, to be distributed only by Bosch and Allam. The new generator offers low noise levels linked with a high quality compact design.

A big line-up of new plant will be exhibited by **Frederick Parker Ltd.** in February. New asphalt plants include the latest Series 2 "Drum-Mix" continuous drum mixing plant in mobile form, and a medium capacity fixed plant, one of a new range.

The "Drum-Mix", say Parker, provides a simple method of producing asphalt and is now available in five sizes. The low level plant on show has an output capacity of 220 tonnes an hour, and is 11m (36ft 1in) long and 2.2m (7ft 2in) wide.

The new range of asphalt plants is known as the "Blackmix" and comprises, basically, plants to service production requirements up to a maximum of 100tph.

Much importance has been placed on energy conservation. The burner on the dryer is of the latest spill back return pressure jet type fitted with a stainless steel air-/fuel mixing/combustion cone to ensure maximum heat release from the fuel.

Also at the show will be a new mobile sand and gravel plant incorporating a sand dehydrator made by an American firm Cindaco Inc, of Dayton, Ohio, which Parker are manufacturing under licence. The plant is equipped with a metric vibrating screen, one of a new series, and has an output capacity in excess of 100 tonnes an hour. The sandscrew, Parker claim, shows a remarkable saving on power and water consumption compared with some traditional methods of handling sand, and is ideal for incorporating into low static plants.

Bramosi zer mobile crushing and screening plant will be on show, along with a Bramobile 125, a fully mobile asphalt plant with a 100tph output.

New Coles Supertruck 820 crane with a lifting capacity of 20 tonnes.

Frederick Parker will be exhibiting the new "Black-Mix" 750 asphalt plant with an output of 75tph.

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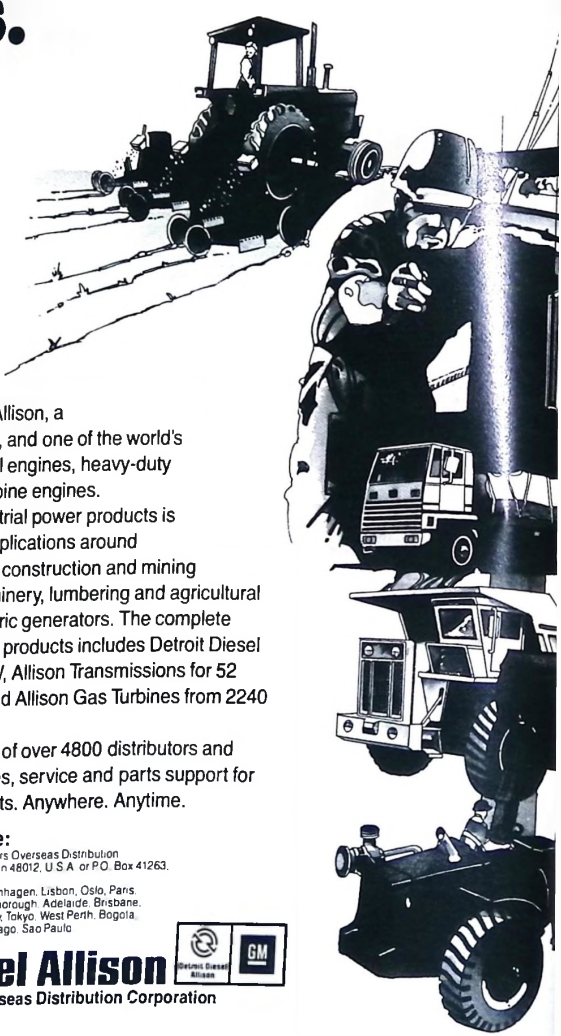

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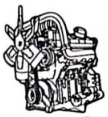

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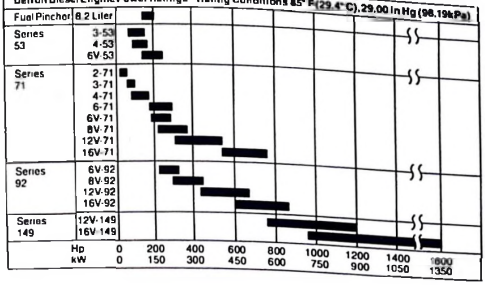

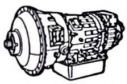

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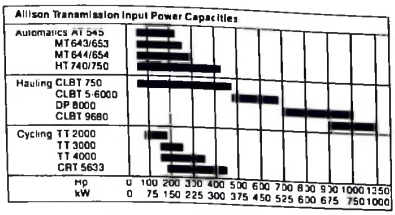

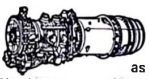

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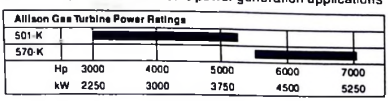

Stabilised soil has long been recognised as a useful type of building material. The cost of using unfired, stabilised soil is low and preparation is simple. S. D. Holmes, ARIBA, MNIA, MZIA, argues that greater use could be made of this material in the Third World and reports on tests carried out in Nigeria and Brazil.

Building with soil

SOIL IS still being used extensively as a building material throughout the world, particularly for low cost dwellings. Rammed earth, Swish, Tubali, Adobe and sun dried laterites are examples of soil building methods currently employed in developing countries. The way in which permanence is achieved is critical, for if protection is not applied scientifically durability cannot be relied upon.

It is generally recognised that the stabilisation of soil involves mixing and compacting soil with small quantities of binders. Soil stabilisation by vitrification is a well-known process of brick production and is not the subject of this article.

This article is concerned with the principle of using unfired stabilised soil as an alternative permanent building material, particularly suitable in the Third World due to its dramatic cost advantages over other materials. Cost savings arise from the reduction of manufacture together with the cost reductions for transportation.

During World War II and in the subsequent post-war period, road development in Western Europe and the US involved research on the use of stabilised soil apart from cement, many binders such as lime, bitumens, resins, chlorides, oils, polymers, silicates and industrial wastes have been tried for the stabilisation of soils and some of these have given satisfactory performance in the field. However, for soil stabilisation under varied conditions of climate and soil type the use of cement has found widest acceptance due to the ease of handling, satisfactory performance and substantial savings in cost as well as its general availability.

There are current developments in various stabilising agents but for the purpose of experiments with immediate practical application in developing countries, cement stabilisation has been selected as the most suitable method for study.

The characteristics of cement stabilised soil depend on the production criteria of soil type, mix proportions, degree and type of compaction, together with the manner of curing. An increase in cement content tends to reduce clay shrinkage, sharply decrease permeability and increase compressive strength. Flexural strength, modulus of elasticity and thermal expansion tend to be increased. An increase in cement content tends to reduce the shrinkage of clay due to the intergranular cohesion produced by the hydration of cement.

Moisture content of the mix is highly critical to final strength. Recent tests for block making at São Carlos University have shown that after 15 days curing, using a local soil, twice the strength was obtained with a mix moisture content of 18 per cent to that of 12 per cent. The crushing strengths were 80 and 40kg/cm² respectively.

For durability testing, the Road Research Laboratory, UK, recommend a laboratory compressive strength of 18kg/cm² after seven days curing at its moulding moisture to take care of all the durability tests specified in the ASTM Standards. The Central Road Research Institute of India has shown that in conditions where freeze and thaw tests are not essential a compressive strength of 11kg/cm² at seven days during is sufficient to satisfy weathering conditions in the tropics.

A valuable durability test is proposed by W. H. Ransom of the Building Research Establishment, UK, in his paper "Building with Cement Stabilised Soil". He recommends a water erosion test by spraying water on one face of a standard specimen. The durability would be assessed according to the loss in weight of the specimen.

The combined durability tests of compression, immersion, water erosion and impact resistance should provide sufficient information to predict performance in the field with reasonable accuracy.

For building use, the more granular soils lack sufficient cohesion while the soils with a high clay content are subject to variation in volume and tend to weaken through environmental moisture change.

The Highway Research Board USA in its publication on soil stabilisation recommends optimum particle size, liquid limit and plasticity index perimeters for ideal soils suitable for economic stabilisation. Soils with the most evenly graded particle size, below 5mm, require the least amount of cement and are well suited to brick and block manufacture.

Chemical analysis is difficult to perform and although iron enrichment and hardening seem to be associated in some way it has been generally accepted that hardening is due to the nature of the changes on dehydration. Fermor (1911) and McFarlane (1969) in Uganda agree that quite distinct physical types of laterite cannot be distinguished by their chemical content. As investigation techniques improve it may become possible to define the part that the iron and alumina content play but this is not of practical value for recognition in the field.

Laboratory and field experiments were carried out in Nigeria by the Ministry of Works, Kano, and the Design Unit of Santana Construction Company Ltd, using various local laterites. The particle size analysis of the laterites referred to in this article are given in the table shown.

Progress in the research and development of the soil stabilisation for building blocks, carried out in Kano between 1977 and 1979, is outlined below.

In the laboratory, cylindrical test specimens were compacted with a 2.5kg rammer in a standard 102mm-diameter Proctor mould. A set of six specimens were made for each concentration of cement from three to eight per cent using laterite type "1". Specimens with a cement concentration of three per cent tested after seven days during at their moisture content of moulding reached 19kg/cm². Hollow blocks made in the laboratory in a standard hollow sandcrete block mould compacted in 75mm layers reached only 7kg/cm².

Three laterites "X", "Y" and "Z" were selected for testing bricks of various mixes made in a "Supertor" manually-operated brick press. Consistently better results were obtained with laterite type "Y" and satisfactory bricks were obtained using a five per cent cement mix recording a crushing strength of 99.7kg/cm² after curing for 28 days.

Hollow blocks were made of the same mix in a Corbetta Compact sandcrete block-making machine. These blocks were sufficiently strong to build experimental building No. 1 but were too weak to withstand rough handling.

A series of steel moulds were designed to fit the sandcrete block machine with the object of producing solid blocks of varying sizes for evaluation. Following tests, the most convenient block size was found to be 220 × 220 × 110mm, the small size being due to the limitations of the machine.

Percentage passing BS sieve											
BS sieve No.	½"	⅜"	3/16"	7	14	25	52	100	200	Liq. limit	Plasticity index
Soil reference											
1	100	—	75.0	—	—	41.0	—	—	22.0	28.0	10.0
X	—	100	92.9	79.5	65.5	54.0	45.8	40.6	37.6	34.2	12.4
Y	—	100	85.4	68.0	52.0	42.0	34.0	27.0	17.6	22.5	3.1
Z	100	96.0	85.0	77.7	73.8	70.8	68.0	64.0	44.5	Negligible	

Table 1. Particle size analysis of various laterites found in Kano, Nigeria, selected for testing.

continued on page 123

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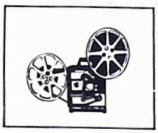

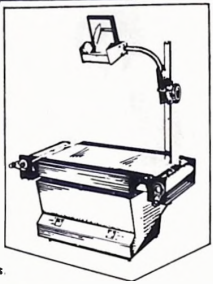

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continued from page 121

It was found that the addition of sand to the mix using laterite type "Y" resulted in reduced spalling of the finished block without detriment to strength. The block was of better appearance, easier to handle and less friable. Blocks of laterite type "Y" composed of cement, sand and laterite mixed in a ratio of 1:11:22 (three per cent cement) obtained an average crushing strength of 31kg/cm² when tested after soaking for 24 hours. They also remained fully stabilised after soaking for 28 days. These blocks were used to build experimental building No. 2 and a number of test wall panels.

The major implications of being able to reduce the cement content from, say, 14 per cent normally required for conventional materials to the extent demonstrated are evident.

A number of machines for cement stabilised brick and block manufacture are in commercial production but few of these are appropriate for developing countries. Block making machines are the subject of a later section.

Experimental building No. 1

The building was constructed on a conventional concrete slab acting as a raft foundation and floor slab. The walls were of hollow stabilised laterite blocks described. The blocks were dry stacked and staggered bonded with an average 5mm thickness of glass fibre reinforced cement render (grc). Comparative window, door, roof and parapet details were considered and these elements incorporated into the final building. The building has been on exposure test since June 1977, and shows no major sign of deterioration apart from the render cracking at timber lintel positions.

Laterite wall panels tested

The test panels for comparative evaluation comprised nine laterite based wall panels, 1.2 by 1.8m high and were composed of varying foundations, blocks, mortars, renders and finishes.

An experimental 600 by 750mm stabilised laterite trench fill foundation, compacted by hand in 100mm layers with cement, sand and laterite mixed in a ratio of 1:5:9, was constructed. All following ratios indicated are composed of cement, sand and laterite.

Blocks were made up in ratios of 1:5:9 or 1:11:22 using either laterites "X" or "Y". Mortars were of the same mix as the blocks in the panel. Renders were also of the same mix as the blocks in the panel but the laterite was first sieved through a 1mm mesh. Some panels were left unrendered and unpainted, others were rendered only whilst the remainder were painted either directly onto block or onto render. Cement paint was applied variously to the panels by brush, by hand tyrolean or by mechanical spray. A GRC coping was applied to all panels.

The panels have been on exposure test since April 1978. None show major deterioration although some putting has occurred to blocks and render using type "X" laterite with three per cent cement.

Experimental building No. 2

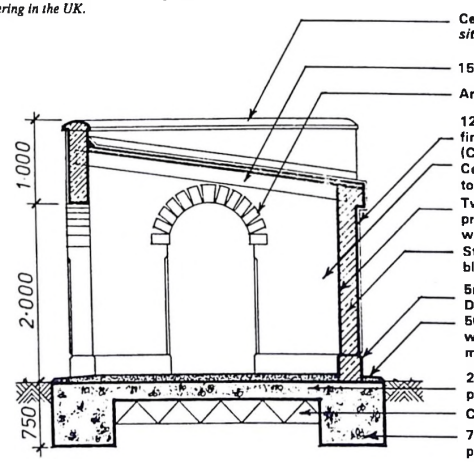
Subsequent to the test panels, experimental building No. 2 was designed and constructed to the following specification. Mix ratios given are all cement: sand: laterite. Floor finish of epoxy resin-based coating was laid on 50mm 1:4:5 screed to fall on 250mm 1:6:12 slab, compacted in two layers on compacted subsoil and integral to a 750 by 750mm, 1:5:9 trench fill foundation compacted in 100mm layers. The walls were stabilised laterite 1:6:12 solid blocks with 5mm GRC 220mm high skirting and termite barrier, plus an external coat of 12mm sieved and stabilised laterite render to the same mix as the blocks. The walls were finished externally with a tyrolean hand spray cement paint and internally with a two-coat clear silicon-based waterproofer.

Structural openings were formed by arches of the stabilised laterite blocks spanning 1.070m. Keystones were formed by cutting and shaping the standard block. 150 by 50 timber roof joists were built into the walls. Parapet walls were capped with 5mm GRC *in situ* render on *in situ* radiused stabilised laterite, finished with a cement paint. The building has been on exposure test since January 1979 and shows no major deterioration.

continued on page 124

Fig. 1. Cross section through experimental stabilised laterite building for Santana Construction Company Ltd, Kano, Nigeria, completed January 1979.

This article first appeared in the form of a paper delivered at a conference on Appropriate Technology in Civil Engineering, held in April 1980 at the Institute of Civil Engineering in the UK.



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Brick and block making machines

The most critical item affecting the adoption of stabilised soil as a construction material is the choice of production method. It is essential to know the characteristics and potential strength of mixes together with type, quantity and cost of stabilising agent. Once these facts are known together with an understanding of the local conditions and traditional building methods, a brick or block may be specified and the appropriate machine selected.

The range of stabilised soil brick-making machines presently available is limited whilst the manufacturers are widely spread. Few present designs are suitable for use in development countries whilst the range in type is wide. Products vary from small solid bricks through various sizes of solid blocks to different sizes of hollow blocks. Some machines have interchangeable moulds. The type of compaction may be manual, hydraulic, vibratory or by tamping or a combination of these. The power source may be manual, petrol, diesel or electrical. An understanding of local conditions will be essential for the appropriate selection of machine.

Manually operated machines currently available are the Cinva Ram (US), Tek-Block (Ghana), Landcrete and Ellson (South Africa), Supertor, Torsa and Tecmor (Brazil). Power-driven machines available are Supertor, Torsa and Tecmor (Brazil), various Adobe types from Adobe Patch (Texas and New Mexico), Latorex (Denmark) and Consolid (Switzerland).

The mass production and use of cement stabilised soil bricks is in progress in Texas, New Mexico and Mexico by firms specialising in Adobe. Mass production of stabilised soil bricks is also in progress in South America using the Brazilian machines mentioned above. The Tecmor machine appears to be the only one that can produce a conventional size hollow building blocks without exceptionally high plant cost. At a development near Brazilia Constructora Ocidental Stda have completed 1,500 houses at Citade Ocidental using soil cement bricks produced on the Torsa machines.

Conclusion

Stabilised soil currently being used in various parts of the world has been demonstrated as a viable building material. In experiments in Kano it has been shown that it may be used as an alternative to all conventional cement based mixes. This indicates the possibility of substantial cost savings and increased production without corresponding increase in the use of scarce resources.

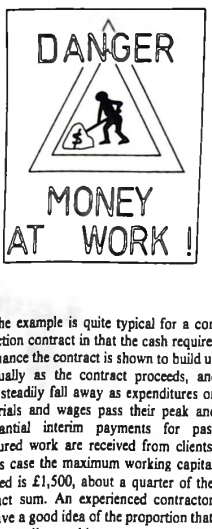
Further research, particularly for durability prediction by calculation, would assist in specifying mixes. A practical method of measuring the exact moisture content of a mix in the field would be of help in obtaining the optimum mix strength, and a fuller understandin advantages of longer curing times testing will all be valuable contribu the improvement of the science.

Not least is the development anc of a range of robust and simple m cal block presses similar in cost anc tion to the smallest sandcrete machines. This is important if stabili construction is to find general acc in developing countries. The demonstrated in that despite cc servicing requirements, some of tl trically-powered Brazilian machir already in use in West Africa.

Whilst considerable attention h given to the superstructure of buildi surprising that more use has not bee of the potential of stabilised soil f structures. The substructure is a element in building cost and undo substantial savings can be made in tl for one- and two-storey building stabilised soil trench fill foundatio integral floor slab demonstr experimental building no. 2 would have wide application.

The viability of using cement st soil as a building material on a ma duction basis in developed countr been demonstrated. Local applica lesser developed countries is a p need. Little further development quired to bring the technology duction and the detailing of building appropriate level for the widespread cement stabilised soil in the Third W

CONTRACTOR'S FINANCE continued from page 113



The example is quite typical for a construction contract in that the cash required to finance the contract is shown to build up gradually as the contract proceeds, and then steadily fall away as expenditures on materials and wages pass their peak and substantial interim payments for past measured work are received from clients. In this case the maximum working capital required is £1,500, about a quarter of the contract sum. An experienced contractor will have a good idea of the proportion that usually applies on his contracts, and this will give him a quick guide to the quantity of work that he will be able to take on without raising additional working capital.

Credit terms

Naturally a lot depends on the terms of credit arranged with both client and suppliers. A materials merchant who will give 3 months credit or a client who pays a "mobilisation" advance on a road contract eases the contractor's cash flow position considerably. On the other hand, clients who are slow to pay (regretably more common the world over) can raise the maximum working capital requirement to 50 per cent, or even more, of the contract sum.

Payment procedures vary from client to client. Some government departments and ministries are slow to honour certificates, and the credit-worthiness of private clients can also vary enormously. There is no substitute for experience (plus candid friends) in finding out which potential clients can be relied on for prompt settlement of accounts, and this should be a key factor in decision-making on whether, and how much, to bid.

Although cash flow forecasts can be produced for any time interval, even daily if required to cope with a short term emergency, for most purposes a monthly forecast is suitable. Intervals of more than a month might mean that a critical peak in cash requirements would be overlooked, while weekly or daily forecasts would be very time-consuming on a regular basis.

Contract programmes

Forecasts of both receipts expenditure should be based on t chart programme for the contract. T gramme will help the contractor to out when various materials and ponents should be delivered to the sit by adding on an appropriate credit p he can calculate when he will have t a cheque to settle with his supplier programme should also give an indi of the amount of work that is likely completed as each interim certific issued and, by adding an allowance f estimated delay before a cheque is ac received, the contractor can also cal the flow of probable receipts as the tract progresses.

In preparing cash flow projec allowances for overheads must be inc as well as other items of a non-t nature such as hire purchase and loa payments, bank charges and tax ments. Depreciation does not, how appear in cash flow calculations, beca does not involve any physical payme cash into or out of the business.

Cash flow forecasting should be se a routine discipline for the contractor. a hard fact that it is much easier to get a cash flow crisis than it is to get out and the contractor has to relearn every market stallholder accepts as a of faith – "paper profits are all very but you can't beat cash in the hand!"

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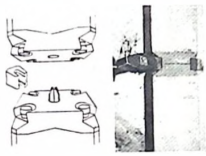
... is very simply constituted: ... dard (2 or 3m high) which ... equipped with notched cups welded at 50cm intervals; horizontal members having different standard lengths and both ends of which are equipped with a vertical wedge-key locked through the use of the hammer; diagonal braces and various ancillary components adapted to the peculiarities of the main applications (shipyards, civil engineering, stairs, towers, etc.). Made from tube of 48.3mm diameter and 3.2mm thickness, highly resistant to oxidation thanks to an anti-corrosion treatment which consists in laying a coat of epoxy resin, the Navental Tro may be assembled and combined with all the other Entrepose couplers and materials.

Mechanical splicer

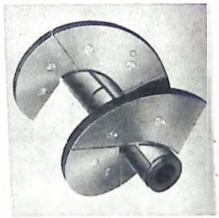
A new mechanical splice for precast concrete piles, developed in Sweden, has proved to be at least as strong in bending moment, tension, compression, shear and torsion as the two concrete elements being joined. It is also claimed to provide major economic advantages both in the factory and on site. The design is light and compact relative to its strength, is cheap to produce in quantity, and lends itself to production of either reinforced or prestressed concrete pile-sections ready for splicing. The actual joining operation requires no tools other than a hammer and can be carried out by unskilled labour in an average of two minutes so as to minimise loss of driving-time.



The joint consists of two identical halves. The splice-plates are ductile-iron castings, made to close tolerances, which fit accurately over the moulded ends of the pile sections. They are secured in position by steel bolts which screw onto the threaded ends of the cast-in re-inforcement-bars.

Auger assembly

Kenco Engineering, Inc. has made available their Auger Assembly designed to greatly extend the auger wear life of Martin Sidewinder Concrete Delivery machines. This assembly virtually eliminates auger changes to produce substantially reduced maintenance, downtime and hardfacing costs.



The Auger Assembly comes complete with Kenco bolt-on replaceable flight shoes, bolts and welded shaft shields that will result in up to ten times longer wear life than conventional A.R. flights. The assembly is designed to function as a standard 12-inch pitched auger, with concrete delivered equally as well as with 6-inch, 9-inch and 12-inch OEM pitched augers.

Kenco shoes have a wear lip that extends over the end of the flight to ensure optimum auger performance while the bolt-on design allows for fast and easy installation. With the Kenco auger system, only the worn shoes, not the whole auger, need replacing.

The hub or shaft is protected by Kenco shields which are fitted and plug-welded without distortion over the tube. Both the shoes and shaft/shields have a Birnell hardness rating of 550 to 650.

Selling storage and production shelter

Hünnebeck's Vario-Instant-Hall is a modular hall system, particularly suitable for rapid erection. The disassembled shelter is easily moved by lorry from site to site. All shelters are type tested and designed to DIN standards.

Vario-Instant-Halls are available in the following dimensions: Spans of 5,00m, 7,50m, 10,00m, 12,50m., any length in steps of 2,00m., gutter height for all spans 3,40m., roof inclination for all spans 15°.

On request, Vario-Instant-Halls are available with extra large doors for lorries and fork-lift trucks. Due to their adaptability Vario-Instant-Halls solve storage problems in all industries. Two to three men can erect the shelter in only a few hours.

Rack forklift

Rack forklift truck MR12, a battery operated type, from **Komatsu Forklift Co., Ltd.,** combines a mast turning up to 180° and a fork employing a pantograph reaching system, contributing to the saving of space in the warehouse.

For more versatility, three types are available to match the depth of pallets, providing free choice according to the accuracy of the road surface, required load, and the lifting height. With the use of the triple mast, a lifting height is possible up to 7,300mm and with the double mast up to 6,300mm.

MR12 is capable of moving outside the rack lane, allowing direct loading to trucks from the warehouse. Optional is an automatic material handling device capable of automatic loading and unloading by a button control, assuring a stable, easy work at high lift. To guarantee safer operations, it is standardly equipped with 4 systems of safety circuit – a low voltage locking circuit, a current limiting circuit, uncontrolled running checking circuit, and a thyristor protection circuit.

Safety fork truck

Like the safety car, safer fork lift trucks have been the subject of a great deal of discussion in the past. **Still's** R60 is an electric lift truck that thoroughly deserves the designation "safety truck". The 60 range offers lifting capacities between 1.5 and 4 tons, in half-ton intervals.

The most outstanding safety feature of this truck is its lateral stability. this is of particular importance in view of the fact that most fatal and other serious accidents with fork lift equipment occur through trucks turning over sideways.

The battery is extremely low between the axles and the cast iron counterweight is very low down at the back. The centrally pivoted rear axle has a high articulation point (this was possible because the battery is not located on the rear axle as it is in conventionally designed trucks).

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

IBA meeting successful

Despite the presence of North American, European and Japanese aluminium producers, and despite inherent conflicting interests among the membership of the International Bauxite Association, the Association's first meeting aimed specifically at discussing bauxite was judged to be successful. This is the gist of a report which appeared last month in the Financial Times.

The IBA's role is somewhat nebulous but it does not see itself as a price-fixing body such as OPEC. In the meeting, however, it did strongly urge that producers of aluminium pay its members a fair and equitable price. Earlier on in the year and more specifically, recommendations were made by the ministerial council of the IBA at Santo Domingo that the minimum price for exporting bauxite this year should be raised from between $26 to £30 per tonne, and that the minimum CIF price for ore sold on the European and North American markets should be two per cent of the average American metal market list price for 99.5 per cent purity aluminium ingot. These recommendations are not agreed with by all the members of the IBA, it should be noted.

Producers, on the other hand, were anxious that IBA members might adopt an export levies policy, despite reassurances of the IBA's Secretary General, Mr Mohammed Lamine Toure, that IBA members had no intention to pressurise the aluminium producers with taxes. Aluminium producers will, however, continue to be unsettled by the imposition of levies on production in Jamaica.

Leaving the market politics of the bauxite sector aside, the IBA went on to discuss the problem of energy and its relationship to the positioning of smelters and refineries. American companies are looking for locations near cheap energy sources. It was concluded that the West African countries along with Guyana and Surinam can harness water and hydrocarbons for generating power.

The IBA has, despite the very different needs of its members, proved again that it can serve a useful purpose by identifying common interests and developing a rapprochement with aluminium producers.

- Financial assistance has been requested from Arab countries – among them Saudi Arabia – by the Government of Upper Volta for the reopening of the Poura goldmine. An estimated £10 million has already been spent on the mine. The mine is supposed to have reserves totalling 20 tons.

Alumina output up

Production at Guinea's Frigua alumina refinery will be increased from 680,000 tons to 700,000 tons. Annual bauxite mining will increase to meet this demand by 40,000 ton/year.

This expansion follows the expansion of the refinery through a $33 million investment programme. Storage facilities and transport equipment will also be upgraded.

Senegalese mining sector

The Senegalese Government has embarked on various programmes to develop its mineral resources. Of particular concern is the decline in phosphate production. Phosphates are Senegal's most important foreign exchange earner next to cashew nuts. Decline in production can be traced back to the fact that present mines are rapidly being exhausted – new deposits need to be worked.

It is with this aim in mind that a three-year research and prospecting programme has been embarked upon. The first year of this programme is being financed by the Fonds d'Aide et de Cooperation at a cost of FF3.4 million.

In Eastern Senegal, about 730km from Dakar at La Faleme, iron ore deposits of great potential have been the object of research by the MIGERSO (Société des Mines de Fer du Sénégal Oriental) for some five years. Although situated a long way from the sea, the iron ore has important value in the long term: research has shown that the deposits comprise about 500 million tonnes, of which 250 million tonnes is magnetic mineral, and 250 million oxidised mineral. These reserves would allow a mining project of 12 million tonnes per annum of marketable product for a duration of 20 to 30 years. The market value of the mineral would increase during that time.

The Senegalese Government has decided to undertake feasibility studies concerning the mining of the mineral. The cost of these studies is estimated at 29 million French francs. The European Development Bank is participating in the financing of this project, with a contribution of 6 million francs, along with the German Federal Republic, contributing 8 million francs, and the French Fonds d'Aide at de Cooperation, contributing 5.2 million francs.

- The Nigerian Federal Government intends to build at ₦15 million carbonisation plant at Okaba Coal Mine in Ankpa, Benue State. It is hoped that once established the plan will provide great employment opportunities for the area and supply Nigerian Industry with coal, coal tar, coke, as well as providing the agricultural sector with fertiliser.

Uranium in Nigeria

Plans to develop Nigerian Uranium deposits have taken a step forward with the acquisition by Minatome SA of France of a 40 per cent shareholding in the newly formed Nigerian Uranium Mining Corporation Ltd (NUMCO). Minatome will carry on where the Franch state-owned concern BRGM left off exploration.

MINERAL PRODUCTION IN NIGERIA

(In tonnes, unless otherwise stated)

Month	Cassiterite	Columbite	Limestone	Petroleum (crude barrels)	Tin metal
1979					
January	298.0	60	144,797	75,785,026	224
February	358.0	53	112,337	68,114,145	283
March	383.0	62	221,138	75,498,981	253
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	n.a.	n.a.	n.a.	66,186,984	n.a.
November	n.a.	n.a.	n.a.	64,520,395	n.a.
December	n.a.	n.a.	n.a.	66,760,894	n.a.
1980					
January	n.a.	n.a.	n.a.	66,923,025[1]	n.a.
February	n.a.	n.a.	n.a.	62,323,009[1]	n.a.
March	n.a.	n.a.	n.a.	66,819,520[1]	n.a.
April	n.a.	n.a.	n.a.	66,676,510[1]	n.a.
May	n.a.	n.a.	n.a.	66,437,237[1]	n.a.
June	n.a.	n.a.	n.a.	65,859,900[2]	n.a.

[1]*Revised.* [2]*Provisional.* *n.a.=not available.*
Source: Central Bank of Nigeria, monthly report.

HANOMAG

Construction machinery made in Germany

Hanomag wheelloader 66 C, turbo-charged engine, 210 hp SAE net.

The Company

Hanomag. That means more than 60 years experience in construction machinery. Construction machinery renowned throughout the world – including the African continent. Until now these machines were supplied by Massey Ferguson. Today Hanomag belongs to the internationally operating IBH group which is continuing to use the existing sales network in the African countries for the sales and service of Hanomag construction machinery. This ensures that there is no break in the continuity of service and spare parts supply.

IBH

The IBH Holding Co. produces and sells solely construction machinery and equipment on the international markets. IBH today is Europe's largest group of construction equipment manufacturers.

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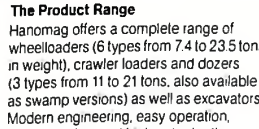
Hanomagstrasse 9 · D-3000 Hannover 91
Telex: 923381

The Product Range

Hanomag offers a complete range of wheelloaders (6 types from 7.4 to 23.5 tons in weight), crawler loaders and dozers (3 types from 11 to 21 tons, also available as swamp versions) as well as excavators. Modern engineering, easy operation, comfort, safety and high output – these are the determining standards for the construction and production of this product range.



For example wheelloaders:
Pace-setting in quality and technique made in Germany in accordance with strict quality norms. With optimal power flow from the motor to the floor. longlasting rugged engine, full powershift transmission, heavy-duty planetary axles – a thoroughly robust design.
Power – made full use of by engineering skill: one-hand controls, automatic two-stage-hydraulics and the already legendary crossover loader linkage.
Decide on the right machine – the one with the quality of Hanomag.

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Service aspects are already given sp attention during development, design production. This is shown in the funct ing efficiency of the machines, the ea maintenance and the simple access of components and assemblies.
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Telex 21255 Lagos

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Developments

Bonus for steel industry in Nigeria

Major discoveries of iron ore and coking coal have been made by the National Steel Council's mining and Exploration Division in Kwara and Benue States. These finds should play a crucial role in feeding the Delta and Ajaokuta steel plants presently under construction.

The major deposit of iron ore has estimated reserves of 360 million tonnes and is located in the Itakpe hills near Lokoja. A smaller deposit was found near Lokoja. Coking coal totalling 162 million tonnes was found near Obi in Benue State, while in Kwara State 4.5 million tonnes of limestone and 1.8 million tonnes of limestone dolomite has been found.

These finds back up the statement made by the chief metallurgist at the Metallurgical Research and Tests Division of the National Steel Council, Dr Justine Adigwe, at the end of last year. It is his contention that the country's steel industry will be completely self-sufficient in raw materials by 1990, while he predicted that limestone imports should cease in 1983. It has been calculated that steel projects in Nigeria will require 3 million tonnes of limestone, 1.5 million tonnes of coal, 1 million tonnes of clay, 100,000 tonnes of manganese and dolomite annually.

Gold for Sierra Leone

A surprisingly large deposit of gold has been found in Sierra Leone, according to a report in African Business. Gold has been found that is said to be richer and more accessible than gold in South Africa. The reserves have been known of since the last century but it was only recently realised quite how extensive the deposits are.

Sampling work has been carried out by a Canadian geologist, E. W. Bazinet; he has now teamed up with the Chairman of Gulfstream Resources to form a prospecting company called Eurocan. Eurocan has been granted a twelve-month exploration licence and is commencing work by drilling to a depth of a hundred feet. At present the company has not worked out a joint venture with the Sierre Leone Government, although it will probably be doing this as soon as its exploration licence runs out. It has been estimated that the mine could be operating at a rate of 5,000 tons of ore.

- Niger has started up coalmining at its first mine at Anou Areren. The first ton of coal was mined in October of last year. The mine will feed the thermal power complex in Anou Areren which will go into operation in 1983.

Exclusive rights blocked

Applications for exclusive mineral prospecting rights made by Union Carbide Rhomet and Corsyn Consolidated Mines have been blocked by the African Business Promotion Associated. The ABPA regard the exercise of exclusive rights by an expatriate mining company in Africa as damaging to the national interest.

The ABPA acknowledges the role foreign companies have in prospecting and mining resources in Africa but it believes that a country's interests can best be served and its resources conserved by mining minerals through joint ventures between indigenous and expatriate countries.

Uranium in Gabon

A new uranium processing facility in Gabon should be completed by December 1981. This will raise production from 1,101 tons in 1979 to a level of 1,500 tons. It has been suggested that when the main link of the Trans-Gabonese Railroad is completed in 1983, production may increase to 3,000 tons.

At present there are five companies prospecting for new deposits – two Korean firms, BP of Britain, Union Carbide and BRGM of France; export earnings from the sale of uranium accounted for 80 per cent of total earnings.

Finnish hydraulic rock-breaker

Over-dimensioned hydraulic cylinders and rods plus a built-in relief-valve system, make the unit highly resistant to shock.

HYDRAULIC BREAKERS which can reduce by 90 per cent the cost of breaking up over-sized rocks in mines and crushing plants, by avoiding the need for secondary blasting, are now available from Kone Oy of Salpakangas, Finland. There are two models – the Roxon 602, which has a working weight of 750kg, and the 602S weighing 880kg. Both are easy to attach to almost any excavator in the 7–20-tonne range. For permanent installation at grizzlies and on crushers, they can be supplied complete with matching LB 410 hydraulic link-booms.

The breakers deliver blow-energies between 1,500 and 1,600 Joules, and their pistons normally travel at ten m/sec over a six cm stroke, delivering between 300 and 560 blows per minute. Tools for rock-breaking and other duties include a moil point, a chisel, an extra-long chisel, a spade tool, a borehole tool, a pile driver and a compacting plate. The breaker can be fitted to an excavator or stationary boom from either its top or its side. A vibration-damping system protects the boom against stresses caused by the breaking action.

The Roxon 602/LB 410 assembly provides a safe and economical alternative to secondary blasting of boulders which are too large for the crushing plant. The boom is of deep-section alloy steel with a yield strength of 700N/mm^2. It has a slewing arc of 100°, a maximum elevation of 80°, and is suitable for grizzlies up to 3,500mm wide by 300mm long.

The LB 410 boom is equipped with self-aligning bearings. Over-dimensioned hydraulic cylinders and rods, plus a built-in relief-valve system, make the unit highly resistant to shock, and to lateral and torsional loads encountered when breaking or manoeuvring large boulders. To cut down stress peaks, the pedestal stands on a rubber plate, and the anchor bolts which secure it to its concrete base are provided with rubber washers.

Damage avoided

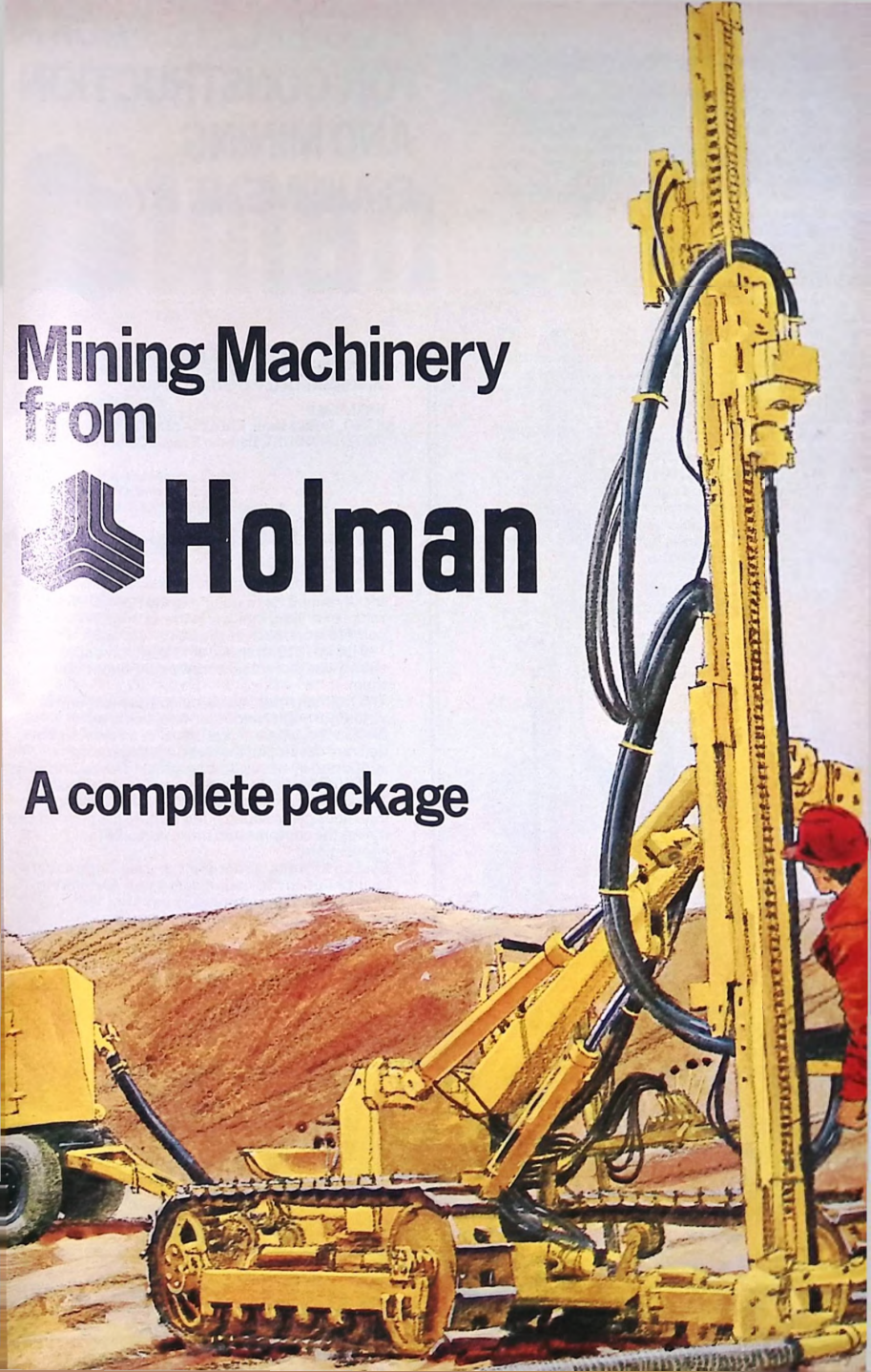
Major benefits of not blasting are that work near the grizzly can continue uninterrupted. There is no need to evacuate the area, and ventilation power can be reduced. The risk of damage to pipes and machinery is also avoided, while throughput is increased and savings are made in down-time on loaders and dumpers, and on compressor maintenance.

At the grizzly installation of a typical underground copper mine, with an annual production of one million tonnes, total operating costs per year (excluding wages) have been reduced by more than 90 per cent – from US$60,903 to US$4,733 – by using a Roxon 602 LB410 rock-breaker. The equipment is supplied complete with an electrically-driven power-back for the hydraulic system, which runs at low pressure (175–140 bar) to simplify maintenance.

The pedestal base occupies an area of 1,320 x 1,700mm, and the breaker is side-mounted on the boom so that headroom of only 4,000mm is required. Total weight of the boom, pedestal, power pack and breaker with tool and bracket is 4,000kg. A special dust- and noise-resistant operator's cabin can be provided.

Mining Machinery from Holman

A complete package



A COMPLETE PACK FOR CONSTRUCTIO AND MINING EQUIPMENT BY

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.

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Holman R045-170 'Hig Pressur Compressor

Ideally suited for matching to th Holman Vol range of drilling rigs, the Holma 'High Press compressors, such as the R045- 0, 450 ft^3/m 170 lbf/in^2 (210 litres/sec at 12 b), have some twenty years of rotary screw exp erience behi them.
The Holman rotary screw air compressor unit virtually trouble- and wear-free, being an oil-flooded, single-stage unit with an axial air delivery developed from two mating rotors supported by heavy duty bearings. The asymm profile of the rotors produces optimum efficie The extra air pressure from the high pressure machines gives added punch where it is need makes the compressors more versatile in application.
Built on a robust, girder-built chassis, large sq beam axles and all-round heavy duty leaf-spri suspension, the compressors have full 180° turntable steering allowing maximum manoeuvrability.
A choice of diesel prime mover is available.

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UG[illegible]mpass Trading Co. Ltd.
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Bu[illegible]us-Erie 88B

Bu[illegible]s-Erie 88B shovels are built especially robust to [illegible]stand the pressure of continuous heavy duty w[illegible] quarries and wherever digging is tough. Th[illegible] shovels feature heavy cast alloy steel main st[illegible]ures including crawler side frames, axles, car bo[illegible]es and massive revolving frames. Big clutches an[illegible] brakes, torque-converter drive and two-pin crawler pad design are all standard. Fast cycle times in most materials. Economical fuel consumption. Comfortable isolated operator's cab has low-effort graduated air controls. Now available in two versions; for hard rock, bucket capacities through 6¾ cubic yards, and as a loading shovel with 10 cubic yard rated capacity.

Aveling Barford 35 Tons Dump Truck

The Aveling Barford RD 035 stays on the job. Producing profit, no matter how rough the going. Incorporating traditional Aveling Barford superiority with features such as...

More Strength

A massive frame, having low well-balanced stress distribution resulting in high fatigue strength. A heavy duty exhaust heated big target body in hi tensile steel, providing maximum resistance to input and abrasion.

More Power

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

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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 u 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 choice of payloads from 17-50 tons.

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Rutile
Sierra Leone's Little Known Mineral

by John Madeley

Rutile processing plant.

SIERRA LEONE is known the world over for its diamonds; for forty years these gems have been the mainstay of the country's economy, accounting for over half of Sierra Leone's export earnings. But most of the country's best diamond deposits have been worked out and production has dropped substantially in recent years. Now a new mineral is coming on stream which could to some extent compensate for lower diamond output and place Sierra Leone at the top of the world league table for the output of a key industrial input.

The country's new mineral is rutile, which is as little known throughout the world as diamonds are well known. Sierra Leone has the world's largest proven deposits of rutile, although until recently great difficulty was experienced in bringing the mineral up to the surface. There are now grounds for hope that the chief difficulties have been overcome.

Rutile is 94 per cent titanium dioxide. It is found enclosed in schistose rocks and in clays and slates in the form of fine needles. Its crystals range in colour from yellow to reddish brown and in specific gravity from 4.2 to 5.2 according to the amount of ferric oxide present.

In processed form, rutile looks like shiny grey or yellow brown sand. The mineral is used to make a white pigment for high quality paint and in glass and porcelain manufacture. It also has strategic importance in that it is used for fabricating the metal titanium, which in its alloy form, is used in the manufacture of parts for aero-engines and sub-aqua vessels.

World output of rutile is at present about 500,000 tons a year. Australia is the largest single producer. If all goes according to plan, Sierra Leone will shortly be producing about 100,000 tons a year and rank second only to Australia in the output league. As Sierra Leone has bigger known deposits than Australia, the West African country could however become the largest single producer by the end of the nineteen eighties.

Sierra Leone's rutile deposits lie mostly within an area covering 520 square miles west of the River Jong and about 20 miles south of the Mokanji Hills in the Sherbro and Moyamba districts, and within accessible distance of Sierra Leone's capital city Freetown and the country's south-west coastline. Sierra Leoneans have been trying to mine their rutile deposits since 1980 but with only limited succe

Exploration problems

Determined attem[pts] to mine in way began in 1967. [A] firm called Si Minerals, a subsidi[ary] of the Pitt Plate Glass Company [tried] mining fo years near Gbangba[tok]. But the m proved extremely [la]stinate and reluctant to be broug[ht] up to the surfa 1971 the company [was] forced to defeat and close dow[n] the mine, very of the mineral having [sur]faced.

The dificulties the [co]n experienced chiefly technical and [the]ose largely be it attempted to use [the] same rutile m technology in Sierra [Le]one that had successful in Australi[a]. But this wa Western technology [that] proved u able for the very diff[erent] conditions existed in West Africa.

In 1972 the Gbangbatok Mine taken over by a new company, S Rutile Ltd. The American influence i company was again dominant, the company being 85 per cent owned b US giant Bethlehem Steel Co., and 1 cent by the Nord Resources Corporati

Technology

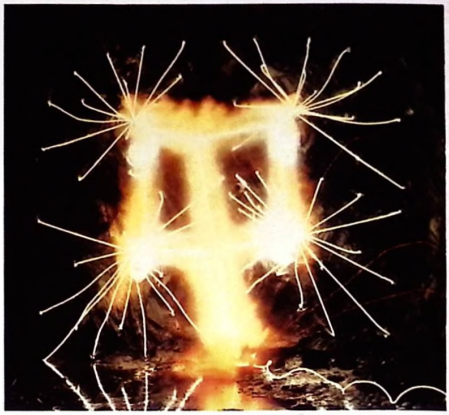
Since 1972 Sierra Rutile has engaged on intensive prospecting o area round Gbangbatok. Its prospe and development programme has inc the construction of six dams to c water for use at the mines, the buildin high dredge and wet table plant an habilitating a dry table plan Gbangbatok. The programme included the testing of suitable m methods and the designing of proce plants.

The dredge that has been construct a huge bucket wheel affair the size o office block. It was assembled in S Leone with parts from Britain, the U States and Malaysia. Paynes, a Br consultancy firm, designed the dredg was erected by contractors Ta Woodrow. The contraption works scooping mud out of the ground in buck the rutile is then processed and separat the wet table.

Sierra Rutile began mining on the March 1979 after seven years of prep tion and an investment totalling not short of $60 million. Some of this amo

conti

The spirit from the days of Alfred Nobel lives on in the creative activities of today.



A tunnel round with Nonel – the non-electric blast initiation system that is completely safe to all sorts of electric disturbance, at the same time as the hook-up offers maximum simplicity.

Nitro Nobel – pioneer in rock-blasting technology and the manufacture of explosives – presents the new generation of explosives!

Nitro Nobel, the first company of Alfred Nobel, was established in 1864 and this makes it the oldest manufacturer in the world of explosives for civil use.

The inventions made by Alfred Nobel and the creative genius and enthusiasm that characterized everything he did paved the way to a leading position for Swedish rock-blasting technology.

Completely in line with the spirit of Alfred Nobel, Nitro Nobel today is carrying out extensive efforts in continuous research and development of both explosives and blasting technology.

The latest evidence of this is DYNAMEX M – an improved and developed version of NG explosives.

DYNAMEX M produces a limited amount of toxic gases and this makes it very suitable to meet the severe demands being made today on working environment all over the world.

DYNAMEX M has an excellent store life and even after long periods of storage, it detonates readily and with a high velocity.

Because of its special composition, DYNAMEX M assures you an extremely high level of handling safety.

DYNAMEX M is available in the form of cartridges, plastic hoses and pipe charges.

DYNAMEX M in the form of cartridges is adapted for pneumatic charging, for example by using the automatic HF-51 pneumatic cartridge charger with a robot tamping device.

It is a pleasure for us to provide you with more detailed information about DYNAMEX M.

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represents loans from the US government, EXIM Bank and other financial insititutions.

Mr David Fraser, Company Vice President, said a few weeks before mining started, "I can assure you that the operation will be a success. The project is five times bigger than it was before; we have invested more and will make a larger contribution to the Sierra Leone economy".

Target set

Mr Fraser was then hopeful that in the first full year of production, about 50,000 tons of rutile would be mined. Whilst the final figure is not yet available, it seems likely that the forecast is not too far astray. The new technology has been successful in bringing rutile to the surface where previous technology had failed.

In November 1979, seven months after mining started, the first shipment of rutile sailed from Freetown to America; 7,000 tons was then exported to the American Cynamid Company of Savinnah in Georgia.

Sierra Leone's entire rutile output will at first be exported but Mr Fraser believes that some of Sierra Leone's own factories may eventually buy and use the mineral. One very important additional benefit to the Sierra Leone economy of the new mine is that 700 jobs have been created.

Potential profit

Sierra Rutile is to pay the government a royalty of $4 per ton of rutile produced, plus 50 per cent of profits. Should 100,000 tons a year eventually be produced as forecast, then sales of the mineral should bring in some $25 to $30 million a year and account for around 10 per cent of Sierra Leone's export earnings. It would be possible for the company to process more than 100,000 tons a year if round the clock working was established. As world demand for titanium is growing on average by 12 per cent a year, the demand for rutile also seems likely to be buoyant.

More rutile mines are expected in the next few years. A st concentration of the mineral is th exist some 35 miles from Gbangb a new mine is likely to open there.

Alluvial diamond mining – Sierra Leone's reserves are running low.

that the technical p lems contin overcome, then ru could thrust Leone to the head o e world outp for a mineral little nown to the public, but vital for a range of indus different parts of the world.

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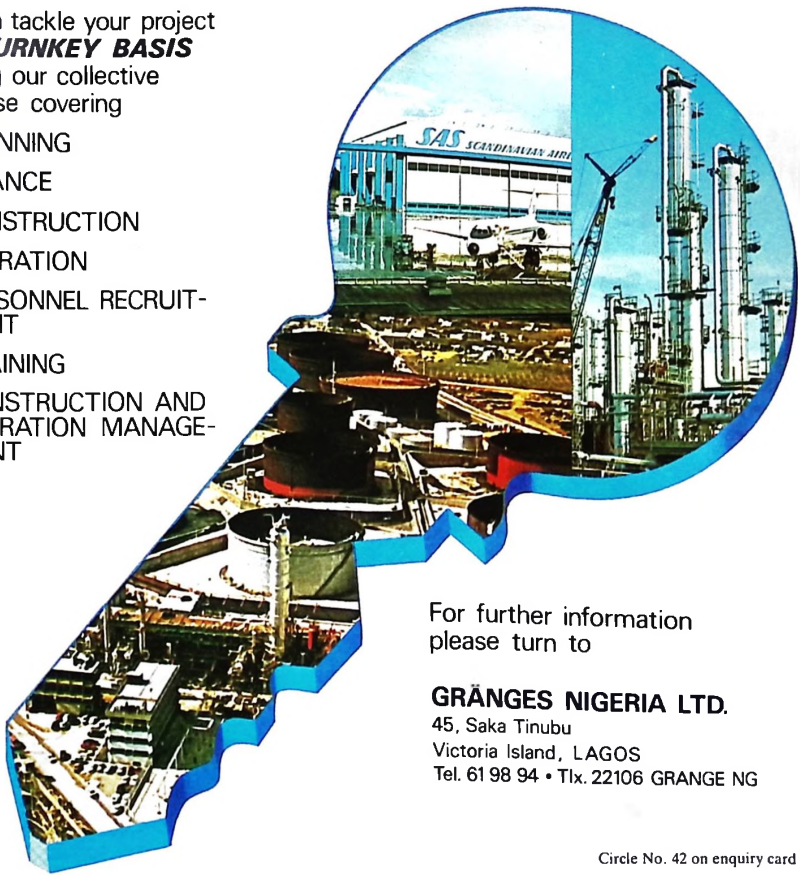

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Materials handling in opencast mining

Alan Kennedy looks at materials handling developments and assesses their potential for the West African Mining sector.*

MANY OF the larger-scale mining operations in West African countries are open pits – for example manganese and bauxite mining in Ghana; the important iron ore mines such as Bong and Nimba in Liberia: bauxite mining at Moyamba in Sierra Leone; and, looking at proposed new projects there is the Nigerian Steel Development Authority's iron ore open pit concentrator at Ikakpe, Kwara State; new opencast bauxite, alumina and [illegible] projects in Ghana and Sierra Leone; new iron ore mines and expansion programmes at Mt. Tokadeh and in the Agbaja range in Nigeria.

Efficiency

The system chosen for handling ore and overburden in large mines such as these – and in the smaller, more numerous quarrying operations – is of particular importance in determining the efficiency and viability of the project. Equipment must be chosen not only for its ability to do the job – handle ore or waste rock in the tonnages required – but must be chosen for maximum utilisation; should spare parts and major servicing be required, a suitable dealer network should exist to ensure that downtime of costly plant and equipment is kept to a minimum.

This generally means choosing (particularly when the mine is sited away from large manufacturing or industrial centres) well-established makes of equipment and machines that have been tried and tested over long periods in similar working environments, rather than going for the very latest designs.

The basic decisions are concerned with what types and sizes of euipment are to be used for handling and transportation of ore and waste within and from the pit to concentrating plant or other destination; and what system of transportation is to be used over longer distances – for example in the case of a product which is to be exported, from the mine or plant to the port.

Regarding the first consideration – the choice of loading/transport equipment for fragmented ore and waste within the pit – there is little doubt that hydraulic shovels are increasingly making their presence felt as primary production units.

Compromise

These shovels probably reflect an almost ideal compromise between conventional cable type shovels and front end loaders, and are making bigger inroads into open pit mine production, particularly at smaller operations. The most noticeable development in this field is the increase in the number of manufacturers offering models and the increasing unit size. Major companies in the field include Demag, Koehring, Liebherr, Orenstein & Koppel (O & K) (which produces the mammoth RH300 – the largest hydraulic mining shovel in the world with bucket sizes up to 30m³) Poclain, P & H and Caterpillar.

The lower overall weight of the hydraulic shovel when compared to a cable shovel is particularly advantageous. This coupled with a simpler layout makes for a much more acceptable machine. Another specific advantage is the knuckle action which is achieved with the buckets of hydraulic machines. This allows the bucket to be loaded by rotation rather than having to draw it though the bank.

In selecting this type of equipment the particular make is often largely determined by availability of back-up service and spares; companies such as O & K and Poclain for example are represented throughout Africa and the former company has many hydraulic shovels in mining applications on the African continent: for example two RH30 electrical type hydraulic shovels with 3.1m³ bucket capacity quarrying limestone in Zimbabwe; RH30's in Egypt's largest quarry; and RH12 backhoe type hydraulic machines recently ordered for digging tough diamond-bearing kimberlite in Zaire.

The means by which broken ore and rock is loaded and transported to a crusher, plant or other destination presents a wide choice. In most instances truck transportation within the pit is chosen, although now there is a trend towards in-pit crushing of rock or ore by a mobile crushing plant, with conveyor belt transportation out of the open pit. If truck transportation is opted for, apart from a decision on unit capacity, there is a basic choice between rigid-frame or articulated trucks.

Trucks

Articulated trucks, although available only in capacities up to about 55 tons at present, are increasingly being chosen for opencast mining work, particularly under conditions of adverse climate of terrain. The articulated dumptruck has the major advantages of traction flotation, gradeability (it can climb slopes) and

continued

Trucks are increasingly being used for open cast mining work. Here a 40 tonne DJB truck with all sheel drive and articulated frame.

*Alan Kennedy is Editor of Mining Journal.

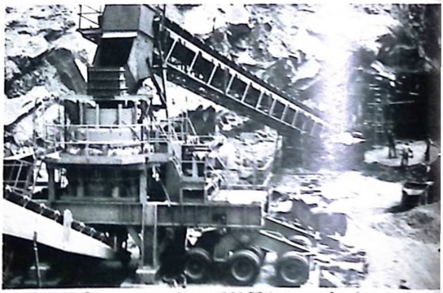
Bergeaud

crushing equipment

A [illegible] TPH mobile primary jaw crusher (1 080 m wide) in The Ivory Coast

A 200 TPH mobile plant in Nigeria

The primary section of a 200 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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The British company DJB, which produces a wide range of articulated trucks using a high percentage of Caterpillar components has one of its trucks hauling 2,500 tons of aggregate a day from a mining face to the crusher at a quarry on the Ivory Coast. The use of Cat components in these DJB trucks means that the customer has the backing of the best and largest equipment distribution network in the world – and this applies to West Africa.

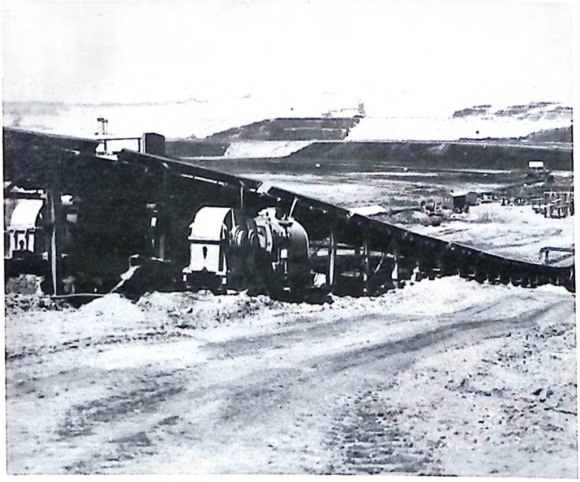
The rigid-frame off-highway truck, which has been made in sizes up to 300 ton capacity, was expected a few years ago to continue increasing in size, although the most widely used are in the 50 to 170 ton range. Mechanical transmissions are fitted in the range 50 to 85 tons with electrical transmissions for 85 tons and larger. The development of the larger sizes of diesel-powered equipment has been dramatically slowed by the very large increases in fuel costs over the past few years. Such increases have also led many open pit operations with big truck fleets to find ways of reducing the fuel bill.

A recent example is at two very large open pit mines in South Africa – the Sishen iron ore mine and the Palabora copper mine – which are to adopt a system known as "trolley-assist". The 150 ton Lectra Haul and Wabco trucks used at Palabora are diesel-electric units whose diesel engine powers alternators which in turn supply electric current to motors driving the rear wheels. The trolley-assist system will enable the wheel motors to draw power directly from overhead conductors on certain routes in the mine. The trucks would then revert to normal diesel-electric drive on other routes.

This type of system gives very impressive reductions in fuel consumption and hence costs; consumption of loaded haul trucks can be reduced from 24 litre/km to only 3 litre/km with trolley-assist.

In the West African context, there is of course the problem of adequate electrical power supplies for such a system; but the example does illustrate how a long-life mine, designed and costed under a particular set of conditions is forced to adapt to external developments.

Aerial ropeway with buckets – widely used in West Africa, here at the Ashanti gold mine, Ghana.



Conventional long distance conveyor.

Mobile crushers

The installation of a mobile crusher within the open pit or quarry is finding increasing usage, and offers a number of advantages. A recent example is for an extension of the Shagamu cement plant, for which the West African Portland Cement Co. Ltd. of Nigeria ordered a second mobile crusher installation from O & K. This unit can be moved in any direction by means of pre-programmed electronic multiple-way steering. Even diagonal travel or turns on the spot are possible.

Travelling speed can reach 400m/h and the crusher has climbing capacity of 10 per cent. This crusher is fed by a dragline, the feed material, limestone and marl being discharged from the feed hopper by an apron feeder with a maximum conveying capacity of 750 ton/h and fed to a double-roll crusher. The material throughput of this crusher is rated at 500 tonnes per hour at a maximum feed size of 1,000mm. The finished material has a size of 0-150mm.

Beneath the crusher, the material is discharged by a conveying belt and fed to the slewing belt which loads the crushed product into trucks. The crushing and travelling operation is controlled and supervised by a common control panel in the operating cabin.

The technique of in-put crushing offers many advantages, not least of which is the mobility of the unit – taking the crusher to the raw material rather than vice versa; other benefits are elimination of large rock lumps which are difficult to handle, frequently require secondary breaking, and can damage conveyors, trucks or other equipment and cause production stoppages. A uniformly-sized, steady flow of product from the pit or quarry offers obvious advantages.

Alternatives

Mines and quarries are frequently sited in remote locations, with a minimum of infrastructure. To get the product to its destination – whether a port, plant, steelworks or whatever – a number of alternative handling systems are available: road or

rail haulage; using an overhead ropeway; various types of conveyor systems; and forming a slurry of the product and transporting it hydraulically in a pipeline. Road or rail suggests a well-established infrastructure, frequently not existing in the sort of locations where mines are developed.

Aerial ropeways such as those engineered by Breco (British Ropeway Engineering Co. Ltd.) are basically overhead cables carrying a series of open or enclosed buckets. They are widely used in the extractive industries in West Africa – particularly Ghana, where typical installations transport gold ore at rates up to 100 tons per hour from the mine (in these instances underground mines) to a crushing or treatment plant.

A ropeway should be given serious consideration if the problem is to transport materials distances of from about 1km to 10[illegible] or more, in daily quantities of up to 12[illegible]ons (or 4 million tons per year).

[illegible]ropeway is usually routed in a st[illegible]ine from loading to discharge. Ch[illegible] of direction are easily within the c[illegible] of the system; it is not common to d[illegible] ropeway in sections eight km or m[illegible]ength, depending very much on h[illegible] the terrain is to be crossed. Long r[illegible] are thus made up of several sections, the buckets transferring without st[illegible] from one section to the next.

[illegible] are many advantages to a ropeway: its path can be crossed without b[illegible] or traffic control, while the ropeway itself can cross rivers, roads, railways and housing with light protective structures if necessary; it is quiet in operation; it consumes a minimum amount of power per ton carried; it is dust free; it requires few operating personnel; it is minimally affected by climatic extremes; and it has a very long life.

Long-distance conveyors

Particular types of long-distance conveyor systems which have attracted wide interest in the mining world are the Cable belt (made by the UK based company of the same name); and the "Stereoduc" and "Curvoduc" conveyor systems offered by the French company Realisations d'Equipments Industriels (REI) of Paris.

The basic feature of the Cable Belt is separation of the carrying medium from the driving medium, as opposed to the conventional troughed belt conveyor which must fulfil both these functions. In the Cable Belt, driving tensions are transmitted by two endless, steel-reinforced drive cables, one at each side of the belt, the belt being required only as a carrying platform for the ore, coal or crushed rock. The drive cables, with the belt sitting on them, are supported on pulleys spaced at regular intervals along the conveyor, spacing (depending on conveyor loading) varying from 4m to 10m. The overriding advantage of the Cable Belt is however that it is one of the most energy-efficient methods of transporting bulk materials.

This type of installation is in use around the world carrying alumina, bauxite, coal, iron ore and many other minerals. An installation in Brazil carries 1,000 ton per hour of iron ore over mountainous country for 14,180ft over a total vertical fall of 950ft. Another interesting feature is that, if the conveyor must make a sharp change of direction (where simple curving of the conveyor was not possible) angle stations can be incorporated which give these sharp directional changes (both horizontal and vertical); the angle stations do not require a separate drive station or an operator.

For some 20 years REI has been designing and developing continuous systems for handling bulk products by conveyor belt known as Stereoducs – basically, a very long conveyor belt of conventional design i.e. resting on roller idlers, but using steel cord reinforced belting and having only one, specially designed drive station. A particularly impressive installation is the 13,336m long conveyor (currently the

Curvoduc by REI – not yet in use in West Africa, but the company plan to market it in West African countries.

longest in the world, although longer ones are to be installed underground at the giant Selby coal project in England by the mid-80's) carrying nickel ore in New Caledonia, which was installed in 1970. A more recent REI development is the Curvoduc, a conveyor transportation system over very long distances, able to negotiate bends in both the horizontal and vertical planes. An 11km long curved conveyor was recently installed for nickel ore at Mea, New Caledonia; it has eight curves in the vertical and four in the horizontal plane on its route.

Hydraulic pipelines

Finally, mention should be made of the potential for long distance mineral transport of hydraulic pipelines. There are now many examples of these, some in remote areas; one such is at the Ertsberg copper mine in West Irian, Indonesia. Here a 69 mile long 4½in o.d. pipeline with a ¼in wall thickness carries copper concentrates from the mine to a port over the most rugged country, involving an altitude drop of 9,000ft. In certain instances such as this, pipelining is the best – if not the only feasible method.

FETEX exhibitors

Buttock shearer

Scottish-based mining machinery manufacturers **Anderson Strathclyde** showed a brand new product at the British FETEX '80 Exhibition and Symposium in December.

On the Anderson Strathclyde stand was the AM420 Buttock Shearer, a purpose-built, floor-mounted bidirectional shearer which is intended to operate in thin and medium sections. The machine has been designed specifically to operate in conjunction with Anderson Strathclyde's Roll Rack chainless haulage system which will also be on show at Harrogate.

An AM420 is at present undergoing extensive tests at the NCB's Mining Research Development Establishment at Bretby and the company expects that two of the machines will be operating with the NCB later this year.

The AM420, which has been developed from experience with Anderson Strathclyde's AB16 Buttock Shearer, will offer a number of attractive features for seam sections down to 762mm (30in.) including: installed power of 200kW on 50Hz (50 cycles) or 224kW on 60Hz)60 cycles) supply; high tractive efforts; haulage speeds of up to 0.122m per second (24ft per minute); simple three-section machine construction with the minimum of external trim; automatic roll steering for improved horizon control; and ranging boom facility, including the ability to rip at face ends.

FETEX marked the first appearance of Anderson Strathclyde's newly developed armoured face conveyor and stage loader which incorporates a four-toothed sprocket tailend.

Hydraulic drilling unit

Torque Tension Limited of the UK has introduced onto the market a "New Rubber Tyred Low Height Hydraulic Drilling Unit".

Built around a sturdy four-wheel-drive, skid-mounted steering chassis provided by the Fletcher Torque Tension Company in the States, this type of vehicle is used extensively in room and pillar mining and other mining operations overseas.

Apart from being highly "compact" and "low" in height (just 1.5m high) the base is equipped with a well-designed control station for clear-sited operations.

Over and above the cleaner working environment normally obtained using hydraulic drilling techniques against that of pneumatic equipment, the machine is also equipped with dust extraction units at the point of drilling. Improved lighting facilities are also a main feature with high intensity light units fitted fore and aft of the machine.

continued on page 157

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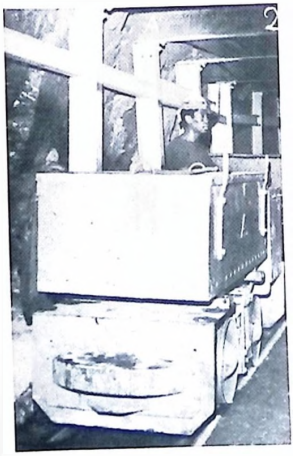
Gold mining in Ghana

– redevelopment for the eighties

Ghana's gold mining industry could have a key role in rescucitating the country's economy. (Below) A haulage drive on 25 level in Ashanti gold mine.



OIL HAS now become the black gold of West Africa, but what about the real thing? Gold has come back into the news again, and Ghana is the country which mining companies will be assessing carefully this year. The Ghanaian Government is trying to initiate something of a Renaissance in goldmining by proposing the development of 14 mines at a cost of $3bn.

Seminar

As a practical gesture to the potential investors the Government held a three-day seminar at the beginning of this month in Accra to make public the fact that Ghana has a mining potential of 2.7 million ounces of high grade, easily accessible ore which could be mined every year for 200 years within an area of 4,112 sq km. The seminar did not come out of the blue; back in November of last year the Daily Graphic reported that the Obenmase goldmine in the Ashanti region was to be reopened following the discovery of substantial gold reserves at Petrensa, Kwakoko and Obenemase. Moreover, the seminar was partly based on a report drawn up last year by a Government committee in collaboration with Lonrho.

The basic problems which faces the Ghanaian Government is a lack of foreign expertise and capital. In order to obtain this, the Government will have to compromise heavily in its relations with foreign companies.

Since independence, the *ad hoc* approach of successive governments to establishing a mineral policy has deterred a lot of would-be investors; already the Government has shown itself willing to make substantial concessions, being prepared to revise the guidelines of equity participation in joint mining interests, reassess management agreements, provide for the repatriation of capital and dividends and improve the conditions of service for expatriate technicians.

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Mining and Quarrying in West Africa

Taxation

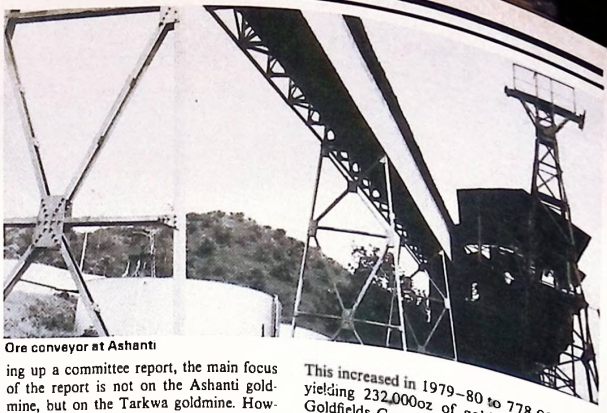
The question of taxation was treated in a more general manner. This has, since Independence, been a sticking point for many expatriate companies, many of them feeling that the burden of tax should fall on profits not on production. Mr Lloyd Qhashie, head of the committee and deputy managing director of the Ashanti Goldfields Corporation, admitted that Ghana taxed more heavily than other gold producing countries in the world, and the Government now says that the present tax system is being investigated with the aim of bringing it in line with that of other countries.

As a more precise indication of what sort of mining prospects mining companies could expect from Ghana, the seminar in January drew attention to the fact that Ghana has over the years abandoned over [illegible] mines and sites. Forty of these, it was [illegible]tained, could be put into operation [illegible] the next three years.

The [illegible]dmining sector of Ghana can well [illegible]th this boost. The fortunes of the G[illegible]mines have declined considerably [illegible] the halcyon days of Gold Coast pre[illegible]g when 35 goldmining companies [illegible]e operating (as compared with 11 [illegible] Ghana has now dropped from be[illegible]fifth biggest gold producer in the wo[illegible] being the tenth biggest gold produ[illegible] On an international level, the price of [illegible] (which has only picked up recently) has [illegible]een another factor inhibiting the development of mines.

Despite Lonrho's involvement in drawing up a committee report, the main focus of the report is not on the Ashanti goldmine, but on the Tarkwa goldmine. However, Lonrho, who own 45 per cent of the Ashanti goldmine, obviously stand to gain by the Government's gold development plans. Ashanti is still potentially the richest goldmine in the world – in fact the Ashanti fissure extends the entire length of Ghana and is its main lode bearer – but it is very underworked.

Provided that gold prices hold, the Ashanti goldmine's purest ore (6oz of gold per tonne) can start to be mined again. In the 1978–9 period 668,000 tons were mined in Ashanti, bearing 238,000oz of gold (by comparison the current level of output of the Tarkwa mine was 240,000tons, yielding 37,000oz of gold). This increased in 1979–80 to 778,000 tons yielding 232,000oz of gold. The Ashanti Goldfields Corporation now have plans to sink a new major shaft at the south end of the mine, since 1979 ore has been found on levels 16 and 22 of the mining, showing great potential.

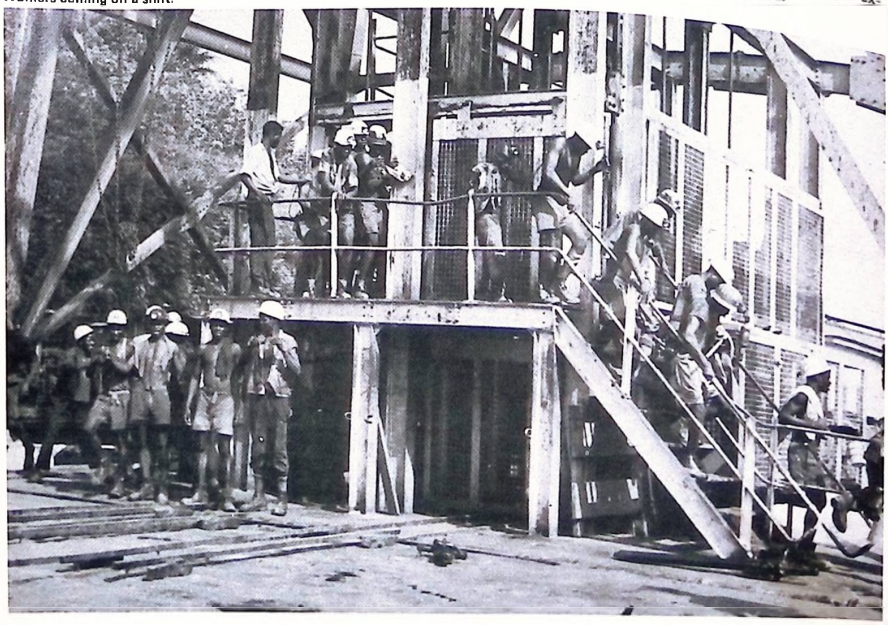


Ore conveyor at Ashanti

Economic upsurge

The development of Ghana goldmines could be a crucial factor in the rehabilitation of the economy. The gold development policy coincides with an optimistic mood on the part of aid agencies and international business. Loans have recently been made and contracts awarded in Ghana. An increase in gold production could provide the necessary foreign exchange to continue this trend.

Workers coming off a shift.



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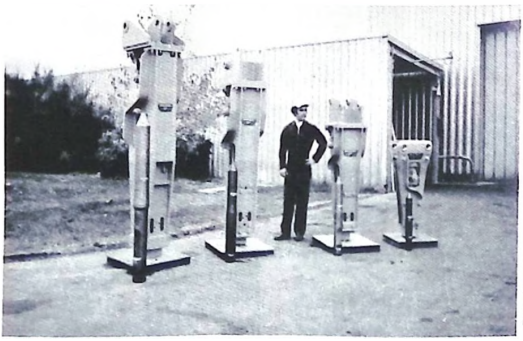

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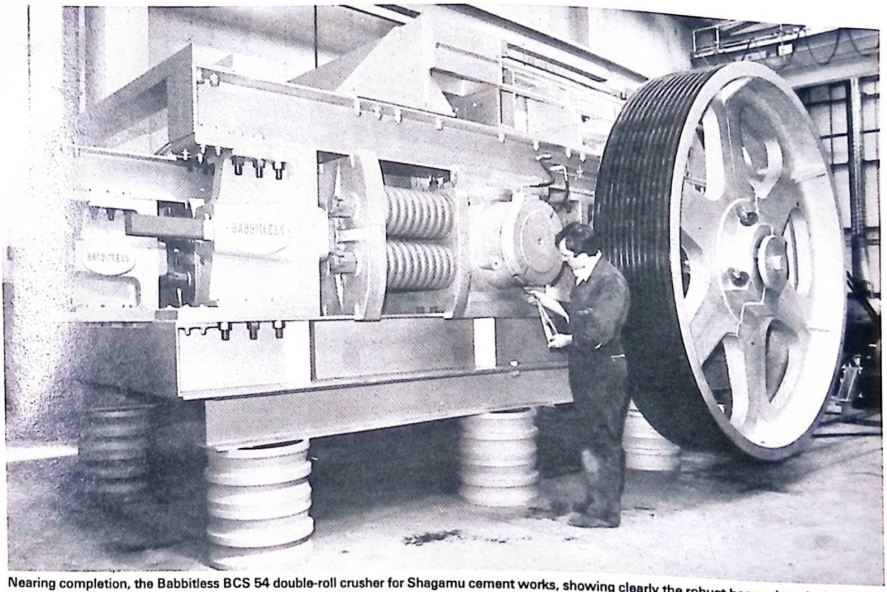


Nearing completion, the Babbitless BCS 54 double-roll crusher for Shagamu cement works, showing clearly the robust heavy-duty design.

UNDER a contract worth over £250,000 Babbitless Co (GB) Ltd have designed and built a double-roll hard-limestone crusher for a cement works extension at Shagamu, Nigeria. Babbitless also supplied an identical machine for the original works.

The new crusher, which has an installation weight of 64 tonne, is designed for an output of 500 tonne/h of limestone, sized 0 to 150mm, with a maximum of 15 per cent oversize stone. The product will be crushed from input material with dimensions up to 1,100mm×900mm×750mm. The limestone at Shagamu has 15 per cent clay inclusions and, in the rainy season, the moisture content of the clay can be up to 25 per cent. Babbitless double-roll crushers are well suited to handling the resulting "sticky" material.

The new machine was ordered by F. L. Smidth / Co Ltd, who are main contractors for part of the West African Portland Cement Company (WAPCO) extension at Shagamu. Technical consultants for the project are the Engineering and Process Division of Blue Circle Industries Ltd, which also has interests in WAPCO.

Crushing rolls

The crusher for Shagamu is a Babbitless BCS 54 double-roll type. The two rolls run with 5 rev/min speed difference to prevent the build-up of sticky material between the crushing teeth. The speed differential is obtained by fitting appropriate sizes of pulley to the separate drive motors.

The shape and arrangement of teeth for Babbitless roll crushers are designed to suit each specific application. For the primary crushing task at Shagamu each roll is provided with slugger teeth for the initial sledging action, together with smaller teeth of two sizes for the final reduction.

The cost of maintaining the height and shape of the teeth is extremely low, even for the most ardous applications. The teeth are of manganese steel and are integral with the onepiece outer shell. Tapered hubs and heavy bolts ensure that the shells are rigidly mounted to their respective drive shafts.

Sprung shafts

The two shafts of the BCS 54 are of forged steel and fitted with large-diameter, high-inertia flywheels which are independently driven by vee-belts from separate motors, eliminating gears and drive chains to give maximum mechanical efficiency.

The crusher for Shagamu is designed to run with 100 to 127mm clearance between the tips of the slugger teeth and the surface of the opposite rolls. To allow tramp iron and other uncrushable materials to pass through the crusher without harm, Babbitless has developed an advanced system of springing to facilitate the temporary opening of the shaftlines.

Each shaft is provided with two main-spring clusters and two return-spring clusters. The main-spring clusters consist of four annular pairs, and each cluster is pre-tensioned. The smaller return-spring clusters eliminate any possibility of

continued

Circle No. 52 on enquiry card

physical contact between the crusher shells when the shaft-lines return to their correct setting following the passage of tramp material. Easy adjustment of the crusher setting is provided by robust thrust screws.

Automatic lubrication

The shaftlines are provided with spherical self-alinging bearings, each with a labyrinth to prevent the ingress of foreign matter, and lubricated at two points by a centralised automatic forced-feed system.

The temperature of each bearing is monitored by thermocouples, the thermocouples being provided with their own seperate gauges. Should the temperature of a bearing reach a pre-selected maximum, an audible alarm is initiated and, should it not return to normal within five minutes, the crusher is automatically shut down.

Heavy-duty design

For the heavy duties undertaken by the BCS 54 crushers the Babbitless design is extremely robust and rigid.

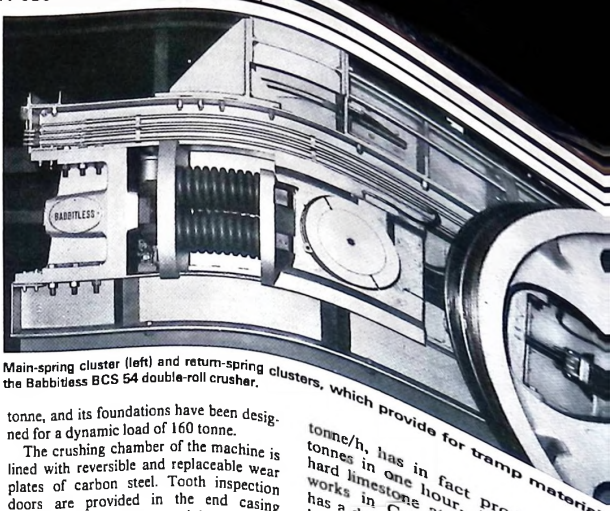
The main frame accommodating the shaftlines and spring clusters, is of welded heavy rolled-steel sections, accurately machined to give a firm and level mounting for the shaft bearings. The remainder of the structure is of cast steel and fabricated heavy steel sections, designed with ample strength for the expected high loads.

For Shagamu, each shaftline, complete with flywheel weighs 19.5 tonne and has a moment of inertia of 46 tonne m². The complete machine has a dead weight of 64 tonne, and its foundations have been designed for a dynamic load of 160 tonne.

The crushing chamber of the machine is lined with reversible and replaceable wear plates of carbon steel. Tooth inspection doors are provided in the end casing opposite the rolls for examining the condition of the crushing members.

Contracts

Babbitless have now supplied a number of double roll crushers built to suit Blue Circle requirements. The BCS 54 at Weardale in the UK which was commissioned in 1963 and designed to produce 0 to 225mm hard limestone product at 400 tonne/h, has in fact produced up



Main-spring cluster (left) and return-spring clusters, which provide for tramp material the Babbitless BCS 54 double-roll crusher.

tonnes in one hour. Another machi
hard limestone at the Blue Circle c
works in Cookstown, Northern I
has a designed output of 600 tonne/
has achieved a maximum of 800 tonne/
Blue Circle Industries, acting as consul
Process Division, acting as Engineerin
also specified Babbitless crushers for P
in Togo, West Africa.
The double-roll crusher supplied to
Circle for the first mobile plan
Shagamu, has now been in operation
nearly three years. WAPCO satisfac
with the equipment is clearly demonstr
by the order for the new BCS 54.

Final testing of rock drills

BEFORE AN ASSEMBLED rock drill is approved for delivery it must be tested so that the customer is guaranteed a satisfactory product. It is then quite natural to test by drilling with the machine and thus determine whether the claimed performance data are actually realized. Drilling in test blocks of homogeneous granite from the Swedish west coast was the predominant testing method right up to the 1960's and it is easy to understand that with Atlas Copco's high annual production of rock drills and such a testing method the beautiful cliffs along the coast would probably have been destroyed unless another testing procedure had been introduced. In addition, the demands made on the quality of our products have continuously increased and consequently there is a growing interest in more controllable testing procedures.

Would it not be possible to mount the rock drill in a rig which imposed fixed preconditions for drilling? Would it not be possible to replace the rock with something else, preferably an indestructible material? Various ideas were born and around 1967 the first simulated test drilling was made in an energy absorber, or as it more prosaically but for some unknown reason was called, the "sump". The absorber consisted of plates, part rubber and part steel, so arranged that a spring constant corresponding to that granite w
obtained. The energy transmitted to
plates was led off by cooling water.
The principle can be most easily
lustrated if we think of the difference

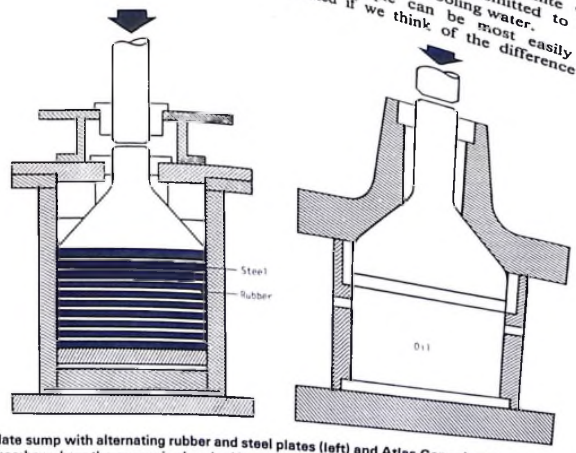


Plate sump with alternating rubber and steel plates (left) and Atlas Copco's new hydraulic absorber where the energy is absorbed by an oil cushion.

This article is a summary of an article written by Engineers Bengt Andersson and Bertil Carlberg, of Atlas Copco.

Here's a sing source for al the answers

A new compan ICI Explosives Ir with a widespread r nal office and a work aimed at impr g supply and te service to those pa the world whic wider choice of exp es products an access to them.

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Circle No. 53 on enquiry card

Mining and Quarrying in West Africa

striking a sledgehammer on a forge and on a thick rubber cushion. This type of absorber had, however, the disadvantage that the rubber plates gradually aged, with a subsequent modification in the spring constant, which rather often necessitated service work on the equipment, to the detriment of smoothly running production.

For several years the Central Laboratories carried out a persistent search for other "sump principles". The successful result was a hydraulic energy absorber. A piston floats on a hydraulic cushion and the energy of the stress wave transmitted in the drill rod to the piston is transmitted by the piston to the liquid and is led off by a cooler. But to achieve as good an agreement as possible with single steel rock drilling it proved necessary to provide the equipment in part with a steel of normal length and in part with a torque brake to hold together the coupling sleeves and thus permit a good transmission of the stress wave.

Requirements

The assignment was that all large pneumatically powered rock drills plus the hydraulic rock drill COP 1038HD should be available for testing.

The detail requirements and version were worked out in a project group with members from the tool, final control and operational departments as well as from the departments within the Central Laboratories.

The following basic data were to be measured:

working pressure; blow rate; rotation speed; air flow; hydraulic flow; leakage flow; and rotation torque.

The following demands were made on the operating and measuring equipment:

- Capable of being used by the personnel assembling the rock drills.
- No possibility of breakdowns due to incorrect operation.
- Simple setting of input data.
- Reading off of input and output data on digital instruments (values in figures) with optical signal if any data below permissible limits. The test to be completed by an automatic print-out of results on an electric typewriter; the print-out to contain the series number, machine type, date, values measured with indication whether they were below, within or above the tolerance limits.

Solution

The above described hydraulic "sump" was selected as energy absorber. The test rig is equipped with a large number of fixtures developed by the tool design department and is intended for all current heavy rock drills which are manufactured at the Sickla Works. In simple terms the rig can be said to consist of a frame on rubber feet, fixture, drill rod, brake and absorber.

In order to simulate the rotation torque which is generated when drilling in rock, the rig is equipped with a torque brake. The compressed air to the installation is supplied by the workshop air network. Since the requirement of maintaining a constant working pressure, it proved important, regulators in accurate air, both to the coming to the rotation motor and to the hydraulic power to

A hydraulic ... built in order to ... and ... drills. The ... impact ... for the ... feeding, impact and flow mechanism and rotation ...

...re at the machine was necessary to build into the system for ... the impact mechanism ...tor.

...pack was designed ... test hydraulic rock ...nit contains pumps ...nism, rotation and ...ers for the impact flows.

Control and measuring equipment

In order to match this requirement ... automatic equipment was used. Once the drill is mounted in the rig the operator goes to the measuring instruments, he sets the machine type and data on a digital switch, closes the doors ... presses one button ... All the machine para... ances limits are store... computer administers ... correct input values ... orders a print-out of ... test.

The computer is, i... impact rate, speed, ... pneumatic flow and tem...

In order to illustrate th... the control system, ... computer and operator t... the operator's work will ... shall assume that the rock ... be tested is mounted in th... pumps have been started ... under supervision.

A lamp (SELECT) flashes on the control panel. The operator sets the machine's serial number, the date of the test, the test case which is valid tolerance limits, and what is to be done with the results measured.

The operator presses the button MEASURE. The lamps SELECT goes out. The computer now reads in from its memory the tolerance limits which apply to the test case and compares them continuously with the prevailing measured values. The correct lubricating oil dosage is obtained from the computer and panel instruments and controls which are not used are made current-free.

The preparations are now ready. The operator starts up the pumps in question and sets according to a table the input values which are valid. These are never more than five. The drill now operates

Tunnelling rig with three Atlas Copco COP 1038 HD hydraulic drills.

during the test. The input values (working pressure, feed force etc) are also set with tolerances, and the operator receives an optical signal if the input value is not approved. In order to proceed with the testing routine all the input values must be approved. If this is the case, the lamp IND lights up and the operator can now order the print-out with the button PRINT. After a testing period which is determined by the test case the results are printed out by an electric typewriter and the test is completed. If the drill is not approved it is forwarded with the test log for investigation and remedial work, and is then tested again.

Conclusion

The step from manual test drilling in granite blocks from the west coast of Sweden to today's advanced final testing installation is a major one. Modern measuring techniques and computer technology open up possibilities which we could only dream about some ten years ago. The above example shows just how many are the areas of application. Modern technology has been well exploited in the present case. Present-day manufacturing methods and production in large series require final testing dimensioned accordingly. And no compromises can be made as concerns final testing, since it lies at the basis for quality and the customer confidence which we hope to count on in the future as well. ●

Portable hydraulic sump pumps

The range of Stanley portable h tools includes lightweight, powe versatile sump pumps that use available hydraulic power sources. ing under 60lb, these units are self and operate in openings under 12in.

These sump pumps will wo hydraulic systems found on eq common to the construction indus mining sector, including dumpe ditchers, back hoes, cranes and ae providing a simple sure means of p from manholes, sumps, tanks and tions.

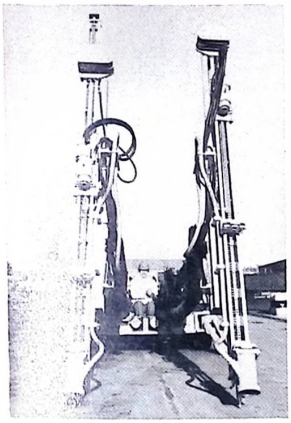
Stanley also provide a portable unit weighing only 140kg. This pow has large site wheels and can e transported in the rear of an estate van.

The pumps feature an open type i made of heat treated steel that easily and handles any debris solid up in diameter. With an adaptor they coupled to a standard 2½in. fire h discharge handling.

Operating with a hydraulic delivering up to 300 litres per minu SM22 Pump handles a dynamic h over 100ft with total delivery in ex 350gpm at a 25ft head.

continued from page 145

Employing either diesel drive or electrically powered drive mechanisms the machine has sufficient power to operate in difficult ground conditions, on steep gradients and can be flitted about from one working face to another at speeds up to 2.4km/hr (1.5mph).



...ble for all forms of mining or tunnel ex...ion work, the machine can operate in a minimum tunnel size of 2.5 by 1.8m hi... and has a maximum operating envelope of 7.5 by 4.7m high with the machine positioned central to workface.

Greater tunnel widths and heights can of course be achieved by varying the machine position or use of the stepped method of drilling. Various drill booms and hydraulic rockdrill configurations can be mounted to the base unit to cater for individual customer requirements which in turn allows for a much greater flexibility on behalf of the end user who can then standardise throughout on his drilling needs and minimise on equipment costs.

Communications

John Davis & Son (Derby) Limited, a member of the Doulton Engineering Group in the UK, exhibited a range of Signalling, Communications, Control and Monitoring systems at the Face End Technology Exhibition, held in Harrogate, UK, in December 1980.

The Davis 200Y Two-Wire Signalling System requires an interconnecting cable of only two cores to provide signalling and lock-out facilities on underground roadway conveyors and other similar items of plant.

A basic system consists of a signalling console connected to a maximum of 50 signalling keys, with an oscillator termination unit connected at the remote end of the system. The maximum operating distance of a basic system is 5km (3.1 miles).

Facilities are available for connecting systems in tandem to enable operating distances beyond 5km and for increasing to any amount the number of signalling keys installed on the system, to provide zone indication.

The system can be interfaced with certified data-transmission equipment and is locked out by either operating the rotary lockout knob of a signalling key, or by pulling on the interconnecting cable which also serves as a pull wire.

The MK II Sivad System is designed for control and communication on a coal face conveyor and its associated stage loader. Facilities are included for signalling and control, pre-start warning prior to either machine starting and audio communication along the coal-face and the stage loader.

The MK II Sivad system consists of a flameproof console, remote intrinsically safe signalling keys, amplifiers and associated equipment. A number of signalling keys and amplifier units are connected along the coal face conveyor.

FETEX exhibitors

Brazilian involvement in limestone

A Brazilian company, Ceramica Cordeiro has entered into a joint venture to quarry limestone in the North of Ghana. The company will process hydrated lime for domestic and export markets. The project will be in full operation by 1982, producing around 40,000 tons of lime annually. It is estimated that the project will cost around Cedi 34m.

PRODUCT DIGEST

Flexitank

A new range of flexible storage tanks for a wide variety of applications has been designed and developed by the Flexible Fabrications Divisions of Avon Industrial Polymers Limited and these will be marketed by **Condor Hardware Limited.**

A unique feature of the new Flexitank is that drinking water can be stored for prolonged periods without contamination or chemical tainting.

Other tanks in the stock range are suitable for non-drinking water, hydrocarbon oils and fuels.

They will perform satisfactorily throughout a wide range of temperatures and environmental conditions. These tanks are manufactured to the highest MOD and corresponding international standards.

They are ideal for providing water supplies to work camps, leisure centres, quarries, construction sites – anywhere main supplies are not available. Flexible tanks are widely used in industry when draining down plant in emergencies or maintenance.

Flexitanks can be used to supply drinking water or even to contain sewage in disaster areas or anywhere normal services have been interrupted.

Other applications are – feeder tankers for fire services and water dumps in high-risk forest areas. For the agricultural industry Flexitanks can be used for irrigation and specially manufactured units are available for the safe storage of fertilizers, pesticides, sewage, slurry and silage liquors.

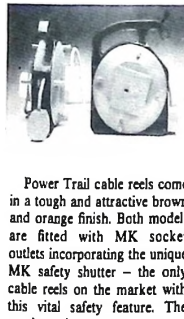
These tanks are available from stock in capacities up to 20,000 litres for rapid distribution wherever they are needed. Larger tanks can be made to meet customers requirements.

Cable reels

MK Electric has introduced two extension cable reels under the name Power Trail. Each offers a number of features that will appeal to any user needing a versatile portable electricity supply source in the home, shops, offices, hotels, hospitals and factories.

Power Trail 761 ORB contains 15 metres (almost 50ft) of 5-amp 3-core cable and has a 5-amp fuse in the MK Toughplug that's fitted as standard. It's for use with power tools, inspection lamps, electrical garden equipment and the like with a maximum wattage of 1.2kW (600 watts if it's powering an appliance with a motor).

Power Trail 762 ORB contains 10 metres (33ft) of 13-amp cable, and the Toughplug has a 13-amp fuse. It's the one to choose for powering equipment rating up to 3kW – notably heating appliances. It also has *two* socket outlets, and so can be used with, for example, a power tool and an inspection lamp.

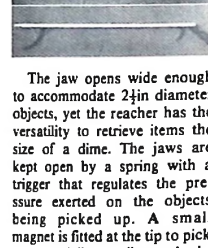


Power Trail cable reels come in a tough and attractive brown and orange finish. Both models are fitted with MK socket outlets incorporating the unique MK safety shutter – the only cable reels on the market with this vital safety feature. The casing incorporates an ingenious combined handle and hanger, so the reel can be carried comfortably and suspended easily during use or for storage. The cable drum has lugs which protect the sockets if the reel is used (or falls) on its side. There is also a neat housing for the orange Toughplug when the cable is rewound – a job that is done in seconds even if the cable is fully extended, thanks to the easy-wind cable return feature.

Add 30" to your reach

The new Matey™ Remote Reacher-Gripper provides an extra 30 inches of reach allowing remote objects to be conveniently picked up, and gives and increased margin of safety when handling hazardous materials.

Manufactured by **Bel-Art Products of Pequannock, NJ** 07440, the reacher is perfect for handling items in fume hoods, picking up containers of acid/caustics, reaching high shelves or the back of deep cupboards.



The jaw opens wide enough to accommodate 2¼in diameter objects, yet the reacher has the versatility to retrieve items the size of a dime. The jaws are kept open by a spring with a trigger that regulates the pressure exerted on the objects being picked up. A small magnet is fitted at the tip to pick up especially small metal objects.

Weighing only 8oz, this lightweight reacher is made of aluminium and molded ABS. It is a must in the safety conscious lab for ease of handling materials and for convenience in reaching out of the way objects.

Boring machine

Merstan Impact Moling of Sittingbourne have introduced a new type of pneumatic boring machine, It features a metre-long guiding probe on the front to maintain the accuracy of the bore. Overall length of the complete unit is around two metres in narrow bores up to 155mm diameter.

The detachable probe and a variety of front-end expanders and profile attachmer fitted as there are n moving parts on the m

Thrust is developed by an 85psi air supp reciprocating piston, m Merstan Mole in effec self-contained p The piston action reversed, allowing the force out of restric bores.

The machine is ava diameters, 70mm 155mm, and 155mm attachments, probes, e special profiles are required and full trai back-up services are ava

Retransmissio control system

Harris Corporati Communications introduces the RF- transmission Control Sy

A unique feature system is the use of a c controlled squelch sy the HF-SSB radio link ing exclusive recogn legitimate HF transr Unwanted communicat rejected.

Tactical VHF/UH radios, within range of manned vehicle or base equipped with a Harris Retransmission Syste communicate over distances via Harris radios.

On the VHF/UHF-F munications link, a ton squelch (TCS) is u activate the retrans system. This allows a g hand-held operators t municate among ther over limited distances, bu push of a button, activ retransmission system an municate with sta hundreds or thousan kilometers away.

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

buyers' 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.

Chemical Engineering

[illegible] Nigeria Ltd. Lagos
[illegible] Lagos

Charter Operations

[illegible] Ltd. Lagos

Civil Engineering Contractors

[illegible] (Nig.) Ltd. Ikeja

Civil Services

[illegible] Nigeria Ltd. Lagos

Civil, Electrical & Mechanical Engineers & Contractors

[illegible] Ltd. Lagos
[illegible] (Nig.) Ltd. Lagos
[illegible] Nig. Ltd. Lagos

Cold Stores

[illegible], Apapa
[illegible] Refrigeration (UK) Ltd.

Commercial Painting & Maintenance

[illegible] Ltd. 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
[illegible] Technical, Ikeja and Apapa
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

EBC BEAM (a Division of UAC of Nigeria Ltd.) Lagos
[illegible] Nigerian Computer Co. Lagos
[illegible] Ltd. Lagos
International Computers (Nigeria) Ltd. Lagos, Nigeria
Leventis Technical Ltd. Lagos
[illegible] Computer Services, [illegible]
Tractor & Equipment (Division of UAC Nigeria Ltd.) Lagos

Concrete Machinery

[illegible] Nigeria Ltd. Ibadan
Afrotec Technical Services (Nigeria) Ltd. Isolo
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Henry Stephens Engineering Co. Ltd. Ilupeju Industrial Estate
Reiss & Co. (Nig.) Ltd. Ebute-Metta
Stokvis [illegible]
UTC Technical, Isolo-Mushin

Concrete Reinforcement

Nigerian Wire Industries Ltd.

Construction Equipment

Blackwood Hodge Nigeria Ltd. Apapa
Camplant, Apapa, Nigeria
Joy Manufacturing Co. USA
[illegible] Nigeria Ltd. Lagos
[illegible] Industrial Supplies Ltd. Lagos
[illegible] Technical, Ikeja and Apapa
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Henry Stephens Engineering Co. Ltd. Ilupeju
Tractor & Equipment (Division of UAC Nigeria Ltd.) Lagos

Consultancy Services

[illegible] Nigeria Ltd. Lagos

Containers & Tanks

[illegible] Reinforced Plastics Co. Ltd. [illegible]

Copy Duplicating Machines & Products

EBC BEAM (a Division of UAC of Nigeria Ltd.) Lagos
Leventis Technical Ltd. Lagos

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Camplant, Apapa, Nigeria
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Henry Stephens Engineering Co. Ltd. Ilupeju
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Tractor & Equipment, Ebute-Metta
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Sara Gears, Malaysia

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Camplant, Apapa, Nigeria
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Nigerlink Industries Ltd. Lagos
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Phoenix Motors Ltd. Oregun, Lagos
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Leventis Technical Ltd. Lagos
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Nigerlink Industries Ltd. Lagos
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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 Div. 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
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 Contract[illegible] Materials

Clausen Engineering Co. Ltd. [illegible]
Cutler-Hammer Nigeria Ltd. [illegible]
Holt Engineering Ltd (a Div[illegible] Allen & Co. Ltd. Oregun V[illegible]
Pan Electric, Apapa
Remco Nigeria Ltd. Calabar
West African Engineering Co[illegible] Ltd. Apapa

Electrical/Electroni[illegible] Equipment

R. T. Briscoe (Nigeria) Ltd. T[illegible] Department, Matori – Osh[illegible]
Cutler-Hammer Nigeria Ltd. [illegible]
EMS (a Division of UAC of N[illegible] Ltd.), Apapa
Faith Engineering Co. Ltd. B[illegible]
Grette Communications (Nig[illegible]) Lagos
Harvest Nigerian Computer C[illegible]
Holt Engineering Ltd (a Div[illegible] Allen & Co. Ltd. Oregun V[illegible]
Leventis Technical Ltd. Lag[illegible]
M[illegible] Engineering Co. Ltd. L[illegible]
Nigerian Computer Co. Lag[illegible]
N[illegible]CO, Apapa
G[illegible] Nigeria Electric Comp[illegible]
W[illegible] (Nigeria) Ltd. Apapa
W[illegible] African Engineering Co[illegible] Apapa

E[illegible]trical Engineeri[illegible] C[illegible]ractors

A[illegible] Wire & Cable Co[illegible]
A[illegible] Engineering Ltd. Yaba
C[illegible] Engineering Co. Ltd. [illegible]
E[illegible] Cable & Overhead C[illegible]
Be[illegible] Electrical Co. Ib[illegible]
[illegible] & Searl (Nig.) Ltd. Lag[illegible]
[illegible] (Nigeria) Ltd. Kano
A[illegible] & Co. Ltd. Ibadan
[illegible] Ltd. Lagos
[illegible] Nigeria Ltd. Lagos
Lilleker Brothers (Nig) Ltd. I[illegible]
[illegible] Nigeria Ltd. [illegible]
M[illegible] Engineering Co. Ltd. L[illegible]
Technical Constructions (Nig[illegible]) Lagos

Electric Fans

Nigeria Engineering Works Lt[illegible]
Reiss & Co. (Nig.) Ltd. Ebu[illegible]

Electric Generating

Lanre Bhadmus Ind. Ltd. La[illegible]
Phoenix Motors Ltd. Lagos
Scoatrac, Ikeja, Lagos
Tractor & Equipment (Divis[illegible] Nigeria Ltd), Lagos

Electrical Mechanic[illegible] Contractors

Lilleker Brothers (Nig) Ltd. I[illegible]

Electrical Services

Afrotec Technical Services (N[illegible] Ltd. Isolo
Bennet Babs Electrical Co. I[illegible]
Cutting Nigeria Ltd. Calabar
Reiss & Co. (Nig.) Ltd. Ebu[illegible]
H. F. Schroeder (W.A.) Ltd. I[illegible]

Electric Pumps

Morpol Industrial Corp. Ltd. [illegible]
Reiss & Co. (Nig.) Ltd. Ebu[illegible]
Tractor & Equipment (Divis[illegible] Nigeria Ltd), Lagos

Electrolytic Capaci[illegible]

Daly (Condensers) Ltd. Dors[illegible]

Electronic Communication Equipment

GTE Nigeria Ltd. Lagos
Grette Communications (Nig[illegible]) Lagos
Jos Hansen & Soehne Ltd. La[illegible]

Electronic Kits ("do it yourself")

Steen Bolbroe A/S Denmark

Engineering Services
Cutler-Hammer Nigeria Ltd, Ikeja
Drake & Scull (Nigeria) Ltd, Lagos

Engineering Laboratory Services
Artec Engineering Ltd, Yaba
Foundation Engineering (Nigeria) Ltd, Lagos
Excavators (Hydraulic)
Camplant, Apapa, Nigeria
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 [illegible] (Nigeria) Ltd, Apapa

Filters
Morpol Industrial Corp. Ltd

Fire-fighting Equipment & Vehicles
Guthrie [illegible] Ltd, Lagos
Leventis [illegible] Ltd, Lagos
Preussag [illegible] Engineers Ltd, Maiduguri
SIDES
Strong[illegible]ria) Ltd, Security & Safety Division, Ikeja

Fire Protection Equipment & Systems
Reiss & Co. (Nigeria) Ltd, Lagos
Intermaco (Ghana) Ltd, Accra

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
Wanteco Ltd, Iganmu

Foundation Works
Foundation Construction Ltd, Iganmu
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 Co's, 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

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
Scotrack, 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 Div., 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 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 Gases
Gas & Welding (Nigeria) Ltd, Ikeja
Industrial Gases Ltd, Apapa

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 Div., Apapa

Irrigation Equipment
Afrotec Technical Services (Nigeria) Ltd, Isolo
Brossette (Nig.) Ltd, Apapa
Guthrie (Nigeria) Ltd, Lagos
Jos. Hansen & Soehne (Nig.) Ltd, Lagos
Landmark Industrial Supplies Ltd, Lagos
Leventis Technical Ltd, 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
Contex (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
Bisiolu Enterprises Ltd, Apapa
Nigerian Foundries Ltd, Lagos

Mapping
Kenting Africa Resource Service Ltd, Lagos

Marine Engines & Accessories
Allens 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
Gottschalks 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 Iard (Division of Scoa Nigeria Ltd), Ogba
Fado Engineering Co. Ltd, Ebute-Metta
Hademec Ltd, Lagos
Heplac 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, Iganmu
Incar (Nigeria) Ltd, Lagos
Leventis Motors Ltd, Apapa
NITECO, Apapa
Phoenix Motors Ltd, Lagos
Henry Stephens Engineering Co. Ltd, Apapa
Wanteco Ltd, Iganmu

Motor Spare Parts and Accessories

Gajra Gears, NS SDN BHD, Malaysia
Lanre Ghadmus Ind. Ltd, Lagos
Morpol Industrial Corp. Ltd
Mufbat Brothers, Yaba & Lagos
Scoatrac, Ikeja, 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.
GBD 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

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 Materials

Elof Hanson Ltd, UK

Partitioning

Context (Nig.) Ltd, Lagos

Petroleum Hoses

Wayne (West Africa) Ltd, Apapa

Piling

Foundation Construction Ltd, Igannu
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

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
Marryat Daniel (Nig) Ltd, Lagos

Poultry Feed Distribution Equipment

Afrotec Technical Services (Nigeria) Ltd, Isolo

Printing Machinery

Elof Hanson 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

Pumps

Afrotec Technical Services (Nigeria) Ltd, Isolo
R. T. Briscoe (Nigeria) Ltd, Technical Department, Apapa
Jos. Hansen & Soehne Nigeria Ltd, Lagos
Holman Brothers (Nigeria) Ltd, Apapa
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
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
Wasteco 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
Scoatrac, Ikeja, Lagos
Henry Stephens Engineering Co. Ltd, Ilupeju

Radio Communication Equipment

J. Allen & Company Ltd, Apapa
Comsac 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

Comsac: 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, Igannu

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
Leventis 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

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, Abcokuta
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 Div., Apapa
C. Zard & Co. Ltd
Projects Department, Apapa

School Furniture

Ihekole International Concern Ltd, Jos
Fawaz Steelwood & Chemicals Ltd, Kano
Steel Works Ltd, Ibadan, Nige

Science & Laborato Instruments

A. M. Faltas (West Africa) Ltd
Ihekole Int. Concern Ltd, Jos
F. Steiner & Co. Ltd, Lagos
Scoatrac, Ikeja, Lagos

Screening Equipme

John Finlay (Engineering) Ltd Ireland
Scoatrac (Nig) Ltd, Isolo

Sealants

Bostik Ltd, Leicester, UK

Sewage Treatment

Bewac Ltd, Apapa
R. T. Briscoe (Nigeria) Ltd
UTC – Engineering Division,

Sewing Machines

Cinsere Sewing Machines Ltd Lagos
Pfaff Industrial Sewing Machi

Sewing Threads & C

West African Thread Co. Ltd

Shelving Systems

Brossette (Nig.) Ltd, Apapa
The Two Cats Nigeria Ltd
General Metal Products Ltd,
Gottschalcks Building Materi
Division of UAC Nigeria L
Steel Works Ltd, Ibadan, Nig

Shipping & Forwar Agents

Air Marketing International C Co's, Crawley, UK
Sevenseas Shipping Co. Ltd (
Apapa
Triana Ltd, Apapa
Veritas & Co. (Nig.) Ltd, Lag

Soil Investigation

Foundation Engineering (Nig Lagos
Nigerian Dredging & General Ltd, Lagos
Trevi Foundations Nig. Ltd,

Solders

Makeri Smelting Co. Ltd, Jos
Reiss & Co. Nig. Ltd, Ebute-

Stationery

Nigerian Office Stationery Su Stores Ltd, Apapa

Steel Structures

Nigerian Engineering Works Harcourt
Steel Works Ltd, Ibadan

Storage & Equipme

Brossette (Nig.) Ltd, Apapa
Dexion Dept.
Gottschalcks Building Materi
Leventis Stores Ltd, Lagos
Nigeria Engineering Works L Harcourt
Stronghold (Nigeria) Ltd, Ha Division, Ikeja
General Metal Products Ltd,

Structural Steelwor Fabrication & Erec (Roof Trusses)

Grid Index Nigeria Ltd, Suru
Intermaco (Ghana) Ltd, Accr

Survey Equipment

Atlas (Nig) Ltd, Lagos
Kenting Africa Resources Su Lagos
Ihekole Int. Concern Ltd, Jos
Plessey (Nigeria) Ltd, Lagos
F. Steiner & Co. Ltd, Lagos

Suspended Ceilings

Context (Nig.) Ltd, Apapa
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 Systems (Nigeria) Ltd, Lagos
Ultra-Modern Electronics Ltd, Surulere

Time Clocks & Systems

Bisiolu Industries Ltd, Apapa
Jos. Hansen & Soehne Ltd, Lagos
Leventis Technical Ltd., Lagos
F. Steinen & Co. Ltd, Lagos

Towers

Niger Basin Transport Co. Ltd, Warri

Trailers, Cycles and Components

Shannon Ltd, UK

Tugs & Barge Hire

Nigerdelta Shipping Agencies Ltd, Lagos

Under Water Services

Nigerian Diving 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 Ogunlola Street, Shomoly, Lagos.
Tel: 44191.

Atl 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 +

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 3284, 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.

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 End, Witham, Essex, UK.
Tel: 0376 83241. Telex: 987425.

Chellarem's Building Materials Department,
19 Wharf Road, Apapa. Tel: 46177.

Chemineva 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.

Cinsere Sewing Machines Ind. Co. Ltd,
5 Badejo Kalesanwo Street, Matori Ind. Estate, Oshodi-Mushin, Nigeria.

Clusters Engineering Co. Ltd,
Plot 83 Airport Road Ext.
Box 5037 Kano.
Tel: 7674. Telex 77206NG

Contest (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, Iganmu 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: 900100, 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 Elcruwa 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.

Dealon 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 2889, 90 Lewis Street, Lagos.
Tel: 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 5045, Ikeja, Nigeria.
Tel. 840058 Telex: 21383 NG.

Elof Hanson 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 47127.

Equip Home (a Division of SCOA Nigeria Ltd),
152/156 Broad Street, POB 452, Lagos, Nigeria.

Equip/Isrd (a Division of SCOA (Nigeria) Limited),
Surulere Industrial Road, Ogba.
Ogba Scheme, Ikeja, PMB 21518 Ikeja, Nigeria.
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. Falias (West Africa) Ltd,
PO Box 1915, 67/64 Campbell Street,
Lagos. Tel: Lagos 26774, 21639.

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, POB2100 Lagos.
Tel: 845090/835393. Telex: 21100 or 21227.
Cable: Foundations Lagos

Foundation Engineering (Nigeria) Ltd,
174 Western Avenue, Iganmu,
PO Box 2100. Tel: 845090/83593.
Telex: 21100 or 21227. Cable: Foundations Lagos.

Fuad-Lekan Ent,
PO Box 5034/3 Falomo-Lagos, Nigeria,
1B Balogun Street, Ilasamajor, Mushin.

GBO BEAM (a Division of UAC of Nigeria Ltd),
Head Office: 58 Marina, Lagos.
Tel: 20678/57234/23976. Branches: Sales and service throughout Nigeria.

GTE Nigeria Ltd,
PO Box 5154, 2 Tinubu Square, Lagos.
Tel: 636432/658025. Telex: 21518.

Gajra Gears NS SDN BHD,
PO Box 210, Seremban NS, Malaysia.
Tel: 76131/2. Telex: MA 63875 Bajrang.

Gas & Welding (Nigeria) Ltd,
PMB 21551, Ikeja, Nigeria.

General Metal Products Ltd,
Apapa Rd., Iganmu. PO Box 442, Apapa.
Tel: 843651. Cable: Gemsprol.

Gottschalcks Building Materials (a Division of UAC Nig. Ltd),
Dexion 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, Amuwoshe, Ikeja. Tel: 931776/932959. POB 1043 Surulere, Lagos, Nigeria.

Grid Index Nigeria Ltd,
PO Box 3743, Saru-Lere.

Guthrie (Nigeria) Limited,
Plots 37-39, Igammu 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: Sevnshue
Telex: 21396 NG.
19 Kofo Awayomi Avenue, PO Box 117, 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 71, Mile 74,
Ikorodu Road, PO Box 3498, 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: 51341.
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,
224 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 Kocha Road, PO Box 144, Kaduna.
Tel: 43353.

31a Sakpoba Road, Benin City.

Infodata Ltd,
PO Box 6687, Lagos.

Interbrake & Co,
80 Adelabu Street, Surulere.
Cable: Terbrok, Lagos.

Internaco (Ghana) Ltd,
PO Box M352, Accra.

International Computer (Nigeria) Ltd,
178 Awolowo Road, Ikoyi, Lagos, Nigeria.
Tel: 684957, 684763

International Messengers (Nigeria) Ltd (IMNL),
Afrijet House, 17 Laide Tomori Street, off Medical Road, Ikeja,
PO Box 2380, Lagos. Tel: 963948

International Messengers (Nigeria) Ltd (IMNL),
Afrijet House, 360 Sarkin-Yaki Road, Kano.
PO Box 1785.
Tel: 7726. Telex: 77150 (Anopit NG).

International Messengers (Nigeria) Ltd (IMNL),
Afrijet House, 451 Zaria Road, opposite Plateau Broadcasting Co., Jos.

International Messengers (Nigeria) Ltd (IMNL),
Afrijet House, 22 Almadu Beto Way, Kaduna. Tel: 213697. Telex: 71317.

International Messengers (Nigeria) Ltd
(IMNL).
[illegible] Street, off [illegible] Road, [illegible]
[illegible].
International Messengers (Nigeria) Ltd
(IMNL).
[illegible] Floor, [illegible] Ikeja,
Lagos State.
International Messengers (Nigeria) Ltd
(IMNL).
[illegible] Commercial, [illegible]
International Messengers (Nigeria) Ltd
(IMNL).
[illegible] Village Road, [illegible]
Road, [illegible] Road, Port Harcourt.
International Messengers (Nigeria) Ltd
(IMNL).
[illegible] Commercial [illegible]
[illegible], PO Box [illegible], Zaria.
Tel: [illegible]
[illegible] (Nig.) Ltd.
PMB [illegible], Ilorin, Nigeria.
[illegible] Ltd.
PO Box [illegible], Apapa. Tel: [illegible]
Telex: [illegible]. Cable: [illegible]
ITT Nigeria Ltd.
[illegible] Road, Yaba.
Tel: [illegible] Telex: [illegible]
[illegible] Co. Ltd in association with
[illegible], [illegible] Street,
Ebute-Metta, PO Box [illegible], Lagos.
Tel: [illegible]
[illegible] (Nig.) Ltd.
PO Box [illegible], Lagos.
Tel: [illegible] & [illegible] Telex: [illegible]
[illegible] Ltd.
[illegible] Group Engineering
Division, PO Box [illegible],
[illegible]
[illegible] Manufacturing Co.
[illegible], Pittsburgh, PA [illegible]
USA. Tel: [illegible] Telex: [illegible]
[illegible] Service Ltd.
[illegible] Street, Lagos. Tel: [illegible]
[illegible] Industrial Supplies Limited.
[illegible] Street West, Ebute-Metta.
PMB [illegible], Lagos.
[illegible] Ltd.
[illegible] Crescent, PO Box [illegible],
Apapa, Lagos.
Tel: [illegible] and [illegible]
Cable: [illegible] Lagos.
Leventis Motors Ltd.
[illegible] Road, PO Box [illegible], Apapa, Lagos.
Tel: [illegible]
Leventis Stores Ltd.
Marina, Lagos.
Leventis Technical Ltd.
PO Box [illegible] House, Lagos Island.
[illegible] (Nig.) Ltd.
[illegible] Queen Elizabeth Road,
PO Box [illegible],
Zaria State, Nigeria.
Lagos. Tel: [illegible]
[illegible] (Nig.) Ltd.
PO Box [illegible], Ikeja, Lagos, Nigeria.
Tel: [illegible]. Cable: [illegible] Lagos.
Machinery & Electrical Equipment
Division of UAC Ltd.
[illegible] Taylor Road, Iddo, PMB 1015,
Ebute-Metta, Lagos. Tel: Lagos [illegible]
[illegible] Co. Ltd.
PO Box [illegible]
Tel: [illegible] Telex: [illegible] Ng.
[illegible] Limited, Air Conditioning
Division.
[illegible] Creek Road, Apapa.
Tel: [illegible]
[illegible] Enterprises Ltd.
[illegible] Broad Street, Lagos.
[illegible] (Nigeria) Ltd.
[illegible] Broad Street, PO Box [illegible], Lagos.
Tel: [illegible] Telex: [illegible] DANCO.
PO Box [illegible], Lagos.
[illegible] Industries Ltd.
[illegible] Oba Akran Avenue, Ikeja.
PO Box [illegible], Apapa, Lagos State.
[illegible] Ltd.
Block H Plot 2 Industrial Estate, Isolo,
PMB [illegible], Ikeja.
Metro-Technical
PO Box [illegible], Ikeja, [illegible]
Avenue.
[illegible] Ikorodu Road, Lagos.
Tel: [illegible]
Mofat Engineering Co. Ltd.
[illegible] Motor Road, Sogunle.
PO Box [illegible], Lagos. Cable: Mofat Eng.
Morpol Industrial Corp. Ltd.
4 Warehouse Road, PO Box 187, Apapa.
Tel: 43802, 41254. Telex: 21517.

Cable: Moroor Lagos.
Branch Office: 12 Kodesoh Street, Ikeja.
Mufhat Brothers,
304 Murtala Muhammed Way, Yaba,
170 Nnamdi Azikwe Street, Idumota, Lagos.
Nigeria. Tel: 863640.
Nigarian-Nigerian Aluminium Extrusions Ltd.
Plot No. 5 Block (H).
Ikeja – Apapa Express Way,
[illegible] Industrial Scheme,
Nigeria.
Niger Benue Transport Co. Ltd.
22 Market Road, PO Box 323,
Warri Bendel State, Nigeria.
Tel: 053-234012
Telex: 43253 FLOSUD NG.
Nigerdelta Shipping Agencies Ltd.
41 [illegible] Road, Sapele Bendel, 21 Wharf
Road, 6th Floor, Apapa, Lagos, Nigerian
Port Authority Premises, Warri.
Tel: Lagos (01) 847 844, Sapele (054) 42258,
[illegible]. Telex: 42266 NIDELT.
Nigerian Carton & Packaging MFG Co. Ltd.
[illegible] Street, PO Box 296 Ikeja and
23 Industrial Avenue,
Ilupeju, Lagos.
Tel: 960209. Cable: Nicapaco Lagos.
Nigerian Diving Services,
Savannah Bank Chambers, 138/146 Broad
Street, 6th Floor, PO Box 2151,
Lagos, Nigeria.
Tel: 636577, 664759. Cable: DODCO.
Nigerian Dredging – General Works Ltd.
6 Bauchi Road, PMB 1029, Apapa.
Tel: 45045, 45046.
Nigerian Engineering Works Ltd.
Plot 49, Trans Amadi Industrial Layout,
PO Box 519, Port Harcourt.
Tel: 21482, 21876. Cable: "Nigeng".
PO Box 3682, Lagos. Tel: 54468, 23641.
PO Box 2081, Kano. Tel: 5285.
Nigerian Foundries Ltd.
(Manufacturers of cast iron water fittings),
PO Box 3574, Lagos. Tel: 963266, 963267,
963402.
Nigerian Office Stationery Supply Stores
Ltd.
Noss, 25 Warehouse Road, Apapa.
Tel: 846304, 845869.
Cable: Stationics, Apapa, Lagos.
Nigerian Motors Industries Limited,
26 Wharf Road, PMB 1032, Apapa.
Tel: 46848. Branch Office: PO Box 833,
Otis Division Plot 1090,
PO Box 8591, Adeola Odeku Street,
Victoria Island. Tel: 610068.
Kano, PMB 5383, Port Harcourt.
Nigerian Ropes Ltd.
65/66 Eric Moore Road,
Iganmu Industrial Estate, PO Box 115,
Apapa. Tel: 45693.
Nigerian Wire Industries Limited,
PO Box 50, Ikeja.
Tel: 33015. Cable: Niwind, Lagos.
Nigerlink Industries Ltd.
MWM-Division, Western House, 8/10 Broad
Street, PO Box 1977, Lagos.
Nigerlux Paints, International Paints
(West Africa) Ltd.
PO Box 67, Oba Akran Avenue,
Ikeja Industrial Estate, Ikeja. Tel: 33895/6.
Nirexim Handelsgesellschaft GmbH & Co.
KG.
Dorotheergasse, 6/11, a-1010 Vienna,
Austria. Tel: (222) 520737.
Telex: 11918. Cables: Nirexim.
NITECO.
11/13 Warehouse Road, PO Box 356,
Apapa, Lagos, Nigeria.
Norman Industries Ltd.
PO Box 334, Ikeja. Tel: 40058.
Northern Sawmill & Furniture
Manufacturing Co. Ltd.
Kundala Road, PO Box 147, Kano.
Tel: 4320 & 4739. Telex: 77141 East Ng.
Cables: SAFUMECO.
Ojo-Fame
PO Box 1839, Ikeja
Plot 3/8, Akinro Street, Lasamaja, Mushin,
Lagos State, Nigeria.
G.N. Okozala Electrical Company,
45 Aminu Road, S. Gari, Zaria.
Pan Electric,
Seaplane Road, PO Box 345, Apapa.
Tel: 42485.
Paterson Zochonis & Co. Ltd.
Technical Department,
160/162 Broad Street, Lagos.
Tel: 26621. Ext: 219, 223, 239.
D.J. Payne (Nigeria) Ltd.

41 Commercial Avenue, PO Box 151,
Yaba. Tel: 43471.
Phoenix Motors Ltd.
Ikosi Road, Oregun, PMB 12011, Lagos.
Telex: 21238 Holts, Lagos.
Phoenix Refrigeration (UK) Ltd.
Phoenix House, Coniston Avenue, Grimsby,
England.
Tel: 0472 82 5074. Telex: 52 7224.
Pilkington Glass (Nigeria) Ltd.
11 Creek Road, PO Box 270, Apapa.
Tel: 42843/4/5.
Plessey (Nigeria) Ltd.
21/22 Marina, PO Box 3481, Lagos.
Tel: 24848. Telex: 21269.
Polythene Enterprises (Nigeria) Ltd.
4 Obasa Road, Ikeja Industrial Estate, Ikeja.
Tel: 33009, 31221.
Preussag Drilling Engineers Ltd.
13 Monguno Road, Maiduguri, Nigeria.
Telex: 82123 (Maiduguri).
Pump Services Nigeria Ltd. (Distributors for
Gilbarco Ltd).
46 Balogun Street, PO Box 321,
Lagos, Nigeria. Tel: 635330.
R. Q. A. Services Division of UAC
(Technical) Ltd.
1 Taylor Road, Iddo, PMB 1015,
Ebute-Metta, Lagos. Tel: Lagos 43310.
Redcoat Cargo Airlines.
Balcombe Road, Horley, Surrey, England.
Tel: Horley 74141. Telex: 87337.
Reiss & Co. (Nig.) Ltd.
71 Apapa Road, Ebute Metta.
PO Box 678, Lagos.
Tel: 834215. Cable: Reico. Telex: 21161.
Samek Construction Company Ltd.
116 Agbani Road, PO Box 750, Enugu,
Nigeria.
29 Ikorodu Road (Jibowu bus stop), Yaba,
Lagos, Nigeria.
H. F. Schroeder (WA) Ltd.
23 Abebe Village Road, Iganmu,
GPO Box 1209, Lagos. Tel: 41984, 45218.
Telex: 21454. Cables: SIMEX Lagos.
PMB 5307, Port Harcourt. PMB 3261 Kano.
Scoatrac,
Dual Carriage Way, Isolo Industrial Estate,
Isolo, PMB 21108, Ikeja, Lagos.
Tel: 848144 845249. Telex: 21376.
Scoatrac (Division of SCOA Nigeria Ltd.),
Dual Carriage way, Isolo Industrial Estate,
Isolo, PMB 1108, Ikeja.
Tel: 48144 and 45249. Telex: 21376.
Sears Lumsden Ltd.
19 Elm Road, South Woodham,
Ferrers, Chelmsford, Essex CM3 5QB, UK.
Sentrycom Alarms (Nigeria) Limited,
156 Herbert Macaulay Street,
PO Box 94, Lagos. Tel: 46764, 46461.
Shannon Ltd.
Lancaster House, 80 Princess Street,
Manchester, UK.
Shogbola Technitronics Inc.,
PO Box 178, E B Lagos, Nigeria.
Sides,
Steel Works Ltd.
Oluyole Ind. Est. off Ring Road, Ibadan.
Tel: 461430 or 412140. Telex: 31147.
Representatives: Eyre Hall-club Trading
Co. Ltd, Head Office: 18 Damina Road,
PO Box 182, Zaria.
Tel: 2814 Zaria. Telex: 75247 Eyre NG.
Steen Bolbroe A/S,
Postbox 170, Walterholm 11,
2750 Ballerup, Denmark.
Tel: 02651133. Telex: 35367 Josty DK.
F. Steiner & Co. Ltd.
150 Broad Street, PO Box 602, Lagos.
Tel: 21565 and 53095. Cable: Steiner.
Henry Stephens Builders' Merchants Ltd.
PO Box 331, Apapa, Lagos.
Telex: 21566 HENSHIP.
Cables: HENSBUILD, Apapa.
Henry Stephens Engineering Co. Ltd.
2 Ilupeju By-Pass, Ilupeju PMB 21386,
Ikeja.
Tel: 961055. Telex: 21566 and 21286.
Cable: HENSENCO.
Stokvis Nigeria Limited,
Ebute Metta, Lagos.
Stronghold (Nigeria) Ltd, Engineering
Services Division,
Plot 17, Oba Akran Avenue, PMB 1060,
Industrial Estate, Ikeja.
Tel: 32980, 31719, 32476.
Stronghold (Nigeria) Ltd, Security and
Safety Services Division,
Plot 17, Oba Akran Avenue,

PMB 1060, Industrial Estate Ikeja
Tel: 32980, 31719, 32476.
Sorastor,
PO Box 391, Apapa, PO Box [illegible]
PMB 5130, Port Harcourt.
Sorastor Technique,
Apapa Road, Iganmu. Tel: 44027.
[illegible] Hadeja Road, Kano.
8 Liberation Drive, Port Harcourt.
Tarpaulin Industries (WA) Ltd.
8 Burma Road, Apapa, PO Box [illegible]
Lagos. Cables: "TARPIND", Lagos.
Tel: 847750, 847814.
Taylor Woodrow of Nigeria Limited
[illegible] Abebe Village Road, Iganmu.
PO Box 178, Lagos. Tel: 83786, [illegible]
[illegible] Telex: 21544.
Tower Aluminium (Nigeria) Ltd.
PO Box [illegible] Ikeja. Tel: 932801/[illegible]
Cable: Tower Lagos.
Tractor & Equipment (Division [illegible]
Ltd.
Tractor & Equipment,
[illegible]
[illegible] Village Road,
[illegible], Ikeja.
[illegible] Ltd.
[illegible] Road, PMB 1064, [illegible]
[illegible], 45982, 45373. Telex: [illegible]
[illegible] Foundations Nig. Ltd.
[illegible] Street, Ilupeju.
[illegible] – Oshodi, Nigeria.
[illegible] Building Products (Eastern [illegible]
[illegible] PO Box 646. Tel: 28355
[illegible] NG
[illegible] Nigeria Limited,
[illegible] Avenue, PO Box 627, Enugu
[illegible] Nigeria Ltd.
[illegible] Division, Plot 1C, Block [illegible]
[illegible] Mushin.
[illegible] Engineering Division,
[illegible] Street, Isolo.
[illegible] Apapa. Telex: 2122[illegible]
[illegible] Hardware Division,
[illegible] Road, PO Box 274, Apapa
[illegible] 877223 and 87603.
[illegible] (Nigeria) Ltd.
[illegible] Road, PO Box 155, [illegible]
[illegible]
[illegible] & Co. (Nig.) Ltd.
[illegible] Street, POB 4585, Lagos
[illegible] Ltd.
[illegible] Road, Iganmu, Lagos.
[illegible] 41864 43037.
[illegible] Nigeria Ltd.
PO Box [illegible] APAPA, Lagos, Nigeria
Tel: [illegible] Telex: 21871 FYN[illegible]
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