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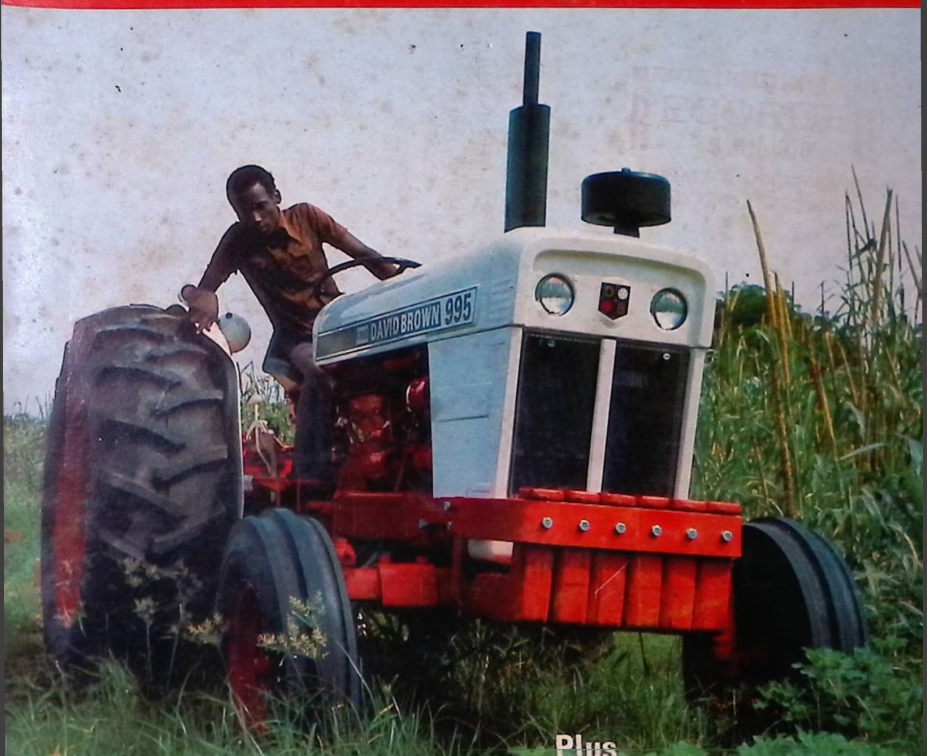
Vest African ECHNICAL REVIEW

ernational Magazine for Industrial & Business Management

June 1978



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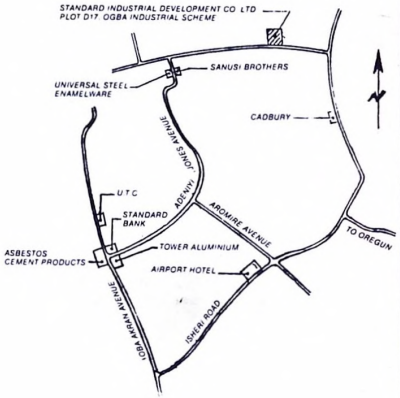

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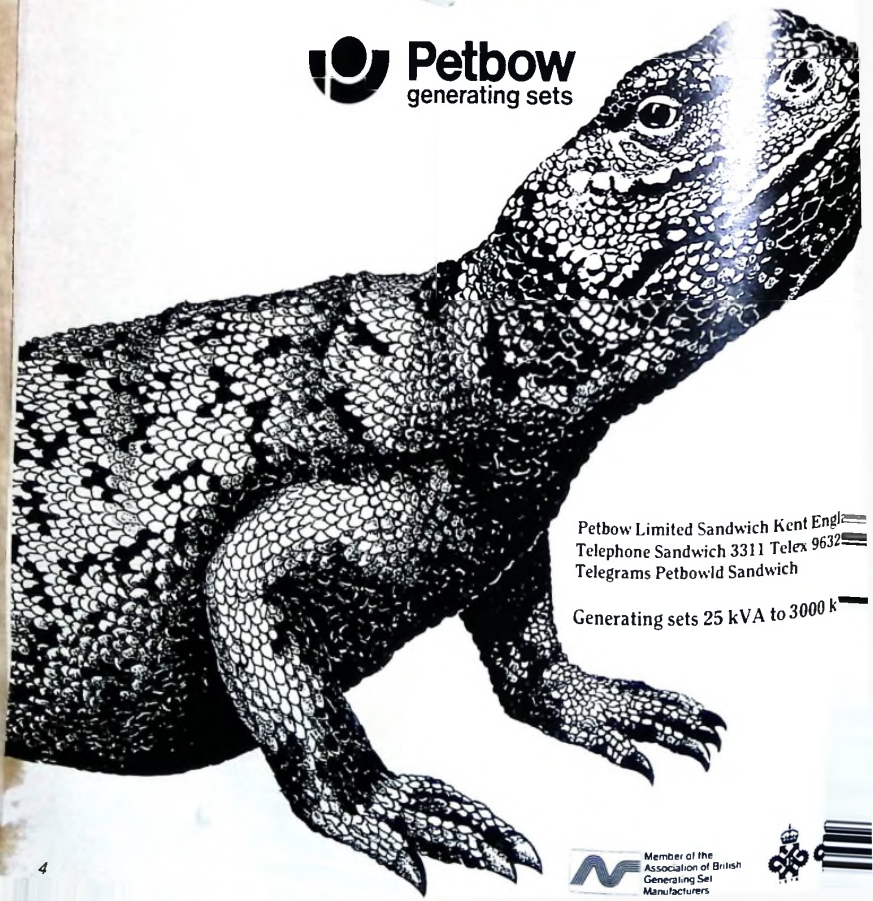

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This month's cover: Shows a David Brown 995 64 hp tractor at work. For more information on tractors see article on page 57.

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Commercial review

Fall in Nigerian oil

Nigeria's lowest figures for the last five years for crude oil production were recorded in March, with an average of 1.52m barrels per day. Nigeria has cut the price of her crudes by an average of 21 cents per barrel, the second price cut since December last year.

West African Economic Association launched in Lagos

The inaugural conference of the West African Economic Association opened in Lagos in April 1978. The theme of the conference was: "Industrialisation in the Economic Community of West African States."

At the opening session, the Chief of Staff Supreme Headquarters, Brigadier Yar'Adua, spoke of the important role the organisation had to play in promoting progress and understanding within ECOWAS.

He referred to such projects as the petro-chemical industry and an integrated steel complex and stressed that without them being developed and managed "by and for our own people on a community wide basis, it will be difficult to accelerate genuine development and economic growth in our various territories."

Brigadier Yar'Adua expressed the hope that the association would develop rapidly and became a source of valuable intellectual catalyst to help ensure that ECOWAS moved in the right direction and that its resources were effectively mobilised and utilised.

Nigeria—UK trade

Nigeria's exports to the UK totalled N32.2m during March bringing the total figure for the first three months of this year to N75.3m. Nigeria's imports from the UK in March reached N114.3m, culminating in a quarterly total of N327.1m.

Ghana-UK trade figures

Ghana's exports to the UK in March were valued at £7.9m, bringing the three-month total of exports to £36.2m. Ghana's imports from the UK for the same month, were £4.4m, with a total of £41.3m for the three-month period. The following table gives a breakdown of import/exports for March.

Ghana Export Total	Coffee, tea cocoa, spices	Metalliferous ores & scrap	Machinery & transport equipment	Cork & wood
£7.9m	£6.5m	£498,000	£241,000	£249,000
Ghana Import Total	**Machinery Transport Equipment**	**Chemicals & related products**	**Metal manufacturers**	**Textile Yarn & Fabrics**
£4.4m	£1.7m	£431,000	£210,000	£182,000

The President of The Gambia, Sir Dawda Jawara (right) making an inaugural telephone call to his country's High Commissioner in UK.

Gambia enters space age

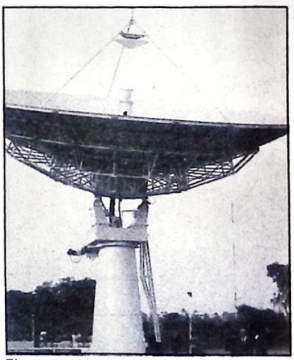
The opening of a new satellite earth station in The Gambia was described by the country's President, Sir Dawda Jawara, as marking a new era in the history of the nation's communication development.

The station, which is owned and operated by Cable and Wireless Ltd., is the 25th in which the company has been involved as either owner, partner, manager or consultant, and five more are expected to be brought into operation this year.

During the opening ceremony at the installation in The Gambia, Sir Dawda Jawara, who made the inaugural telephone call over the satellite system, said: "The station will offer very great advantages to The Gambia and is vital for the development of economic, social and commercial life."

Cable and Wireless was represented at the ceremony by the company's Chairman, Lord Glenamara, and guests included Gambian Government Ministers as well as telecommunication directors and Ministers from Senegal, Nigeria, Mauritania, Benin, Liberia, Ghana, Gabon and Sierra Leone.

The earth station is situated near the capital of The Gambia, Banjul, and the opening ceremony included a live television broadcast from London during which the President exchanged greetings with this country's High Commissioner in the United Kingdom, Mr. B. O. Semega Janneh.



The new cable and wireless Standard B Earth Station near Banjul.

Gambia's earth station works to an internationally-owned communications satellite over the Atlantic Ocean. It is a small dish installation which fully meets the Standard B specifications laid down by the International communications Satellite Organisation.

Brazil to buy Nigerian Rubber

Nigeria is to export a minimum of 5,000 tonnes of rubber to Brazil soon. An agreement to this effect was signed in Lagos between the chairman of the Nigerian Rubber Board, Mr. J. J. Umoren, and Mr. Roberto Frensece, General Manager of the Brazilian company Cotia Comercio.

The agreement represents the biggest single contract entered into by the board for direct export to a consuming country.

Brazil-Africa Trade Improves

Trade exchanges between Africa and Brazil have risen from $353m. in 1973 to $1,086m. in 1977, an increase in Africa's share of Brazilian trade from 2.8 to 4.5%

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NORTHERN EUROPE → NIGERIA

Nigerian — Brazil trade expands

Brazil has for the first time achieved a modest surplus of $1.681m in its trade balance. March exports totalled $1.059bn while imports totalled $1.057bn. This brings the quarterly deficit to $345.82m, this situation has been brought about by the heavy oil imports to build up stocks, combined with the effects of lower world prices of soya, coffee, maize and sugar exports and long droughts. This has caused a shift away from more traditional areas to intensive industrial development, requiring considerable imports of capital goods and raw materials.

Brazil is, therefore, altering the nature and markets of her products hoping to sell in growing quantities to developing countries, where a readier market exists for manufactured goods and services. An impact has begun to be made here in both civil engineering and manufactured goods especially Nigeria where the need to import oil is reflected in the trade balance. In the first two months of 1978 Brazil exported $39m to Nigeria and imported $30.3m from Nigeria.

Interbras sales drive in Nigeria

Interbras, the trading company of the State-owned oil conglomerate Petrobras, is rapidly increasing trade with the Middle East, Latin America and Africa, especially Nigeria. The 1977 annual report shows some success has already been achieved, exports to Africa rose from $23.865m in 1976 to $145.365m in 1977.

Interbras deals essentially in commodities foodstuffs, manufactured goods, domestic appliances and is pushing the idea for new service contracts in developing countries. Interbras recently launched an all-out drive in Lagos to place more than 30 types of Brazilian domestic appliances on the Nigerian market.

Last year, for the first time Interbras acted as agent for household appliances and sold $2.657m worth to Nigeria, Venezuela and the Middle East. Interbras last year acted as agent for such Brazilian services as the improvements to the Lagos telephone service, supervised by Brazil's Protec-Sobratel consortium.

...more exports from Brazil

The Brazilian company **Grupo Maximiliance Gaidzinek** is preparing to export wall and floor tiles to Nigeria especially designed for the tropics and said to be competitively priced. The possibility of a joint venture and the setting up of a factory has been discussed. The principal agent in Nigeria is **Hofao Nigeria Ltd.**, Lagos.

Lagos beats New York

According to Business International S.A., a subsidiary of the Business International Corp. of Geneva, Lagos is now amongst the most expensive cities in the world to live, and is rated three places above New York in a league table of the world's costliest cities. New York is taken as mean at 100 and Lagos on the same scale rates 102.5, with Tokyo at the top of the list at 142.9.

New business data source

A special report published by Kogan Page forms a compilation of statistics showing just how large a market-place Nigeria has become. The guide, compiled by Ian Maclean and Guy Arnold, is aimed directly at overseas businessmen hoping to initiate trading links with Nigeria. The report comprises of over 90 statistical tables derived from government and Nigerian trade accounts.

Hong-Kong/Nigeria air-sea link

Hong Kong has set up a new air-sea cargo link with Nigeria to speed up deliveries. Cargo from Hong Kong will be shipped to Amsterdam and then air-freighted direct to Nigeria. The new service is expected to cut the delivery time from sixty days or more for an all-sea delivery to about 35 days. Initially there will be ten sailings a month to Amsterdam, and three flights a week to Nigeria, though this can be expanded.

Continued

EXECUTIVES' CALENDAR

A monthly service listing some of the major events in West Africa and around the world that are likely to be of interest to our readers. Further information on most events can usually be obtained from the commercial office of the embassy of the country concerned.

JULY		
3-9	National Fair for Mechanical Machinery Electro-Technics & Electronics	SAO PAULO
4-17	International Exhibition of Equipment & Techniques for Food Industries Trade	MOSCOW
10-14	National Housewares Exhibition	CHICAGO
16-21	International Furniture Exhibition	SAN FRANCISCO
AUGUST		
18-24	Hi-fi '78 International Exhibition	DUSSELDORF
19-27	OMURUE — International Agricultural and Food Industry Fair	LJUBLIANA
25-3 Sept.	International Consumer Goods Fair	STOCKHOLM
28-3 Sept.	BYGG International Building Exhibition	GOTHENBURG
29-2 Sept.	International Marine Engineering Exhibition	GLASGOW
29-4 Sept.	CONECO '78 International Exhibition for Building Material & Interior Furnishing	BRATISLAVA
30-3 Sept.	16th Overseas Import Fair "Partners for Progress"	BERLIN
31-10 Sept.	FIRATO International Radio & TV Exhibition	AMSTERDAM
31-15 Sept.	SELCHOSTECHNIKA International Exhibition of Agricultural Machinery	MOSCOW
SEPTEMBER		
3-5	INTERFEREX — International Trade Fair for Hardware, Tools & Household Goods	BASEL
3-10	INTERNATIONAL AIR SHOW	FARNBOROUGH
11-16	AIEE — International Office Equipment Trade Fair	SYDNEY
12-16	International Technical Fair	HELSINKI
13-21	International Machinery Trade Fair	BRNO
14-17	GOLVEX FIM — International Fair of Floor, Wall Materials, Paints, Cleaning	STOCKHOLM
15-20	IKOFA 12th International Trade Fair of the Food Industry	MUNCHEN
16-20	VISUMAT — International Commercial Equipment Trade Fair	BRUSSELS
17-18	International Footwear Fair	SALZBURG
19-23	AQUATECH — International Exhibition of Water Treatment, Storage, Transport & Consumption	AMSTERDAM
20-29	SICOB International Exhibition of Data Processing of Communication & Office Organisation	PARIS

Five Zones for News Agency of Nigeria

The board of Directors of the News Agency of Nigeria has approved the establishment of five zones for the operations of the Agency.

The zones are:

1 Kaduna, made up of Kaduna and Sokoto, Niger and Kano States.
2 Ibadan, consisting of Oyo, Ogun and Kwara States.
3 Benin, comprising Bendel, Ondo and Imo Sates.
4 Enugu Zone including Anambra, Benue, Cross River and River States.
5 Bauchi, made up of Bauchi, Borno, Gongola and Plateau States.

The board has also approved the deployment of editors for the zones as follows: Mr. Wada Maida for Kaduna Zone; Mr. Toye Olofintuyi for Ibadan zone; Mr. D. O. Igiewe for Benin zone; Mr Chukurah Ezebube for Enugu zone. The editor for Bauchi zone is yet to be appointed.

The zonal editors are now in their various headquarters setting up zonal and state offices of the agency.

The News Agency of Nigeria was set up by Decree Number 19 of 1976 and is due to begin operation on October 1, 1978.

The ten-man member board, headed by Professor Alfred Opubor of the University of Lagos was inaugurated on March 16, 1978.

Nigerian Shipping Expands

A new shipping line Asian African Container (Nig) Ltd. has been formed to operate between the Far East and West Africa. The line forms part of the Ashamu Group of Companies and represents a joint venture with Orient Overseas Container Line (OOCL). The new service will cover Yokohama, Kobe, Keeling, Hong Kong, Bankok, Singapore and Lagos, Tema and Abidjan, and due to national line status, the service will enjoy quick and planned berthing privileges at Lagos/Apapa.

Complete dredging plant for Nigeria

Making its first voyage from the Middle East, the **Stevin Express**, a £1½ million floating dry-dock and workshop combined, the only one of its kind in the world, has just transported a complete dredging plant including the Beverwijk 38 cutter suction dredger, a fuel barge, two launches, two work pontoons and over 1,000 tons of spare parts nearly 8,000 miles from Saudi Arabia to Nigeria via Algeria in just 40 days.

As a result, the Stevin Group, were able to cut transport costs by almost £½ million and save no less than two-months compared with conventional shipping.

Benson Project well ahead

The C45m Benson Oil Palm Plantation (BOPP) at Adum Banso in Ghana is well ahead of schedule. The project involves the planting of 10,000 acres of oil palms over the six year period 1976-81. UAC International holds 57% of the shares, the Ghana Government 40% and Barclays Bank International 3%.

When the estate is in full production in 1986 it is expected to produce 9,000 tonnes of palm oil annually as well as 2,000 tonnes of palm kernal.

Currently Ghana imports about 18,000 tonnes of palm oil. Once work on the C[illegible]ed palm is completed, it will process fruit from the plantation as well as produce from the planned 3,000 acres of smallholdings around the estate. Field planting is progressing as planned, with 1,[illegible]00 acres of palms planted in 1977, and a further 2,000 acres expected to be planted this year.

A road system covering 6,000 acres on the estate is near completion, 1,100 workers are included in the project.

Food Crisis Conference held at Ibadan

The third general conference and the tenth anniversary celebrations of the Association for the Advancement of Agricultural Sciences in Africa took place on April 10, 1978 at the University of Ibadan.

Delegates at the conference were to discuss "Food Crisis and Agricultural Production in Africa: Problems, Policy and Solution."

In a message to the conference the Federal Commissioner for Agriculture and Rural Development, Mr. B.O.W. Mafeni, expressed concern that agricultural production in Africa was not keeping pace with its population growth.

He also noted with concern that food production level on the continent lagged considerably behind those of other parts of the world, including other tropical and less developed regions.

The situation, he pointed out, created social, economic and other problems which had led various governments on the continent to pay more attention to agriculture than before.

The Commissioner attributed the serious situation to a number of factors, one of which, he said, was that for far too long in the continent's history, food production was taken for granted and given inadequate attention.

Mr. Mafeni then announced a number of measures taken by Nigeria to improve agricultural production, and its support services.

These include the establishment of agro-service centres throughout the country; the setting up of large seed multiplication programme and the introduction of mechanical bush clearing and land preparation scheme in aid of farmers.

He also revealed that the government had established eleven river basin development authorities to harness the potentials of the river basins in the country for agricultural production and other use in addition to the launching of the Operation Feed the Nation programme (OFN). The OFN, he explained, involved a total mobilization of the nation towards self-sufficiency and self-reliance in food supply and an encouragement of every Nigeria to produce all or part of his food.

Other measures listed by the Commissioner include the establishment of seven commodity boards; a five-year tax holiday for those willing to invest in combined agricultural production and processing as well as the provision of improved seeds and fertilizers to farmers at subsidised rates.

Fixed Prices for Palm Oil

The Nigerian Palm Produce Marketing Board has fixed new producer prices for palm oil, aimed at encouraging increased output.

In recent years palm oil and kernel production has declined and local industries, such as Lever Bros Nigeria Ltd and PZ Industries, which depend largely on these inputs, have been badly hit. However, with the establishment of palm oil plantations by some state governments the future outlook for the palm oil industry appears more encouraging.

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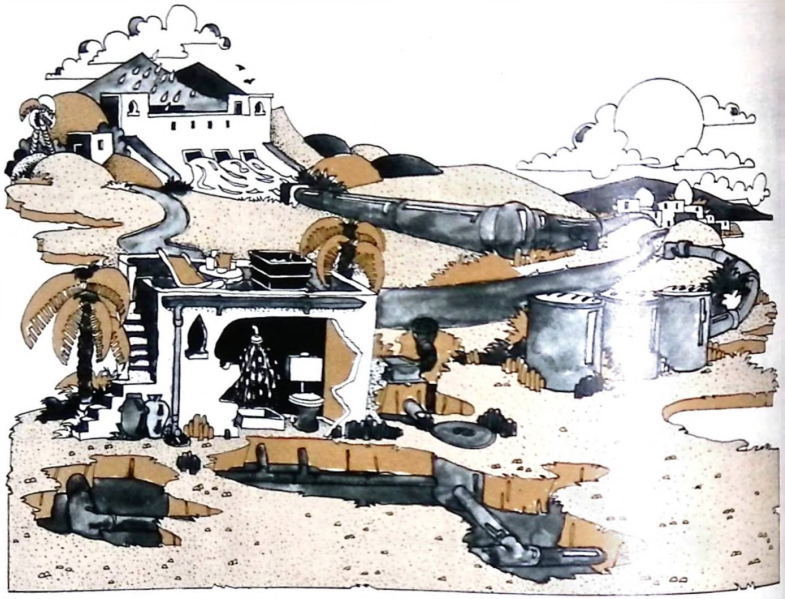

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Nigeria's first National Seed Plan

Minster Agriculture, in co-operation with their Nigerian associates, ABC Nigeria Ltd. and Agricultural and Rural Planning Associates Ltd., have completed Nigeria's first national seed master plan designed to provide guaranteed supplies of high quality seeds to Nigeria's eight million farmers.

The companies called on their expertise in seed production, processing and storage, and their extensive experience of West African conditions.

Two multi-disciplinary teams were deployed. They visited all nineteen States in Nigeria and surveyed existing seed multiplication practice and, in co-operation with the Federal and Stage Agricultural Ministries, assessed future demands. Major research institutes and private sources co-operated by providing further technical information.

Co-ordination of the agricultural criteria with the federal, regional and local agricultural organisations in a society undergoing rapid structural changes was not simple and considerable flexibility was therefore built into the master plan.

The plan provides estimates of the demand for maize, millet, sorghum, rice, cassava and vegetable seeds up to 1990, together with the associated technology, manpower training, and finance requirements. In addition detailed plans were put forward for the setting up of the legislation requirements to ensure that the quality of the seed is maintained until it reaches the farmer.

Sierra Leone...

Sierra Leone is setting up its own company to manufacture high-quality jewellery for sale in Freetown.

The aim of the scheme is to sell diamond jewellery of a high standard below the price at which it is available elsewhere. It is hoped that this scheme will help the country's tourist trade.

A feasibility study on the proposed creation of a school for the training of hotel workers has started in Freetown. The project is under the supervision of Mr. D. Denelezzi an International Labour Organization expert on tourism.

The Sierra Leone Supreme Islamic Council is to build seven primary schools, estimated to cost Le 28,000 in the Bo district.

The Saudi Arabian Government has given Le 88,000 to assist self-help projects in Maforki Chief, Port a Loko, in **Sierra Leone.**

An air traffic agreement has been signed between **Sierra Leone and Pakistan.**

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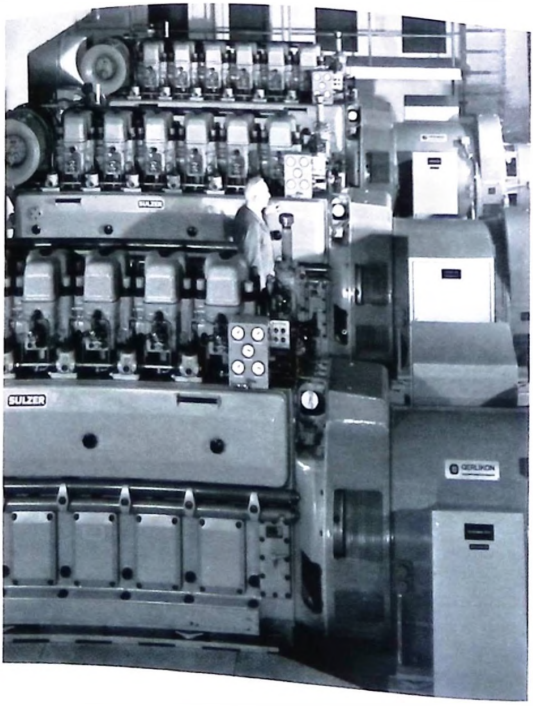

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Ivory Coast looks at Tourism

Tour operators from seven European countries have been to the Ivory Coast for a week's inspection tour at the invitation of the Minister of Tourism. Last year 140,000 tourists visited the Ivory Coast, and it is hoped this number will double by 1980.

Abidjan conference on marine pollution

A seminar organised by the United Nations and the Ivory Coast Government on marine pollution was recently held in Abidjan.

It was decided that the main sources for this pollution are of hydro carbons mostly due to the transportation on a large scale of crude petrol: (b) industrial waste; (c) domestic water that has a heavy concentration of organic matters and micro-organisms.

During the course of the seminar, a meeting was recommended of the top people of the countries concerned. The objectives of this meeting could be to start a programme, preparing a plan for treatment and for evaluating polluted waters.

First direct air link Ivory Coast-UK

The first ever direct air service between London and Abidjan, Côte d'Ivoire was inaugurated on 7th May by British Caledonian Airways.

British Caledonian's Sales Director, Mr Duncan Haws, who was travelling on the flight, said: "Business traffic will generate most demand on the route but the excellent hotel and beach facilities available in the Côte d'Ivoire will make the development of tourism a natural step.

"Indeed, our tour operating subsidiary, Golden Lion Holidays, is right now planning a range of Côte d'Ivoire holidays for the 1978/79 season."

He added that there was also a large demand from students to visit the UK for English language and trade and technical courses.

Mr Haws stated that B.CAL had received "very positive encouragement and excellent co-operation" in the development of the new service from the Government of the Côte d'Ivoire, both in Abidjan and through the Embassy in the UK.

The B.CAL service to Abidjan operates once-weekly with Boeing 707-320C aircraft, via Monrovia, Liberia, leaving Abidjan at 07.45 on Mondays or leaving London at 22.15 on Sundays.

Non-stop Monrovia-London

A major expansion of the activities of BCAL and its associate companies in Liberia was highlighted, when the Chairman visited Monrovia recently.

Now, as from 8 May, BCAL can offer Liberia's first non-stop flight to London departing Monrovia at 0955 every Monday. This is BCAL's third weekly flight to London, the other two flying via Freetown and Dakar.

A major role in establishing the new service is being played by the new Monrovia sales office, which was opened by Liberia's Deputy Minister of Commerce, the Hon E. Sumo Jones.

Caledonian Hotel Management have also expanded in Liberia with a contract to provide technical assistance in the planning of accommodation and support facilities for the 1979 OAU Conference. This will involve helping in the planning of the special heads of state residences — 52 are being built — and the Hotel Africa, which is being specially constructed to accommodate the 3,000 delegates expected during the conference. CHM will also be heavily involved in promoting the conference all over Africa.

Record Vehicle Sales in Ivory Coast

According to figures recently published by GIPA (Groupement Interprofessional de l'Automobile) local sales of vehicles in the Ivory Coast have beaten a new record in 1977.

12,803 cars were sold during 1977, 15% more than in 1976 when 11,105 were sold, which, in itself was a 43% expansion over 1975.

Looking more closely at the statistics it can be seen that the Japanese are continuing to do well on the Ivorian market, for, out of 12,803 cars in 1977, 5,928 were of Japanese origin. This is not only the case with car sales but also with heavy vehicles. East European makes are also beginning to make an impression, notably Lada and Cacia.

MAKES	1977	1976
1) RENAULT	2,812	2,199 (2)
2) DATSUN	2,385	2,655 (1)
3) PEUGEOT	1,916	1,717 (3)
4) TOYOTA	1,650	1,700
5) MITSUBISHI	619	384 (6)
6) HONDA	513	304 (7)
7) CITROEN	443	473 (5)
8) LADA	442	298
9) MAZDA	338	250(11)
10) SUBARU	324	—
11) SIMCA	289	250(10)
12) FIAT–SEAT–LANCIA	232	251 (9)
13) MERCEDES	167	191(12)
14) VOLKSWAGEN	100	—
15) VARIOUS	573	531
	12,803	11,605

SALES OF UTILITY VEHICLES BY CATEGORY

	1977
Light utility vehicles	361
Vehicles for the transportation of passengers	1,063
Vehicles of 1.5 to 5 tonnes	3,092
Vehicles of 5 to 10 tonnes	1,155
Vehicles of over 10 tonnes	1,176
Road tractors	621
Agricultural tractors	364
Trailers	411
Various	481
	8,724

Liberia — Ivory Coast Agreements

An air agreement has recently be signed by the Liberian Minister of Commerce, Industry and Transportation and the Ivorian Minister of Foreign Affairs. The two countries have also signed an agreement for the construction of a hydro-electric dam on the River Cavelly.

In the mining and geology fields the two countries have decided to intensify their co-operation and undertake studies with the view of erecting organisations for petroleum research.

First Veterinary Congress in Accra

The first African Veterinary Congress ended in Accra after five days with a resolution to establish an African Veterinary Association.

Once in full operation the Association will act to facilitate the exchange of veterinary surgeons and students between member states and promote laws to develop livestock industries in Africa.

The Datsun F02 Proves Big Things Take Place When Nissan Sets Out to Engineer Breakthroughs

Only 1 outstanding feature. That's the trouble with most forklift designs. But total performance determines the true value of materials handling equipment. So, Nissan decided the time was ripe to engineer some changes.

The new-generation Datsun Forklift F02 incorporates a number of super improvements. Attractive, low-profile styling creates double benefits—higher load stability and a lower floor level. F02 models safely lift their rated standard load to a height of at least 4 meters. Warm white and orange colors bring out the new personality. A smaller minimum turning radius (2,150mm for 2-ton; 2,220mm for 2.5-ton) results from reduced external dimensions. Lifting speed is a stable 490mm/sec*, Which is considered ideal for most jobs.

Operator comfort and safety reach new levels. Single-lever tilt/lift, power steering, improved forward visibility and a well-padded bucket seat keep operator fatigue down. The non-slip floor mat, rigid overhead guard w rain drip channel and duo-servo, self-adjusting brakes instill greate confidence. Plus other recommen optional safety equipment is avai Simplified servicing further enha traditional Datsun reliability. The maximum use of standardized, h duty components provides super long-life operating economy.

The Datsun Forklift F02 Series. It's totally engineered by Nissan profitable performance.

*Standard gasoline engine

DATSUN FORKLIFT

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In brief...

Chairman of Costain West Africa, Alhaji Shehu Malami reported a turnover of ₦58.5m for 1977 and a pretax profit of ₦3.7m but pointed out there "will be fewer new contracts open to tender in the months ahead."

Nigeria and the Republic of Guinea have signed an economic agreement on commerce, agriculture and industry in Lagos. It is part of the arrangement to establish economic relations between the two countries in the spirit of ECOWAS.

A South Korean economic delegation recently visited Lagos and met with officials of the Federal Ministry of Trade and members of the Nigerian Chamber of Commerce and Industry.

The Nigerian **Federal Government** has reportedly received applications from all 19 states for brewery licences. At present there are 7 breweries operating, and 7 more are expected to start this year.

The **Fertilizer procurement** and distribution programme for 'Operation Feed the Nation' is estimated to cost N40m during the current financial year. The quantity under this programme amounts to 243,000 metric tonnes, comprising of 11 different types of fertilizer.

SCOA Nigeria Ltd., wishes to establish contact with potential suppliers and manufacturers of glue for application with wood, ceramic tiles and plastic laminates.

Standard Bank of Nigeria intends to have its senior management fully Nigerianised by 1980 according to an announcement in the Business Times, Lagos.

Telecommunications between France and West Africa have been improved with the inauguration of a new 2,500 Kw submarine cable extending to the Ivory Coast. There is already an existing line linking France, Morocco and Senegal.

Negotiations are near completion for a German firm **Raulmex** to take over the running of all government farms and plantations in **Cross River State.** The firm will finance, manage and develop projects including model farms, Agricultural Development Corporation plantations the Obudu Cattle Ranch and Ranch Hotel.

Feasibility studies on the construction of an oil refinery in Senegal with an annual capacity of 1,250,000 tons have been completed and the refinery is scheduled to start operations in 1983. The statement was released by the **National Iranian Oil Company.**

Cutting the tape to open officially British Caledonian's new West African headquarters is the Oba of Lagos — the city's traditional ruler — His Highness Alayeluwa Oba Okeyan II. Immediately behind the Oba is Caledonian Airways Limited Director, Mr Stuart Young, who travelled from London to Lagos especially for the opening.
The new office provides expanded capacity for B. CAL's sales reservation, marketing and administration requirements in the whole West African region.
In Nigeria it had streamlined co-ordination with B.CAL's offices in Ikoja, Warri, Kano, Kaduna, Jos and Port Harcourt which together make up the largest network of non-Nigerian airline offices in the country.

The **ECOWAS** Development Fund now stands at $20m according to the current chairman of the Community's Council of Ministers. Nigeria has contributed $6.7m towards the fund.

In June, the Gambia is to take delivery of a new passenger and freight service ship for the River Gambia. The US$3m "Lady Chilel Jawara", named after the President's wife, will provide a vital line of communication along the River Gambia. It will also help the growing tourist industry, and replaces the 27-year-old "Lady Wright".

As part of the 15-year programme to develop the tourist industry, the Ghana Tourist Board is compiling a register of hotels and rest-houses in an attempt to enforce minimum standards.

- Chief J. O. Odoji has been appointed as the new chairman for R. T. Briscoe (Nigeria) Ltd. The former chairman, Mr Mogens Pagh, will remain as member of the board.
- Mr Henry K. Aderbigbe has been appointed a director of Livestock Feeds Ltd.

A trailer boarding the Blue Matsuyama on the new monthly trailer service introduced between Lagos and the UK by UKWAL to supplement their conventional and container service. "West African Shippers who have supported the new service have been well satisfied with the speed and efficiency of the operation," a company spokesman said.

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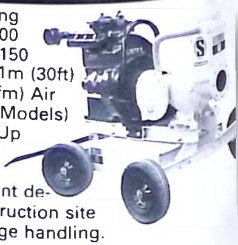

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Selwood induced-flow pumps won the 1976 Queens award for Technological Innovation

STRUCTOR TECHNIQUE

WEST AFRIC... ...LINE

Air Bridge to SDP in Bauchi

The Austrian manufacturer of motor vehicles, Steyr-Daimler-Puch AG (SDP) has agreed to a joint venture with Nigeria to assemble commercial vehicles in Bauchi, a city of some 100,000 situated in the heartland of Nigeria.

Original plans called for the start of production assembly by September of this year, but the usual snags have postponed this date well into 1979.

The biggest headache is transport of parts from the landlocked factories in Austria to the even more landlocked, if not impossible, city in Nigeria. Initially, some 6,000 tons of parts per year — over and above the machine tools required to set up the plant — must be freighted to Bauchi by 1991, this volume is estimated to reach upwards of 20,000 tons a year.

Three possible routes have been discussed by SDP with transport firms:

1 Overland to Hamburg; by ship to Lagos; and then overland to Bauchi. Estimated transport time: six to nine weeks;

2 By ship - from Trieste or other Adriatic ports — or plane to Algiers, and then some 2,200 miles overland through the desert south to Bauchi.

3 By air from Austria to the nearest Nigerian airport to Bauchi (Kano about 450 km distance) — flight time, six hours — and then overland to Bauchi. Total travel time: about two days.

The first option was rejected by SDP because of the unloading wait in Lagos: weeks and often months in the crowded harbour, waiting for a berth. During this expensive waiting time, the dangers of piracy increase; ships have been stripped to their hulls by harbour pirates in waters off Lagos.

The overland route from Algiers has also been rejected because of the dangers during the long journey south from marauding nomadic tribes and other insecurities of this desert marathon.

Utilizing the third possibility, a Boeing 707 or a DC-8 jet freighter, each with a capacity of about 38 tons, flies from Austria every other day to Nigeria, where the road between the Kano airport and Bauchi is said to be reasonably good and already utilized for part of its length by Peugeot. This is to be increased to five flights weekly as of the end of next year, with daily flights shortly thereafter. Jumbo jet freighter aircraft, each with 100-ton capacity, are envisaged to replace the 707s and DC-8s.

The costs for this air bridge — between 500,000 and 650,000 Austrian schillings for one 707 or DC-8 return flight; costs vary as do share prices and seem astronomical at first glance. But these costs are compensated by lower insurance rates for air freight than for goods sent by ship or over long land stretches, as well as by shorter periods that capital is tied up.

The competition for the transport contract for SDP parts to Bauchi was frenetic, it is worth between AS 130 million and AS 160 million annually at present, rising to AS 200 million and higher within a few years. The arrangement is likely to continue for no less than 15 years, so that upwards of AS 3,000 million is involved at current price levels.

The probable winner is Austrian Airtransport (ATT), a subsidiary of Austrian Airlines (AuA) specializing in charter and freight transport. Neither ATT nor AuA have enough aircraft to handle the contract, so that they are in the market for leasing aircraft belonging to other air lines. The first 707 jet freighter is likely to be obtained from the Belgian charter air line, Young Cargo. Talks have also been underway with the Luxemburg carrier, Cargolux.

Nigerian Airways (NA) has also indicated that it would appreciate a piece of this profitable traffic. But the African carrier is already overloaded, and it will doubtless be some years before any portion of this air traffic goes to NA. Meanwhile, ATT and other European cargo lines stand to profit handsomely — especially as ATT has not worked through aircraft brokers — from this air bridge to SDP in Bauchi.□

Niger to become fourth largest uranium producer

In three years, when Niger becomes the fourth world producer of uranium, it will be able to export, by road, thousands of tonnes of concentrated uranium. Nowadays the rainy season renders the roads between Agadez and Tahone unusable.

Arlit, where most of the uranium originates from, is in the middle of the desert. But in three years time the 650 km. "uranium road" will be asphalted and it will be open all year round. Twelve French, Italian, German, Japanese, American, etc., companies are participating in the cost of this road, in agreement with the ONAREM (National Office of Mineral Resources in Niger).

Its total cost is estimated at FF 600m. This "Uranium road" is only part of the route of nearly 2,000 km. which goes as far as the port of Cotonou in Benin.

Today 350 trucks with 25 tonnes drive up and down this road three times a month. With the increase in the production of uranium and consequently the products that will have to be imported to sustain the mines and the new towns, twice as many trucks will be required to make this journey fifty times a year.

For every tonne of uranium that goes to Cotonou, 25 tonnes of various products are needed. The treatment of uranium requires a large amount of sulphuric acid to dissolve the mineral. Fuel, machinery, food are also needed. Fortunately water is available on the spot.

The "uranium road" goes north-south between the desert of Niger and the coast of Benin. But already there are concrete plans for a north-south road from Algiers to Lagos. The Trans-Sarah Algiers-Laghouat, Gardhaia-El Golea. In Saleh-Tamanrasset will be mid-July be entirely tarred for more than 2,000 km. Between Tamanrasset in the south of the Algerian Sahara and Arlit in the north of Niger's Sahara the distance is 600 kms., going by the frontier post Assamaka. However, a new more rectilinear route, further to the east is envisaged, putting Arlit 170 km. from the Algerian border.

UK research on tropical water disease

The secrets of a mysterious blood cell that may eventually affect the fight against bilharzia are being revealed by research in the UK.

The cell is called the eosinophil and for 80 years since its discovery scientists have known it only as a cell probably playing some part in inflammation caused by an allergy. Now basic research at the National Institute for Medical Research (NIMR) has shown that, in the laboratory, eosinophil is a killer of the parasite responsible for bilharzia.

Bilharzia is a water-borne disease of tropical Africa and South America, which can cause fatal damage to kidney, bladder, liver and bowel. About 200 million people are infected by a worm-like parasite called a schistosome.

Infections were known to raise the blood levels of eosinophils up to 10 times the normal and why the sudden rise took place and what the cells were doing remained a puzzle. Recently in Nairobi Dr Tony Butterworth, working for the Wellcome Foundation, discovered that the human eosinophils would kill schistosomes if serum from sufferers was also present. The research has been done with eosinophils from rats. The cells stick firmly to the surface of the parasite covering it completely. Inside the cells are granules containing enzymes, they fuse to form large sacs and the cell discharges the contents onto the parasite. The surface is damaged and the cells then migrate through the lesions and start stripping off the parasite's surface and after about 18 hours the young worm dies.

This is only the test tube result, whether the cell works like this in people who develop immunity to the disease is now being investigated. There are still many other unanswered questions, but in the build-up of knowledge that is necessary to wipe out bilharzia perhaps, the research will eventually lead to a vaccine that would release millions of people from an age-old scourge.

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COMPANIES & CONTRACTS

General Telephone & Electronics Corporation has been awarded a $1m. plus contract for communications transmission systems in Nigeria. One system will connect Bauchi with Azare, with four repeater stations. The second system will connect Zaria and Funtua with one repeater station. Both systems will have a 24 channel capacity. GTE Nigeria Ltd. hopes to complete the systems by the end of the year. UHF radio and multiplex equipment will be supplied by **GTE Telecommunicazioni S.p.A.** Milan.

Under a contract worth nearly ₦840,000 **International Marine Radio Company** (IMRC) is to supply equipment that will provide worldwide communications for 19 general cargo vessels being built for the Nigerian **National Shipping Line.**

The vessels constitute one of the largest new shipbuilding contracts recently placed. Eight, of 12,000 dwt., are being built in Yugoslavia by **Brodogradoliste Split** in Split. The other 11 ships of 16,000 dwt., are under construction in South Korea by **Hyundai Shipbuilding and Heavy Industries** at its Ulsan yards.

Powell Duffryn Engineering, have secured an export order worth over ₦7.2 million for special purpose container handling and refuse collection vehicles for use in Lagos, Nigeria.

The contract covers two types of vehicles — the large hydraulically-operated demountable container handling unit, known as the Dinosaur, which is to be used to transport large bulk quantities of refuse; and the heavy duty compaction refuse vehicle, known as the Mammoth. In addition, containers of 27m³ capacity for use with the Dinosaur and of 1600 litres for use with the Mammoth are being supplied.

Over a hundred vehicle units and 900 containers will be exported.

This is the largest export order yet obtained by this company," said Mr F. W. Stokes, Managing Director. "The contract also provides for the supply of spares and ancillary equipment, as well as the training of Nigerians to operate and service the equipment. A number of Nigerian officials have already been to Llantrisant for training."

The Cross Rivers State Government has awarded contracts worth $1m. Two are for the construction of a Central School of Nursing and Midwifery and the third is for the construction of an x-ray block in Calabar. These have been awarded to **Bekado Nigeria Ltd, John Andy Ltd** and **Staddcon Associates.**

An order worth ₦300,000 has been placed with **TI Fords** of the UK for eight slitter-rewinders for the new factory at Agbara of **Colodense Nigeria.** The plant has been set up to meet increased demand for sweet and biscuit wrappings.

A contract has been won by **Rail Indus Technical and Economic Services Ltd** to carry out a survey of the managerial and staffing of the **Ghana Railway Corporation.** The study will cost $200,000 and will enable the **World Bank** to make a $10m loan for the improvement of the railway.

Powermaker International Ltd. manufacturers of generators have gained a new order for their power units in Nigeria, at a new factory at Port Harcourt. Powermaker's Poyand powered 566 KVA set is to be used as the prime power source, and was sold during a recent trade fair visit.

The Finnish concern **Lemminkäinen** has won a FinM 40m (£5m+) contract for the municipal engineering, electrification and roadworks for the 1,100 house new town of Matadi to be built near the centre of Monrovia.

The project is due to be completed in 22 months; some of the materials will be imported from Finland.

C. F. Casella & Co Ltd, UK have won orders worth ₦108,000 for meteorological equipment to be supplied to the **Federal Ministry of Civil Aviation** in Lagos.

Rollalong have supplied three caravans to **Egeston Engineering (Bromley) Ltd.** for a telecommunications project in Enugu, with the unusual feature of a full-length verandah and canopy on one side to provide extra living area. The company claims to be the only one making this type of verandah.

A. P. V. Kestner Limited transfer hopper of somewhat unique configuration (see below) undergoing final touches. The hopper has been specially designed as part of a soap manufacturing plant for **Messrs. Unilever Ltd.** and will form part of a plant to be erected in Nigeria.

Hawker Siddeley Power Engineering Ltd's generation division has won a £¼m contract for electrical distribution and stand-by diesel power plant at the Maiduguri Teaching Hospital Complex in Nigeria. The contract awarded from **Technical Constructions (Nigeria) Ltd.** is for the design of the system in association with the consulting engineers for the hospital **Hoare Lea & Partners.** Altogether six Hawker Siddeley companies will supply equipment.

Sierra Leone is to ship 2,000 tons of salt a month worth Le 160,000 to **South Korea.** The result of contracts made during the recent **Daily Mail Trade Fair.**

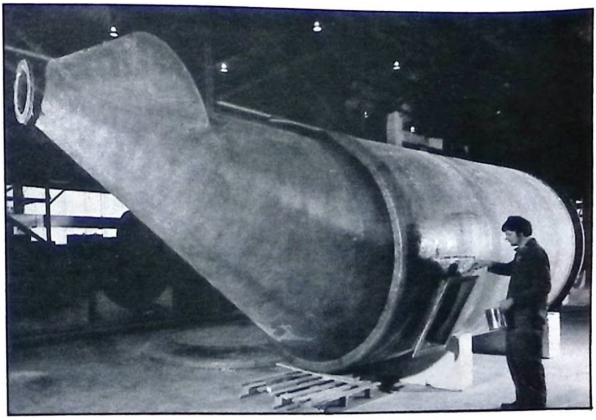
Aldersley Equipment of the UK has shipped the first consignment of equipment for a £200,000 malt-silo complex for the Guinness brewery in Cameroon.

A $135m order has been won by **Kobe Steel** from **Societe Arab des Industries Metallurgique** (SAMIA) to build an iron ore pelletising plant in Mauritania by 1981. The plant to be built in Nouadhibou will be capable of making two million tonnes of pelletised iron ore a year.

SAIUGE an Italian construction company and affiliate to Fiat have recently purchased an HM2 Mark 4 craft from **Hovermarine** to transport their workforce, from the accommodation village of Kirikiri to Ebumetti. SAIUGE are currently involved in the construction of an interconnecting freeway around the Port of Lagos and the building of bridges linking the Islands. Hovermarine have been on location in Lagos and Calabar since 1976 training local personnel in the setting up and running of high density commuter routes.

Ondo State Government has awarded a $2m contract for the establishment of a modern Government printing press in Akure to **Adecentro (Nigeria) Ltd.**

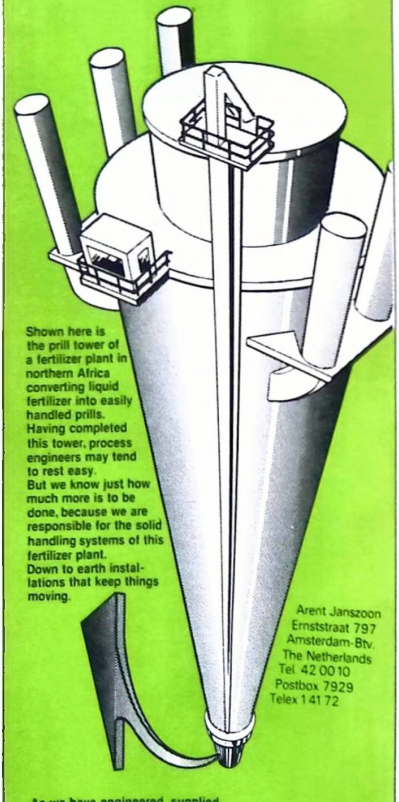
Continued



The Unique transfer hopper from A.P.V. Kestner Ltd.

Now the prill tower has been completed, there's still much to be done.

DOWN TO EARTH



Shown here is the prill tower of a fertilizer plant in northern Africa converting liquid fertilizer into easily handled prills. Having completed this tower, process engineers may tend to rest easy. But we know just how much more is to be done, because we are responsible for the solid handling systems of this fertilizer plant. Down to earth installations that keep things moving.

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WEST AFRI... ...UNI...

Contracts

Westinghouse, US, is to supply electrical equipment worth $2.2m for a new paper mill owned by **Nigeria Papermill** at Jebba. The order includes switchgear and electrical motors.

NEPA, Lagos has ordered gas turbine and accessories worth $50m from **General Electric Company,** US.

Skoup & Co. Nigeria Ltd., in association with **Nippon Koei Co. Ltd.,** Tokyo, are engaged on a detailed feasibility and design of projects on behalf of the Ogun — Oshun River Basin Development Authority. The projects involve 5 pilot-irrigated farmland areas to determine suitable irrigation methods and crops in various areas.

Upper Benue River Basin Development Authority has awarded a contract worth ₦12,000 to **ALTS (Nigeria)** for the first phase of studies of the Donga and Taraba river basins in Gongola State.

The Ondo State Water Resources Corporation has awarded a ₦10.16m contract for the construction of the Ero River Dam to **The Water Resources Company.**

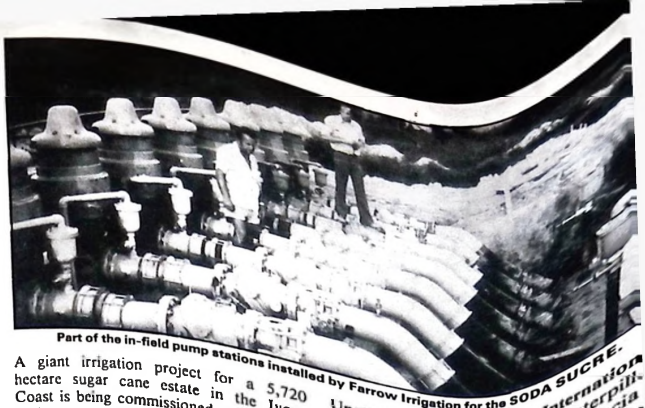
Grand Metropolitan International Site Services has been awarded a contract by **Chiyoda** of Japan to provide accommodation and catering services to 1,000 staff engaged on the Kaduna refinery project.

NCR has placed a ₦18m with Kawasaki of Japan for 150 new coaches and 12 power cars for the railway.

D. Balfour & Sons, consulting engineers have recently been awarded an additional contract for water supply projects in Borno State, bringing the estimated cost of the project to ₦18m. The work will involve borehole abstraction, simple water treatment plant, service reservoirs and supply and distribution mains.

Final shipment has now been made of equipment supplied by **Kent Instruments Ltd.** against a major order from Nigeria for instrumentation for a water distribution network. The **Anambra State Water Board** is to construct a massive network of pipe systems, pumping stations, and treatment plant. Instrumentation for the scheme was ordered by **John Holt and Company (Liverpool) Ltd.** The order comprises 380 Dall Tube differential pressure flowmeters, and 200 'Commander' type KJD/T recorder-integrators, and is valued at N400,000.

Energoprojekt Associated Enterprises has commenced work on the new town hall in Libreville, capital of Gabon. The project is estimated to cost $15.5m covering an area of 9,500 sq. meters, and is to be completed in 8 months.



Part of the in-field pump stations installed by Farrow Irrigation for the SODA SUCRE.

A giant irrigation project for a 5,720 hectare sugar cane estate in the Ivory Coast is being commissioned on a phased basis. **Farrow Irrigation,** have designed the scheme and supplied much of the equipment. When finally complete the scheme, at Ferkessedougou, will comprise about 150 Km of underground mainline pipe and about 330 Km of portable irrigation pipeline. Thirty kilometers of overhead electric transmission line supplies the electric pumps which have a capacity to deliver 75 million gallons of water a day from the Bandama River into 15 Km of canal which serve all sections of the estate.

A ₦9m contract has been signed between **Technip** of France and **CAFEC** for the design and construction of a lime plant in Senegal to produce 60,000 tonnes a year.

The UK-based consulting engineers, **Alistair McCowan & Associates'** Nigerian subsidiary has been appointed by the **Anambra State Government** to provide supervisory staff for three road contracts in the state.

Ghana's **Volta River Authority** have signed contracts with two Canadian firms for the hydro-electric project at Kpong. The first is worth $7.1m with **Dominion Bridge Co.** for spillway gates. The second, worth $6.7m with **Canron Ltd.** for power-house gates.

A contract has been awarded to the Nigerian subsidiary of the Finnish company **Perusyhtma** for the construction of 16 apartment buildings in Lagos, made of semi-prefabricated elements, forming part of the housing programme for the Nigerian army.

Shell has confirmed that negotiations are almost complete for a transfer in technical leadership of the large Nigerian gas liquefaction project, planned for Peterside Island, to consortium member **Phillips Petroleum.** Phillips will also operate the plant after completion.

A Leyland Scammel heavy truck for hauling machinery and logs, a DAK Caterpillar tractor and two D6 logging tractors worth Le 600,000 for the **Forest Industries Corporation** have arrived in Freetown, forming part of the Le 3m Development Loan from the UK.

Unatrac Division of UAC International Ltd. has recently supplied a Caterpillar D399 TA generator set to an associated company, **Brewery Holdings and Services Division of UACI.** The 683 Kw, 3 phase, 50 Hz, 400 volt unit was urgently required to supply electric power for **Nigeria Breweries Ltd.'s** plant at Aba.

The Saudi Arabian Development Fund has agreed to lend Gabon $20m to help finance a 690 km railway being built at a cost of $1.3 billion.

Midland Television Trade Services, of the UK, has sold a number of reconditioned colour television sets to a Nigerian distributor, **Archibong & Sons,** of Calabar. The sets are worth about ₦12,000.

A Canadian group of aviation consultants, **Aviation Planning Services,** is to design and implement a maintenance and overhaul facility at Mustala Mohammed airport, Lagos, Nigeria. Part of APS's contract calls for consultancy work and tender advice.

A. Johnson & Co. Limited, UK member of the **Axel Johnson Group,** have completed a contract valued at ₦156,000 for the design and supply of a Parkson Deodorizer to **Procaci** at Abidjan on the Ivory Coast for the continuous processing of cocoa butter.

The order was placed through **Interfood Services Techniques SA,** Swiss-based consultants to Procaci, and was despatched last year for erection on site. A team of engineers from Johnson were responsible for the erection, installation and commissioning of the deodorizer.

Exports of 120 tonnes per day of glass bottle manufacturing plant is to be shipped to Nigeria by **Toyo Glass,** Japan. The contract is worth ₦960,000 and was set up by **Mitsui** and the **Metal Box Glass (Nigeria).**

Edbro International, manufacturers of hydraulic tipping gears plan to expand their product range in Nigeria through their agents **BEWAC Ltd.** At present the company is planning a market research operation to establish the demand for Edbro's demountable truck bodies, skiploaders, metal crushers and balers, and PTO units for a wide range of trucks, transmissions and pumps.

PROTEO

Time Division Switching System for Telecommunications

THE DEVELOPMENT of telecommunications networks is determined by various factors, past experience and resulting requirements have pointed this out. These factors are recognisable in the growth of standard service requirements, demand for new services and technological evolution affecting the structure of networks through system modifications.

Present requirements in the field of telecommunication service concern a qualitative service expansion in addition to the quantity of information conveyed to networks.

A fully-integrated electronic system

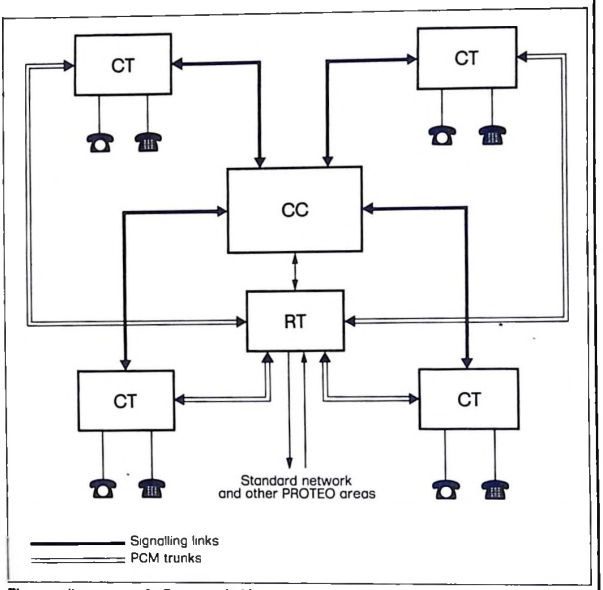
PROTEO is a fully-integrated, all-electronic, stored-programme-controlled, time telecommunication system.

One of the main characteristics of time division exchanges is that of treating all information passing through them — in particular the sound, date and signalling — in the form of pulses.

In traditional telephony, the voice, acting upon the diaphragm of the transmitter, generates a variable current which is sent along the telephone lines as far as the receiver where it causes corresponding vibrations of the receiver diaphragm; this is called continuous transmission since the signal is carried by a current of continuously variable intensity in relation to the sounds that have generated it. If that same current is "sampled" every 125 millionths of a second and its intensity is measured, a pulse or equivalent length can be produced, thus providing a succession of very short pulses. The period of 125 millionths of a second between a pulse and the following one has been fixed so that a proper circuit, at arrival, can restore exactly the original variable current without any distortion.

There are, therefore, series of pulses travelling along the line with a long interval of time between each other completely empty, and consequently available for other calls. In fact, if the same operation of transforming continuous signals into pulses is repeated into some 125 millionths of a second without getting mixed, this forms "temporary channels".

The task of signalling out pairs of users who at any moment are calling one another is committed to special "cyclic" memories which, when the calling user dials the number of the called one, record the "address" of both, together with all the data required for the call, and transmit them every 125 millionths of a second and the instant when the temporary channel assigned to the users concerned goes into action.



The overall structure of a Proteo switching area

Characteristics of the PROTEO system

A special feature of this new type of connection is of high fidelity and exempt from interferences.

A fundamental characteristic is represented by the integration of techniques thanks to which the functions of switching, signalling and transmission are performed by the same equipment, whereas in the traditional exchanges such functions are carried out by different equipment physically separate.

Another important type of integration is realized unifying all services which allows the system to treat the various types of information indifferently, amongst which are first of all voice and data: this means that the normal telephone calls can coexist simultaneously and without particular contrivances with the transmission of data taking place either between calculation centres or between more or less sophisticated terminals put at the disposal even of ordinary users according to their own requirements. These two types of integration are a characteristic of the PROTEO system operating by the division.

The PROTEO system also offers several other facilities besides all the services already available with the traditional exchanges.

First of all it is possible to connect, besides the ordinary telephone sets with dial, also those with keyboard, which can be utilized even as simple terminals for the transmission of data.

The installation can also provide for other services in the future, such as the ringing tone automatically informing the user who is already talking, then he himself is being called and can, at will, be connected to either of the two lines. Moreover, the exchange permits conference — the simultaneous connection of three users to one another, as well as the detection of a disturber, if any, by selecting a special code.

The users may also request the provision of other services, such as calls addressed to them to be temporarily referred to another pre-fixed number or the automatic repetition of a call to absent or engaged users.

By utilizing a key number, it is also possible to interrupt temporarily the provision of subscriber trunk dialling, or finally it is possible to utilize abbreviated numbers for usual calls.

The exchanges can also treat given groups of subscribers as belonging to a

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PROTEO

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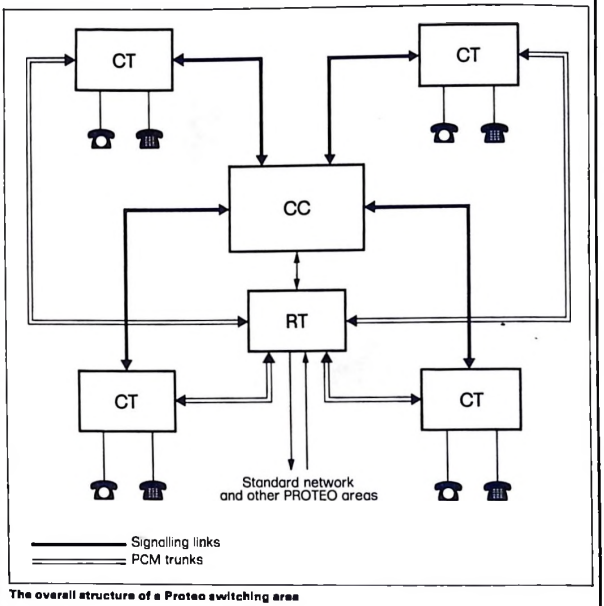

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Continued

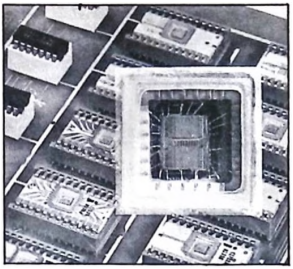
single community; this service, called "centrex" allows the users to make use of all the facilities offered by the private exchanges even if they are directly connected to the used telephone exchanges.

Due to its flexibility, the PROTEO system practically offers unlimited possibilities of introducing more services. The fact that the system's characteristics are so particular and that it is conceived according to a philosophy so different from the one of the traditional electro mechanical or semi-electronic systems does not prevent it from being perfectly compatible with any other switching system used at present, and consequently when programming it, it is always possible to contemplate its gradual introduction into an already existing network.

Comparison with traditional systems

The traditional systems of establishing connections utilize a permanent line connecting the two subscribers during the whole call. In the PROTEO system, on the contrary there is usually a single link accessible to all subscribers, and the connection is made by cyclically connecting the two correspondents for a very short time.

The service quality is actually improved by the PROTEO system for instance the audience signed attention is independent from the distances over the whole territory where the system works. Moreover, the integration of techniques causes as a result, the disappearing of the traditional and well-defined determination between switching and transmission, due to the fact that numerical multiplexing terminals become an integrant and indivisable part of the automatic switch.



Board of a microprogrammed processor

The flexibility of the new equipment, the efficiency of elaboration, and the very high memorizing capacity of the telephone processors permit the realization of the new services already mentioned. In particular should be mentioned the possibility of access, in the subscriber's trunk dialling to intercontinental telecommunications the individual documentation of charges, and so on.

Another field of particular interest is that concerning the automation of the installation and services management.

This facility can be carried out at first through the centralization of alarms and the telecontrol of the test devices inherent in the centralised control with which the system is equipped, but later on these same functions will be transferred to a specialized programmer to which all the processors operating in each individual switching area converge.

Power consumption is less than for traditional system

PROTEO is advantageous from the point of view of power consumption compared to the traditional system under the same conditions. It also offers advantages from a constructional point of view as the system covers a space corresponding to approximately 20% of that required by an exchange constructed in accordance with the present electromechanical technique.

Finally, with regard to cost, a substantial progress by degrees is taking place, subject to the number of subscribers who are connected. In fact, almost three quarters of the investments are concentrated in the terminal exchanges and vary almost in line with the numbers of connected subscribers, since the parts that fall most on this item can be installed by degrees according to the increasing of subscribers and of connections. □

HOW TO DELIVER ON TIME

A reliable delivery service can make or break a company's sales record. Although it can be expensive to set up a system to ensure reliable deliveries there is no doubt that it pays to do so. In this article S. Paulden, author of "How to Deliver On Time" identifies the areas where hold-ups can arise, and suggests various ways of improving them.

ALCAN METAL Centres, the aluminium stock distribution subsidiary of the Alcan Group in the U.K. found last summer, that it was losing its market share. It commissioned research to discover the cause and found that its customers regarded its delivery promises as too unreliable.

The company launched a special programme of education and motivation to make its workforce aware of the importance of reliable delivery. Four months later, a second research survey showed that late deliveries had decreased from 19 per cent of all orders to 7 per cent. In the same period, sales of aluminium had gone up by about £500,000 per month — an improvement of 20 per cent.

Price versus guaranteed delivery

There is not doubt that it costs money to set up systems to ensure reliable delivery performance, but there is no doubt, either, that it pays to do so. Customers are willing to accept higher prices for goods if they can be guaranteed a delivery date. A small engineering company, Trailer Systems Ltd, employing only about 40 people in London, had the choice of purchasing components from a nearby supplier who would not keep to delivery promises, or of importing them at a higher cost from a manufacturer who would guarantee delivery to within a few days of his promises. Trailer Systems then gave the following choice to its own customers: 'You can pay the standard price for a trailer with local components, but with no certainty of delivery, or you can pay 8 per cent more for a trailer with imported components, but be assured of delivery as promised.' Nine out of ten buyers preferred to pay the extra and be sure of the date of arrival of the trailers.

Reliability or speed?

Reliable delivery is quite distinct from speed of delivery. Too many manufacturers confuse these two factors. Buyers do not necessarily require goods in a hurry. They are simply very unhappy when goods do not arrive as promised, for this upsets their own production plans and results in waste of time and money. The Alcan Metal Centres research showed that few customers complained about the length of delivery times being quoted, but the great majority insisted on getting the goods on the day specified.

It not only costs the customers money to receive goods late. It also costs the manufacturer money who delivers late. There are many hidden expenses in unreliable delivery that, when examined carefully, prove that it is more economical to invest in systems to improve delivery performance than to imagine, falsely, that it is better to muddle along.

In my book, "How to deliver on time", I have identified as many as fifteen different ways in which industries lose considerable sums through slack attitudes to delivery. It involves a factory in uneconomic working in order to hasten an individual order, especially on overtime and in one-off operations to try to please a dissatisfied customer. The longer an order stays in the pipeline, the more labour content, handling costs and storage costs it incurs. When orders are late, revenue does not come in as planned and overdrafts and loans cost more at the bank.

Pacifying the customer

Any investigation of how sales and production executives spend their time is likely to show an unbelievable proportion devoted to the pacifying of irate customers demanding attention because their shipments have not arrived as provised and to chasing round the company in an effort to generate last-minute action. Many times, senior management has to travel considerable distances within the home market or abroad in order to regain the confidence a customer has lost due to failure to deliver on time.

One of the greatest hidden losses is the poor reputation gained by the manufacturer. Once it is thought that a company has a poor delivery record, then there is a serious loss of goodwill in the market and sales are that much harder to win. Poor delivery can very quickly spoil a reputation that it has taken a long time to create and it needs a big investment in time and money to climb back up in the opinion of potential customers.

On the international markets, p performance by a few manufacturers give the whole industry of that countr bad name. So that even the relia manufacturers find sales resistance wh they go out to win orders.

Controlling the salesman's promise

To ensure an acceptable level of deliver reliability, a company must control salesmen's promises, monitor supplies buys from other companies, control orde through the whole production cycle and s that the management structure tak delivery into account as a function importance, supervised by a responsib person of senior status.

Late delivery usually begins with th promise made to the customer by th salesman. If salesmen are expected t obtain orders at all costs, then th company must expect trouble. The sale department must be convinced that a order is only worth having if the compan is able to perform to the promises made. A the same time, a salesman cannot b expected to make promises on guesswork Information must be made available to hi so that he knows what kind of delivery dat he can agree with the customer. There must, therefore, be a close relationship between production and sales departments Unfortunately, as one production manage said: "We produce what the salesmen cannot sell, and the salesmen promise wha we cannot produce".

Up to date data essential

To provide accurate data on delivery th production department must have system operating that give basic, up-to-date infor mation on capacity, manufacturing rat and stocks. Minimum lead times must b known for different types of product an different sizes of order. Perkins Engines the diesel engine manufacturers, hav installed a computerised order entry system which makes it impossible for the salesmen to enter an order that does not give th factory time enough to fulfil the promise delivery date. The computer rejects th order and tells the salesmen why. Perkins

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were obliged to make this kind of investment in computer control because of a reputation they earned about four years ago for poor delivery. Now, with the new system, business is booming for them again.

Compiling information

Data must be "captured" on the shop floor of the factory where the work is being done. To achieve this, systems of data collection have to be extremely simple, for no worker will co-operate if there is too much paperwork. The factory workstation is not the place where detailed form-filling can be accomplished. The more complex and demanding the forms, the more inaccurately they will be completed. It is a good test to examine each piece of information requested to see if it is really *necessary* or whether it is merely *interesting* to the management. Factories have found that piecework — paying workers according to work done — can be counterproductive, as employees will not tolerate big fluctuations in their wages. They "fool" the system one way or another in order to receive a regular wage. It is however possible to provide a good basic wage with a small proportion extra deriving from the quantity or type of work achieved. This extra can be geared into the data collection system, so that it becomes virtually a payment for filling in the forms that tell management which stage each order has reached. Total production figures may be less important than information on specific orders, for if work is done in quantity but out of sequence, then many orders can be delayed and revenue cannot be received from the customers.

Major causes of late delivery

A major cause of late delivery from one factory is that supplies are late from other factories, so that production is halted due to shortage of vital components and materials of suppliers is, therefore, of top priority. One reason for late supplies is that the purchasing officers have objectives that do not fit in with a company's general objectives. A purchasing officer may work mainly on the lowest cost for supplies, whereas the cheap components, arriving late, hold up production and cause much greater costs to the company as a whole.

Difficult to pin-point hold-up

Very few manufacturers actually know what percentage of their deliveries are being made on time. When things go wrong, they cannot highlight the cause nor do they know how to put it right for the future. This is because companies are all too frequently organised in watertight departments, each reporting upwards to senior management, with nobody responsible for complete delivery on time to the customer. The sales department, for example, can make a promise, but cannot control production. Production might try to keep to a promise, but may not be in charge of purchasing or despatch and transport. Each separate manager, therefore, could be actively doing his best, but, without strict co-ordination, orders could regularly fail to be delivered on time.

A solution

The answer is to appoint a very senior executive as the person with total responsibility to the customer — encompassing data given to salesmen, priorities in purchasing supplies, acceptance of orders outside set limits of lead times, and checking on the status of orders going through the factory. At least, then, if anything goes wrong, the chief executive knows who is responsible. If no such system exists, you find that those customers with the worst tempers get the best attention, with no thought to the production and delivery sequence that would best suit the majority of the company's customers. The customer shouts at the salesman, he shouts at the production manager and uneconomic efforts are made on a single order, whilst all the other work is pushed into the background. One customer is satisfied and ten others are lost for ever.

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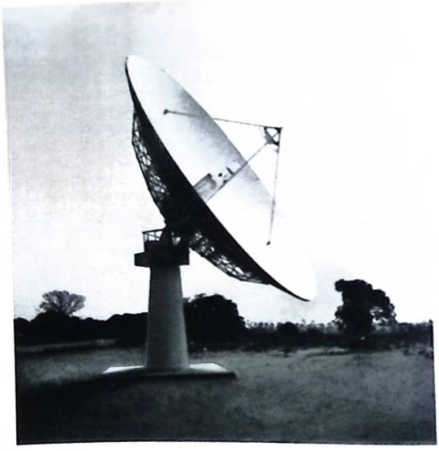

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Nigeria Hotels Limited

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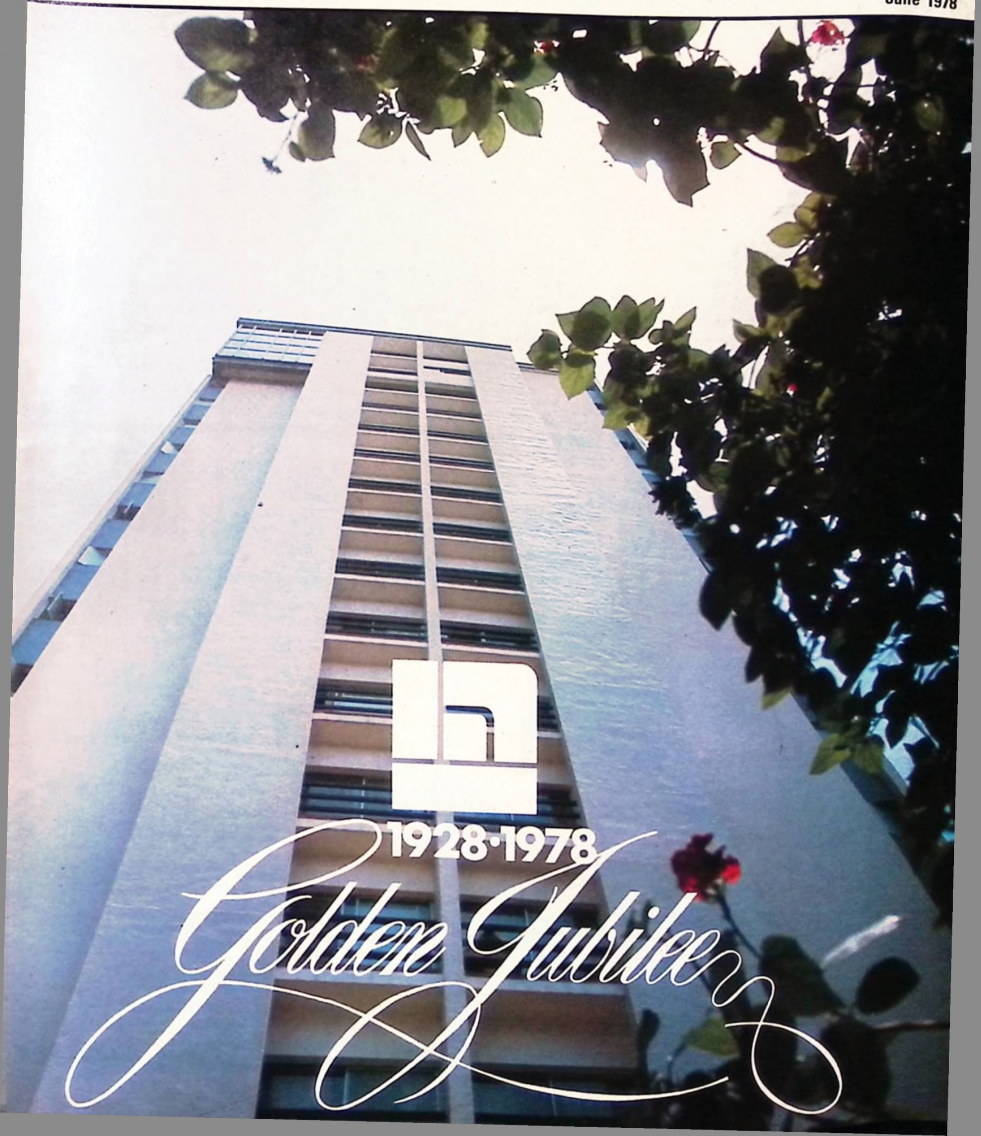
Supplement to West African Technical Review June 1978



A GOLDEN JUBILEE FOR NIGERIA HOTELS LIMITED

Nigeria's foremost hotel and catering group, Nigeria Hotels Limited, are celebrating their Golden Jubilee this June, to commemorate fifty years of successful development and service in the hotel industry.

A view of the Ikoyi Hotel, Lagos showing the recent "Atlantic Tower" extension.

Nigeria Hotels Limited (NHL) has undergone a remarkable transformation during the last fifty years, expanding from modest beginnings back in 1928, as the Caterers for Nigerian Railways into a multi-million management concern today, employing over 2,000 people. At present NHL has full ownership of two hotels, the Ikoyi Hotel, Lagos and the Central Hotel, Kano. The group is also responsible for the management of the following hotels:

The Bristol Hotel, Lagos.
The Lagos Airport Hotel, Ikeja.
The Premier Hotel, Ibadan.
The Lafia Hotel, Ibadan.
The Hill Station Hotel, Jos.
The Metropolitan Hotel, Calabar.
The Lagos International Trade Fair Motel.
The Satellite Town for Members of the Constituent Assembly.
The Federal Government Special Guest House, Lagos.

It is not surprising that with such a wide spread of hotels throughout the Federation, seven out of every ten visitors to Nigeria patronise NHL.

A Brief History of NHL

A brief outline of the company's development is essential, if the achievements over the last fifty years, culminating in the Golden Jubilee are to be fully appreciated. In 1928 when the company was first acquired and registered as a Limited Liability Company by Nigerian Railway it was responsible for the running of the restaurant cars and the railway guest house at Kano. In 1930 the company was sold and then run by the shareholders, United Africa Company (UAC) and G. B. Ollivant (GBO). The company continued to operate in this way for 20 years.

In 1950 the shares of UAC and GBO were transferred to the Nigerian Railway Corporation and the Chairman of the railway, Mr. D. C. Woodward, became Chairman of the company. By 1952, the first milestone was reached when the company took over the operation of the Ikoyi Guest House, Lagos on behalf of the Government. It was on October 29th, 1954, that the company first started to operate under its present name, and the share capital was allotted to the Federal Government. In 1956, the outright purchase by the company of the Kano Central Hotel and the Ikoyi Guest House took place. NHL continued to function along these lines until 1959, when the Commonwealth Development Corporation (CDC) was allocated 110,000 shares out of an increased share capital of 205,000 shares, thus gaining control of the company. At the same time Lagos Hotels Ltd., a subsidiary of NHL was incorporated to operate the Bristol Hotel then under re-construction. This was followed in 1962, by major additions and improvements to the Central Hotel, Kano and to the Ikoyi Guest House, making way for the creation of new hotels of International standards.

By 1974, continuous expansion of both hotels resulted in the fourth phase of development at the Ikoyi with the completion of the 16-floor 'Atlantic', tower block, with roof top restaurant. The hotel now is fully air-conditioned, all bedrooms have private pathroom, there are several suites, three restaurants, two cocktail bars, swimming pool, hairdressing salons, shops, agencies and a tourist market, a new training school and the NHL head offices. At the same time the fifth phase of development was under way at the Kano Central with the completion of new public areas, swimming pool, tennis court and six storey accommodation block, using the first automatic lift system in Kano!

The CDC continued to control the company as the largest share holder until 1972, when the Federal Military Government again became the largest minority shareholder in the company.

Accompanying these major structural improvements and general consolidation of the company, has been the growth and expansion of manpower, using improved management techniques and so acquiring

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higher standards of staff at all levels. This achievement has been directly attributed to the formation of a training school, the first of its kind in the country, commanding the largest and most competant number of management staff in the hotel and catering industry. An essential move to meet, and keep up with the expansion now taking place in Nigeria's hotel industry.

...Premier Hotel, Ibadan, situated on ...s Hill.

...ressive Growth ...ecord

When the company was first incorporated in 1928, the share capital was only ₦20,000. Twenty-eight years later, when the company changed its name to Nigeria Hotels Ltd., it had increased its share capital to ₦160,000. With the participation of CDC in 1959 it increased to ₦410,000. Ten years later the capital had increased by 300% to ₦1.2m. Since then the authorized share capital of the company has continued to grow and has now reached the colossal milestone of ₦3m, with a paid up share capital of ₦2.8m. Nigerian share holding in the company is now 100%, the largest major share holder being the Federal Government with approximately 70% of shares.

In terms of profitability, NHL has gone from strength to strength, with a declared profit of ₦1.7m in 1976. A projected profit for 1978 has been estimated at ₦2m. Since 1972 growth has followed an upward trend as follows:

1972 net profit of company ₦440,800;
1974 net profit of company ₦790,000;
1975 net profit of company ₦1.6m;
1976 net profit of company ₦1.7m;
1977 net profit of company ₦ Awaiting publication.

The marked increases during 1975/6 are attributed to the Ikoyi and Kano extensions starting to yield a profit.

Reasons for NHL's Success

NHL's hotels are virtually always full, running at above 90% room occupancy, which the Managing Director, Mr S. A. Alamutu felt was 'good going'. The average annual takings for the Ikoyi Hotel and Kano Central Hotel alone, amounted to ₦8m for last year. This impressive record can be attributed to several important factors. Firstly, the close working partnership between NHL and the Federal Government. The Government considers NHL to be playing a vital role in the development of the hotel and tourist industry, hence the company has received full Government support for their expansion programmes; meeting the challenge of providing sufficient accommodation for the growing numbers of businessmen together. At present the Government is lending its full support to the expansion of the Ikoyi Hotel from 300 to 600 rooms at a cost of

The Hill Station Hotel, Jos.

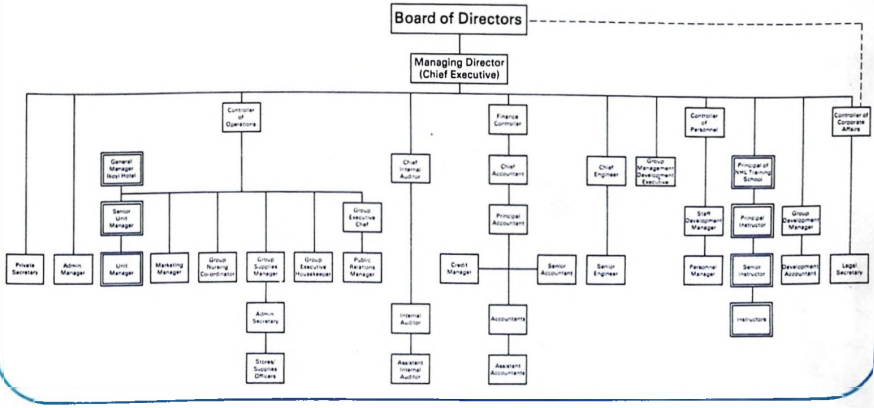
₦20m and the Kano Central Hotel from 200 to 400 rooms costing ₦15m, both doubling in size. Accompanying this move, is increased participation in other associated hotels, for example the Lafia Hotel, Ibadan, where work is shortly to commence on a 14-storey extension to provide the hotel with 240 rooms, Banquet and Conference facilities, and the doubling of the bedrooms at the Hill Station, Jos and Metropolitan Hotel, Calabar.

An efficient management

Success also stems from an efficient management; essential for the smooth running of any hotel. NHL is headed by experienced Nigerian Hoteliers, some with over twenty years experience, such as the Managing Director Mr. S. A. Alamutu who is assisted by competent, well-selected Senior Executives and Top Management staff.

Continued

NIGERIA HOTELS LIMITED
Head Office Organisation Chart as at 1st June, 1978



Continued

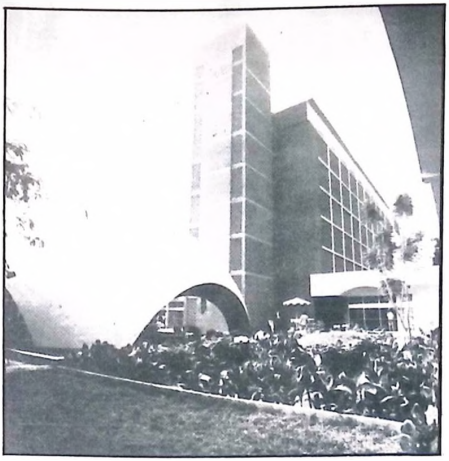
Mr. S. A. Alamutu was one of the first Nigerians to pioneer the hotel industry in his country. His training commenced in 1955, when he attended a Catering and Hotel Management course at the Huddersfield College of Technology, UK, and was later appointed a full member of the Hotel and Catering Institute, London. In 1958 Mr Alamutu returned to Nigeria where he joined NHL as a Management Trainee, and in 1963 he became the first Nigerian Hotel Manager of the new Bristol Hotel. In 1964 he was promoted to Manager of the Ikoyi Hotel, this was followed in 1967 by promotion to Assistant General Manager of the Company. In 1970 he was appointed General Manager of NHL and finally in 1973 Mr. Alamutu became the first Nigerian Managing Director of NHL, a post he still holds today. Mr Alamutu has also represented Nigeria at various National and International Conferences relating to the hotel and tourist industry and is the current Chairman of the Hotel Management Council of Nigeria.

NHL also employs a few Expatriate Staff, especially chosen for their specific skills, such as Executive Chefs, Development Managers and Training Instructors.

Coupled with an efficient management is the high standard of service offered by the Group, for NHL has earned a reputation for exceptional service. This is a result of the formalised training programmes offered at the Training School, supervised by regular inspections, accompanied by 'on the job training' and the recruitment of professional staff such as Chefs and Food and Beverage Managers, all operating to International standards. The Managing Director summed up the situation when he said, "We are doing our very best to satisfy all customers and are always looking for new avenues of improvement every day."

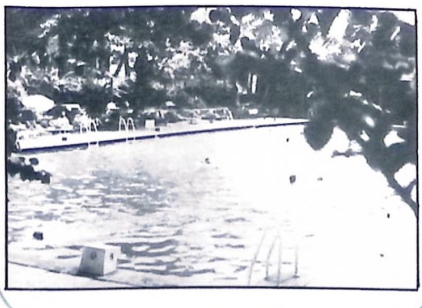
Nigeria Hotels Ltd has hotels scattered throughout the country, and this has played an important role in providing the company with a wide variety of geographical locations, so a businessman or

Continued



The Central Hotel, Kano. Only a few minutes from the airport.

The above picture shows an interior view of one of the suites at the Airport Hotel, Lagos. Below is a view of the impressive swimming pool at the same hotel.



50 GOLDEN YEARS

FROM

Nigeria Hotels Limited

hotels of distinction, variety and service

Continued

tourist travelling the country will be sure to stay in one of NHL's hotels. During a recent interview with West African Technical Review, the Managing Director expressed enthusiasm for encouraging domestic tourism, supporting the campaign of "Know Your Country Better", which it is hoped will stimulate co-operation between domestic airlines, hoteliers and tour operators to "put the house in order" before receiving International tourists. Mr. Alamutu said that "If the tourist infrastructure is not properly developed, tourists will not come back for a second visit!"

Mr Samuel Aremu Alamutu, Managing Director — NHL.

Purely a commercial organisation

Another important factor contributing the NHL's success has been the ability of the company to operate independently as an entirely commercial concern, this point was expanded upon by the Managing Director when he said: "NHL is lucky to have dedicated people who are also knowledgeable about hotel keeping and catering. Secondly, the company has been operating purely as a commercial organisation with a free hand, this of course means a profit, giving good service and expanding operations, providing more jobs for Nigerians and making the Government feel proud of its investment."

The Bristol Hotel Restaurant, Lagos.

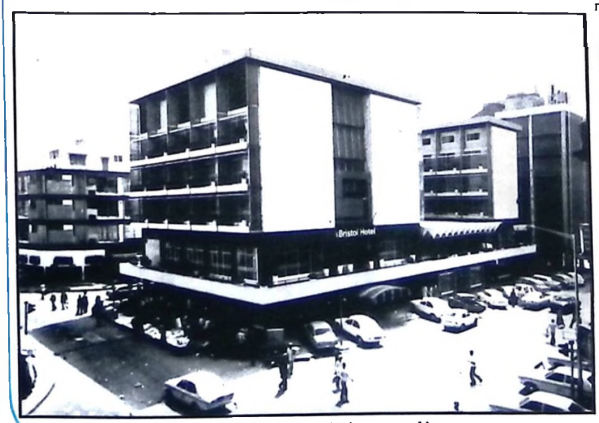
Future Development

The future objectives of NHL were briefly outlined by the Managing Director who stressed that emphasis would be placed on continual expansion to meet the growing needs of the International business community and to be ready at all times to assist in the development of new hotels, with a view to supervising the management. Accompanying these objectives is the company's ambition to eventually establish viable hotels in every State Capital throughout the Federation.

The Golden Jubilee Celebrations

The Jubilee Celebrations are scheduled to take place between the 12-17 June, and it is NHL's intention that the festivities be on a modest scale in keeping with the present Government policy. This is not intended to prevent the Jubilee from creating the desired impact on guests, shareholders and staff. It is hoped that the celebrations will have a lasting effect, forming the basis of the first concerted advertising campaign to be launched by the company. Although the festivities will last for only one week, the effect of printed promotional material should create a lasting impression throughout the year.

The celebrations are to include socials, organised sports between the units, an exhibition, lectures and a Gala Night to round up the occasion.



The Bristol Hotel, situated in the centre of Lagos.

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Managing Director and Chief Executive:
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Director: Alhaji A. B. Wali, representing Kano State

Director: C. O. Lebi, Esq., representing Ministry of Trade

Director: Dr. P. E. Jakpa, representing Nigerian Railway Corporation

Director: Alhaji H. R. Zayyad, representing N.N.D.C./N.N.I.L.

Director: Alhaji H. Damaturu, representing Ministry of Trade

Ministry of Finance

Director: J. O. Farodove, Esq., representing N.I.C.O.N./N.I.D.B.

THE NHL TRAINING SCHOOL

The new Training School and Head Office at the Ikoyi Hotel, Lagos.

Before 1973, instruction of NHL staff took the form of 'on the job' training with several Managers responsible for instruction in the hotels. However in 1973, the current Managing Director decided it was time to establish Nigeria's first fully formalised Hotel and Catering School following a regular timetable, with examinations at the end of each course, with the aim of, improving and maintaining the standard of service. Following the approval of the Board of Directors, finance was raised to construct a new building housing the Training School and also new Head Offices. The Training School was officially opened on 19th August 1974.

Modern Teaching Methods

The teaching methods used in the school are all extremely modern, making use of the most up to date visual aids and equipment in the form of over-head projectors, close circuit television and video systems for making training films during lectures. The advantages of this system are many, allowing for the greatest number of students to benefit from a demonstration class, as the lecture can be seen from all classrooms. Educational films made in this way can then be sent to other units for their individual use. There is also a 12-booth language laboratory for English and French as well as three classrooms, a conference room, demonstration kitchens, training restaurant and bar.

The Staff

The staff form a group of well qualified instructors, headed by the Principal, Seni Oduyoye, who has had considerable teaching experience as a headmaster for 12 years at Ibadan, and further specialised education in the UK where he attended a hotel course at Blackpool. In 1966 he returned to Nigeria as Assistant Catering Manager at the Ikoyi working his way up to the position of Manager. In 1976 he took one year study leave in the UK, attending a post-graduate management and study course at Essex. In 1977, Seni Oduyoye returned to take over as Principal of the Training School. Other members of staff include a Chef Instructor, three Food and Beverage Instructors, a Housekeeping Instructor. Language Instructor and Accounts and Book Keeping Supervisor. There is also a School Technician, and of course Administrative Staff.

The aim is for cheerful, swift service of an international standard.

The Students

The competition amongst the staff is very keen for attendance at the school. Each student is selected on merit by the 11 unit managers throughout the country. Each unit is allocated a specific quota of students and these numbers are growing each session. Providing there are no unexpected distractions such as Trade Fairs and International Functions, the attendance is increasing as follows:

In January — 30 students;
In February — 61 students.
In March — 71 students, the highest number so far to attend.

For April if all allocations are filled, there should be 77. The limiting factor is unfortunately that of adequate space in the class rooms.

The Courses

The Training School is Nigeria's first approved centre for Catering and Trade Examination for the London City & Guilds, as well as the Hotel and Catering and Institutional Management Association Examination. The success rate for examinations so far has been high. Amongst the subjects offered are several intensive four-week basic courses for waiters, cookery, front office reception, bedroom stewards, general account clerks, and senior waiters. There are also twenty-week courses for food preparation and beverage service, as well as crash courses for barmen, service waiters and supervisors. There is also a one week telephonists course. At the end of each course all students are awarded a certificate of completion at an end of term ceremony, when a personal address is given by the Managing Director.

The training of Management staff is the responsibility of the Management Development Executive who arranges courses both in Nigeria and overseas utilising Management Consultants training organisations and Universities. Training overseas includes study in the UK, USA, at the Management Centre in Brussels, the European Institute for Business Administration, France, and the International Labour Organisation training centre, Turin, Italy. These formal courses are frequently held in conjunction with an attachment programme to a hotel chain so that management skills and techniques can be put into practical use.

Results of the Training Programme

During a recent interview with West African Technical Review, the Principal pointed out that it is impossible to quantify the training benefits, but the company does expect that students, who have received training should put into practise the skills they have acquired and also to make efforts to influence, in a pleasant way, their colleagues who have not had the opportunity to attend the school.

The aims of the Training School were discussed by the Principal who stressed the need to achieve a "status of Professionalism" equipping the staff with the right attitudes and approach to respective functions and guests, serving as a model for the hotel and catering industry. The Principal concluded his interview by saying: "Even though our standard is not yet what we want it to be, I think we still have the best hotel and catering standard in the country, which provides an example for others to emulate." It is this recognition of the role training plays, that has kept NHL at the forefront of Nigeria's hotel industry. □

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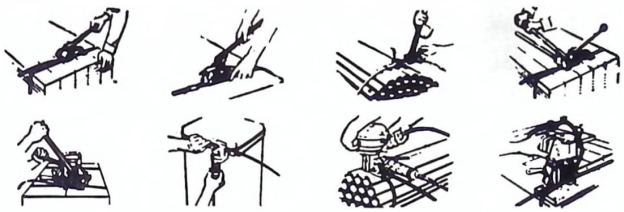

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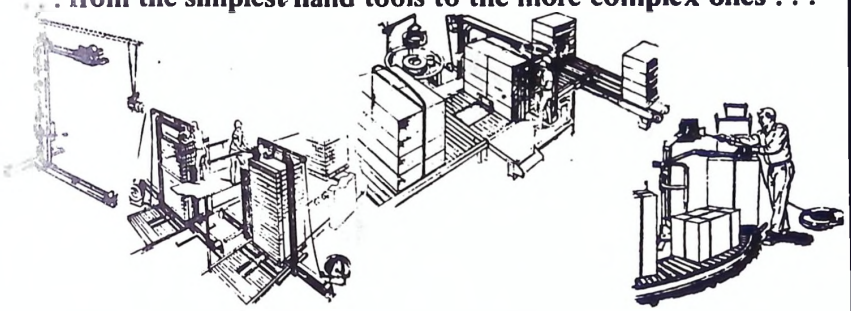

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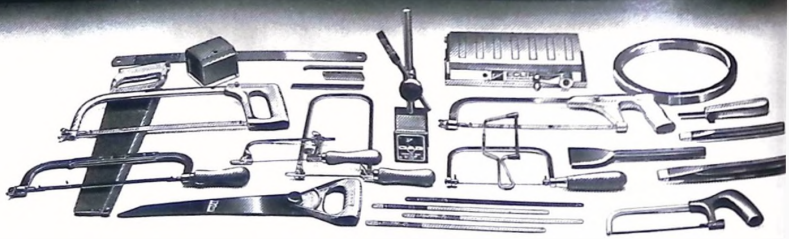

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WEST A FDII

An example of severe water erosion.

SOIL PRODUCTIVITY IN RETREAT

In this second article on agricultural development in West Africa, H. D. Franks, of Minster Agriculture looks at the problems of declining soil productivity and suggests some practical solutions.

HISTORICALLY WEST Africa has been regarded as an area with plentiful land resources for growing food. Compared with developing countries in Asia, most West African countries have an extremely favourable population/land ratio. Not only is there plenty of land but that land benefits from well distributed rainfall which has enabled major population centres to develop 500 - 600 miles inland from the Gulf of Guinea.

In spite of these land and climatic resources, the production of adequate food for the population is by no means assured, especially in countries with a large urban population or with a low annual average rainfall. Nigeria's 'Operation Feed the Nation' and Ghana's 'Operation Feed Yourself' bear witness to the increasing preoccupation that some countries have in ensuring adequate food supplies. In additions, the more sparsely populated countries to the north, in the sub Sahel, have been through periods of extreme food shortage in recent years due to the failure of the rains and increasing population pressure on the land.

Poor response

There are many reasons why the rural sectors of countries are faltering in their response to the demand for more food from the community as a whole. They include natural phenomena such as drought or floods, poorly developed infrastructure, changing food tastes (for instance the rising demand for bread) and many others. However, underlying all these aspects, there are serious problems of decline in soil and land productivity.

Agriculture and livestock production in West Africa has traditionally been *extensive* — low offtake of beef Nomadic herds, shifting cultivation on a 10 - 20 year cycle. Over the last few years the rapid rise in population — coupled with a rise in Livestock numbers and a restriction in their grazing areas — has led to increasing pressure on land. Shifting cultivation cycles have been shortened as farmers have found it necessary to reduce the length of the fallow period. This intensification of land use is leading to a decline in soil productivity.

The productivity of the soil is being

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Continued

reduced by three major phenomena, all *inter-related*, which are:-

(1) Reduction in soil fertility (soil nutrients) due to the gradual change from ecologically stable systems of shifting cultivation into short fallow and continuous cropping systems — DEGRADATION.

(2) Increase in soil erosion from water (and wind) partly due to new cropping systems and, to some extent, due to modern trends in agricultural development — EROSION.

(3) Loss of land in the North of the region as a result of wind and water erosion on an over-exploited land resource — DESERTIFICATION.

Most spectacular of these three [illegible] is, without doubt, Desertification and there are many reportsof the rate of encroachment. Serious as this is, [illegible] that the less spectacular [illegible] of continued Degradation of soil [illegible] have as much or more impact on [illegible]'s ability to produce food. So [illegible] conventional' rainfall soil erosion [illegible] phenomenum of least immediate [illegible] distressing though it is when seen [illegible] ground.

[illegible] factors are inhibiting the food [illegible] ability of West Africa either by [illegible] reduced yields or by taking areas [illegible] production altogether. How can [illegible] in soil productivity be halted or reversed? Theoretical and practical approaches are considered below.

An increasing site — desert encroachment.

Theoretical Approaches

The term 'conventional' has been used intentionally in the previous paragraph in reference to erosion as it is this factor which has received most attention — certainly in the Western world. American researchers have developed, over many years, 'the Universal Soil Loss Equation' for predicting rainfall erosion losses under different circumstances of cropping and environment. The equation is:-

$A = R \times K \times LS \times C \times P$

Where A = Soil loss (tons/hectare/annum)
R = Rainfall factor
K = Soil erodibility factor
L = Slope length factor
S = Slope gradient factor
C = Cropping management factor
P = Erosion control practice factor

Although the majority of research work

Continued

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A Tinkabi on test at the International Institute for Tropical Agriculture (IITA), Ibadan, Nigeria (1978).

ENGINEERING FOR FOOD PRODUCTION

— ARE SMALL TRACTORS APPROPRIATE?

Many attempts have been made to produce a cheap effective mechanical power source for small farms. So far few successful machines have emerged, for this reason a conference was recently held at The Institution of Agricultural Engineers to discuss in depth the economic and technical requirements of small tractors. R. Lewis, of The National College of Agricultural Engineering, reports on the conference.

The 1978 Spring National Conference of The Institution of Agricultural Engineers was held in March at the National College of Agricultural Engineering (NCAE) to discuss the economic and technical requirements of small tractors; to see how far these are met by present designs and to propose a policy for their future development. Eleven papers (1-11) were submitted to the Conference, all but one being presented in two sessions, the first concerned with 'Economic and design theory' and the second with 'Existing designs'. The third and final session was a discussion forum entitled 'How the present problems may be overcome'.

The seriousness with which this subject is taken was mirrored by nearly 200 delegates representing a wide range of organisations and countries. The organisations included many of Europe's tractor manufacturers, educational and research establishments, national and international organisations, agricultural consultants, voluntary bodies and the media. Although most of the delegates were from Europe; Africa, the Americas, Australia and the Indian sub-continent were represented too.

In the last twenty years many attempts have been made in different parts of the world to produce a cheap, effective mechanical power source for small farms in Less Developed Countries. Few of the machines which emerged have been successful, and although the reasons for their lack of success were documented we have still not absorbed the lessons of failure well enough to enable us to overcome them. If we had, this conference would not have been necessary!

Conferences of this kind present information very effectively, but the identification in discussion of solutions to problems is altogether another matter. Most of the papers presented successfully brought us up to date with technical detail or suggested new approaches. The outcome of the discussion period, by contrast, was much less clear. Although Dr. von Hülst did his best from the Chair to persuade delegates to answer the central question, the outcome of the main contributions was to ask another: was "Are Small Tractors Appropriate?" the right question? The answer to this query was not forthcoming directly, though it was there for all to see.

Session 1: Economic and design theory of small tractors

It was apparent through the conference that delegates were happy to define a "Small Tractor" in one sense as a machine whose nominal engine power output was less than 15kW (20 hp). That left plenty of scope for variations in design, capability and cost as we were to hear.

Continued

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Continued

The first paper (1) 'Economic Aspects of the Introduction of Small Tractors in Developing Countries — A Philosophy for Small Tractor Development' was presented by Steve Pollard, Economist in the Overseas Department of the National Institute of Agricultural Engineering (NIAE). Pollard and his co-author set out to be provocative. They thought it was generally agreed that new technologies for Less Developed Countries (LDCs) must be both appropriate and acceptable in terms of operational and technical suitability, the particular socio-economic environment, and the resources and aspirations of its members. After defining the main attributes of the "Small Tractor" (here not including single axle tractors) they suggested that it was failed to answer the LDCs need for farm power. The main reasons for this, they thought, were:

- lack of a multi-disciplinary approach to the development of the machine, with little or no consideration of the importance of LDC rural sociology, markets and politics, agricultural credit, farm management, tropical crops and livestock, soils, machinery manufacture, and so on,
- more specifically, the small proportion of LDC farms in the 6 to 8 ha size range for which many small tractors have been designed: the vast majority (according to admittedly limited data) are much smaller,
- the extensive (or subsistence) farming systems, the vicious circle of low yields and low prices, which greatly restrict or prevent the farmer from investing in any expensive technology.

Many other factors were discussed in an excellent paper. The authors concluded by repeating their philosophy, admittedly not new, that the prime need is for a simultaneous multi-disciplinary approach to agricultural development, coupled with the understanding that economic development takes time, is complex, and requires unique solutions for each country and region.

WEST AFRICAN FARMING

In the second paper (2) Giles Cattermole discussed the 'Economic Political and Social Aspects Governing the Success of Small Tractors'. Cattermole looked first at the size gap between the smallest tractors in volume production and the LDC small farm need: a gap which has widened since the day of the Ferguson TE20 in the late 1940s, and has now resulted in most major tractor manufacturers entering into marketing agreements with Japanese tractor manufacturers to extend their own ranges downwards. He looked at the production of small tractors (again excluding single axle types) in Third World countries and concluded that the total of about 10,000 units/annum fell far short of the 1973 UNIDO predicted demand of 52,000 in 1975 and 181,000 in 1980.

A Landmaster single axle tractor to power a processing machine (IITA 1978).

Pollard and Morris's contention that small tractors had failed to meet the demand would seem to have been confirmed.

Cattermole went on to discuss the effects of economic, social and cultural, and political factors affecting the uptake of small tractors. From his discussion he then drew up a country "Profile" of the conditions likely to favour the adoption of small tractors. A comparison of this profile with the observed characteristics of many LDCs then showed, Cattermole considered, that non-technical factors rendered the small tractor an entirely inappropriate answer to the mechanisation need in many cases, a conclusion which reinforced the arguments in the first paper.

Peter Crossley followed with his paper (3) entitled 'Theoretical Design of Small Tractors', which to some extent contradicted Pollard and Morris's contention that engineers adopt a "blinkered" or one-dimensional approach to design problems of this kind. Crossley briefly considered the characteristics of LDC small farm systems, and identified the need for an increase in available power from 0.04 to 0.4 kW/ha in combination with other inputs. He identified the average farm size as about 3 hectares, and agreed substantially with Pollard and Morris about the integrated approach which should be used to identify an "Appropriate" technology for increasing the power available on farms.

Design factors

Crossley went on to discuss in detail the design factors relevant to a small tractor; engine type, transmission, tractive performance, implement attachment and control, stability and operator comfort. He then considered some economic factors, suggesting that a small tractor should be economically viable where:

1 its output in basic tillage and weeding operations in conjunction with other inputs produced extra income in excess of costs

or

2 tractor costs were covered by the production value from previously uncultivated land whose use was socially acceptable.

The basic design that Crossley proposed from his detailed considerations was based on a work rate in primary tillage of 0.5 ha/day. His parameters were:

mass	1 tonne
drive tyres	2, size 7.50-16
engine power	9 kW

Such a tractor, he suggested, would be capable of carrying out one primary and three secondary tillage operations on a holding of about 30 ha, at an operational cost within the range of £32 - 60/ha. This tractor was designed for direct traction in LDCs. Crossley emphasised that careful prior investigation of the economic and social environment was vital to ensure that the concept was viable, and that successful operation would, as always, be dependent upon satisfactory technical, economic and extension infrastructures.

The fourth paper, (4) by Francisco Murillo-Soto and Manuel Aguirre-Gandara, discussed 'Large versus Small Tractors from an Economic Standpoint in Mexico'. The authors reviewed the factors affecting the mechanisation of small farms, many of about 10 ha, in Mexico and arrived at the same conclusions about the need for a fully integrated approach as previous speakers. One interesting difference in the economics of large and small (20 kW) tractors in Mexico is that the smallest they have, the Sidena (Belarus) T-25 costs less per kW than tractors of twice and four times its power output. Add to this that doubling or quadrupling the nominal power output of a tractor does not necessarily multiply up its work output in the same proportion, and the authors considered that in their case the small tractor should be more cost-effective than larger ones.

The authors presented a fairly standard method for analysing the cash flow in a farm business in relation to the machinery and cultivation methods used, so that cost/benefit analyses or internal rate of return criteria could be used to select the

Continued

A Tinkabi on show powering an irrigation pump.

best technical least cost system of mechanising. They rightly reminded us that the decisions resulting from such an analysis would only be as good as the information put into it, and commented that in Mexico, as in so many countries, there was a serious lack of the necessary data.

This presentation concluded with a short film which compared mule powered tillage with a 3-wheeled small tractor under development in Mexico. This tractor was not mentioned in the paper; most interestingly it appeared to be very similar to the 3 wheeler design developed at the National Institute of Agricultural Engineering (NIAE) about 18 years ago, and subsequently tested in a number of tropical environments including the then Northern and Western Regions of Nigeria. The main features of the NIAE tractor were its single large driving wheel at the rear, two small wheels and toolbar at the front with tiller type steering, rear mounted engine of about 7 kW, simple and robust transmission alongside the centrally placed operator. It was a logical design; but problems of cost and effectiveness prevented it from being accepted at that time.

Paper five (5) by Peter Barton on 'Changes in the Demand and Design of Small Tractors During the Period 1960 to the Present' was not presented. The paper comments briefly on some of the experimental and production small tractors produced during the period, and then goes into more detail on the sophisticated Japanese small tractors of conventional layout, and discusses the history of development of single axle tractors. A number of appendices give details of the production, cost, and use of small tractors and related equipment in developing countries for which data is available.

The first session concluded with a paper (11) by Frank Inns, 'Operational Aspects of Tractor Use in Developing Countries — A Case for the Small Tractor'. Inns suggested that tractor operating costs in developing countries were likely to be at least twice the level experienced in industrialised countries, due to lower serviceability and increased costs of repair. He developed his thesis by extending from accepting developed country tractor operating cost figures to LDC costs using a number of multiplying factors based on the differences in infrastructure and costs between the two environments. This was a hypothetical argument which would need to be tested against actual data. The major cost differences suggested, apart from the overall ratio of 1:2 in favour of developed countries, are shown in Table 1.

Inns used these figures to suggest that a suitably designed small tractor, made in the country of use, was the solution to the cost problem. Spare parts would also be locally made and therefore cheaper and readily available, he argued. Furthermore the simple tractor would enable slow progress over a broad front in agricultural development to go hand in hand with intensive and perhaps highly mechanised plantation type enterprises. The design rationale for the tractor would of course depend on its integration with viable agricultural production systems.

Component of Costs	Developed	Developing
Labour	42	2
Repairs	8	53

Table 1. % of some tractor operating costs in developed and developing countries.

At the end of the session we had been reminded of all the factors which had to be considered in the analysis and design processes for successful farm mechanisation in LDCs. Several different approaches to these processes had been described, but at the same time the scarcity of accurate data relating to the socio-agro-economics of small farm production systems highlighted.

Session 2: Existing designs

The conference now went on papers on existing tractor desi tion to LDCs.

Arno Gego gave a paper (6) size and Concept of Tractors f Agriculture'. Gego, as one woul a Deutz engineer, was commit logic and comparative cost ad tractors larger than 15 kW i power output. He argued that s use of larger machines was economically viable answe mechani[sation] of small farms, example the characteristics cultivati[on] in Asia, cultivation o areas in [Egy]pt, and cultivation of soil in A[frica]. Gego's remarks wo to large[r] farms, or pooled farms not rela[ted] the problem faced by ference. [Re]ference was made t of capi[tal] small fragmented pl mixed cr[opping] and all the other p nor ind[ustry] to the pronounced success [of] machinery sharing operative [mac]hinery enterprises LDCs. O[ne] in his last but one p did the au[thor] admit that most farm be from [1] ha, and that these o use even [the] smallest tractor of 1(full capacit[y].

The next paper by Alan Carte described 'The Tinkabi System', on rare stories of gradually growing Four hundred units are now in u have proved financially viable progressive small scale farmers, m Swaziland. Early models were solid sidised cost, but it was not clear this was still the case.

The design parameters for the were drawn up after consultatio "... countless people engag agriculture throughout the (African tinent ...". The initial design conce changed little. Important details hav refined and improved to correct t troubles. A rectangular chassis wheel at each corner, fuel and hydrau tanks built in, carries the engine an pump. A hydraulic motor transmits to each rear driving wheel. The supports a load carrying platform front when required, and a mechanic system at the rear. A range of imple has been built for use with the t those needed for essential operations.

The Tinkabi was extensively field in Africa and put through a sta tractor test at the N.I.A.E. Summary these reports are presented in this p There is no doubt that the tractor perfect; there are problems with mechanical lift, ploughing with an body is difficult, and the maximum level to which the operator is subjected very high. But in overall terms the tra successfully contributing to the dev ment of agriculture, albeit in a small w

Contin

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Service contracts essential

The service contract operated by the manufacturing company has had a considerable part to play in the success of the tractors. Servicing is done in the field by vocationally trained mechanics. Major units can be tested, also in the field, by the same mechanics using simple procedures. Units which fail their test are replaced with exchange units, the faulty assembly being taken back to the factory where it is repaired by highly trained fitters and then put back into the scheme.

J. Bouyer next presented his paper (8) 'The Bouyer Tractor. The Light Low-powered Tractor for Agricultural Work in [illegible] Countries'. The Bouyer factory at Tombiaine, France, employs about 450 people and produces 25,000 units/annum, at present, mostly single axle tractors for small farms in the hot tropics. When it became clear from the Company's trials that a somewhat larger four wheeled tractor which carried its operator was needed, co-operation was set up for this development work between the French Company for the Development of Textiles (CFDT), the Centre for Experimentation in Tropical Farm Machinery (CEEMAT) and the Bouyer Company. The tractor was to be manufactured partly in France (the more sophisticated components) and partly in the user country. The design concept included fitting any convenient engine from 12.5 to 25 kW output, using standard type transmission and front axle assemblies and making provision for a front mounted transport tray, drawbar or a simple hydraulic lift package and supplying power take off points for rotary tillers and irrigation pumps. A further important provisio was that it should be possible to adapt to the tractor any type of implement that farmers already possessed.

Prototypes were tested in the Ivory Coast, Mali and Senegal. A larger batch of 70 machines was then put out in 1977 for supervised field testing in seven West and Central African countries. Reports of this experience discussed in October 1977 encouraged the developers to put a further 200 tractors into the field in 1978. Detailed attention is now being given to the economics of the exercise, perhaps rather late in the development process, although users were said to be happy with the tractor. The importance of operator training and technical backing with spares and service facilities was emphasised.

Here is another case, similar to the Tinkabi in terms of approach, clearly destined to be successful in its own sphere. The total numbers are still in hundreds, however, way below the projected demand of about 180,000 in 1980 mentioned by Cattermole (2).

Japanese factors

Noburu Kawamura's paper (9) 'The Japanese Small Tractor' was read by Peter Cowell (NCAE). The success of the Japanese single axle tractor is well known, and not surprising in an agriculture consisting of farms typically 0.5-1 hectare in size, over an arable area of 5.615 million hectares, 57% in paddy fields of 0.1 ha.

Over the last 10 years Japanese production of 2 wheeled (single axle) tractors has declined from 478,000 to 296,000 while the output of small four wheeled tractors has increased from 24,000 to 236,000. 72% of these 4 wheeled machines are of 15 kW or less, clearly in the "small tractor" category. But these are highly sophisticated machines, designed primarily to power rotary tillers. Four-wheel drive, three and four-speed power take-off shafts, multi-cylinder high speed engines, complex hydraulic systems are all features of the Japanese machines. Within the constraints of low technology, low yields and low prices it is difficult to foresee a demand for the small Japanese four wheeled tractor in LDCs. Regardless of this the paper gave a fascinating account of the characteristics of the tractors and the agricultural system of which they are part.

The Amex tractor

The final paper (10) of the conference 'The AMEX Tractor' was presented by V. J. Dac-Bryan. AMEX is an overseas consultancy firm based at Shaftsbury in England. The author became associated with AMEX in 1975 to develop a small tractor to fill the gap between a good ox team and production tractors of about 26 kW. The main design parameters were:

1. enough power to plough 1 furrow in any conditions.
2. simple design and construction with large safety factors.
3. "low" cost — US $3,000 was quoted.
4. economic operation.
5. high design stability to give safe operation.

Traction criteria produced design values for mass, draught and tyre sizes very similar to those arrived at by Crossley (3). Design detail was aimed at production or assembly in LDCs.

At first sight the AMEX tractor looks a bit like a dumper truck except that a transversely mounted 12 or 13 kW engine and belt drive transmission takes the place of the hopper, and of course the small wheeled steering axle is the front of the tractor rather than the back of the dumper truck. Mechanical inboard disc brakes and a simple hydraulic lift system are incorporated with auxiliary power drive taken off the engine crankshaft. The tractor is very compact, having a wheelbase of only 1.17 m. and an outside wheel width of 1.0 m. This may well make it an uncomfortable machine in rough ground conditions.

The author claimed that the AMEX gave a high tractive efficiency when ballasted (quite heavily for its size) at the rear. Construction is certainly simple, and the tractor appeared to have potential for operation on small level farms. No production figures, official or tropical test data were available.

The second session described in some detail the development methods which have led to modest success for the Tinkabi and Bouyer tractors. Others could clearly be built on the same lines, but it has taken us a long time even to arrive at this stage in "Small Tractor" development. What

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nswers could the final discussion provide owards overcoming the problems we still ace?

Session 3: Discussion forum on how present problems may be overcome

The discussion was opened by R. D. Bell, Head of the Overseas Department at he N.I.A.E. He highlighted some of the comments which had been made in the papers, and brought up additional factors or delegates to consider:

1. only a small number of farms would appear to be suited to the 10-15 kW "Small Tractor" concept (Pollard & Morris)
2. servicing problems are greater at low operational densities, perhaps tractor servicing should be coupled to other mechanical operations
3. many small tractors have lacked effective linkages and implements. There was no prospect of success without these
4. it is more severe to use small tractors at full load than big tractors at part load
5. should small tractors be fitted to agricultural systems, or used as catalysts for development like the Tinkabi?
6. perhaps we should use small tractors with large ones to cover the marketing profit motive.

Following this introduction, the chairman suggested that the key to increasing small farm outputs lay in improving the living conditions of small scale farmers. He then asked delegates to concentrate on answering the central question posed by the conference, "Are Small Tractors Appropriate?"

Discussions went on long past the time allotted. Many useful contributions arose from the floor. Among them was a comment on the relationship between crop yield and value, and the cost of a tractor. It was stated that the quantities of paddy

A single axle tractor under development.

required to fund a small tractor in a range of countries were:

Country	Tonnes paddy	Land area (ha)
Japan	3.3	0.7
Sudan	6	
Nigeria	12	
Malaysia	15	
Philippines	18	
India	33	11

No further comment is needed.

Brian Pothecary (Agricultural Engineering Consultant) and C. Uzureau (Director, CEEMAT) considered that the Tinkabi and Bouyer tractors had succeeded in unique environments, implying perhaps that other regions were not so fortunate in possessing the right ingredients for success. Ian Johnson of the Overseas Department, N.I.A.E., suggested that successful marketing of single axle tractors in Kenya and the Philippines had been associated with non-agricultural companies.

The Chairman emphasised a delegate's comment that there was still no shortage in many countries of land waiting to be brought into production by suggesting that there was a total area of 225 x 10^9 hectares in this category. So in addition to increasing production from existing farms a great deal remained to be done in clearing and developing new land. The main limiting factor is still a shortage of energy as Crossley (3) pointed out, developed countries having an imput of 0.6 kW/ha compared with much of Africa at 0.04 kW/ha. That energy, of course, could be provided by much larger power units if the overall agricultural organisation permitted.

In answer to the central question Boshoff (IITA, Ibadan) struck a blow for the larger unit. He suggested that the developer of a small tractor found two critical questions difficult to answer —

1. What is the size of your market?
2. What is the intensity of use of your product?

In addition the price of the crop and the skill of the farmer were vital factors in the success of small tractors. After many years of involvement in development Boshoff had concluded that as crop prices, farmer skills and tractor use intensity all increased, the larger tractor was progressively encouraged.

Overall, however, there was a strong consensus that answers could be found to the engineering problems, but that correct analysis of the many other critical factors of sociology, economics, agronomy, production systems and the like was much more difficult yet vital to success.

Each country or region would need its own unique solution to the overall problem of increasing production in the most economical way. This would take time, and would only be achieved by the painstaking multi-disciplinary approach. □

The National Institute of Agricultural Engineering tractor 1962.

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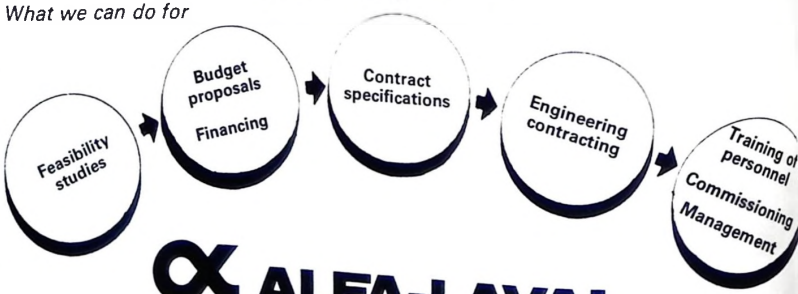

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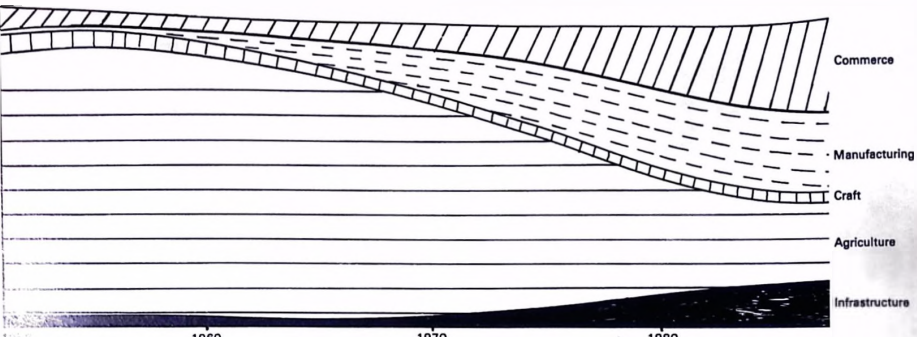

EXPECTED TRENDS IN RURAL ECONOMY TRANSFORMATION IN NIGERIA

RURAL INDUSTRIALIZATION IN NIGERIA PROSPECTS AND PROBLEMS

Despite the prominent role petroleum plays in Nigeria's economy, the country is still essentially agricultural, with over 70% of the population involved in the rural sector. In this article Dr. J.O.C. Onyemelukwe looks at the importance of a concerted rural industrialization programme if meaningful national development is to ensue.

IN SPITE of the present commanding height of petroleum industry in her economy, Nigeria is still essentially an agricultural country. This view has its basis in the fact that, first, over 70 per cent of the country's population belongs to the agriculture-based rural sector and to the many agro-towns which dominate the urban scene particularly of south-western Nigeria. Secondly, over 65 per cent of the country's total labour force is in agriculture on which over 60 per cent of the country's population depend for livelihood. Thirdly, the share of agriculture in the Gross Domestic Product of Nigeria is now second only to the oil-dominated mining sector whose major reserves, as wasting assets, have a very short life, judging by the current rate of exploitation. This latter point provides part of the basis for the Nigerian Government statement that "agriculture and its related activities will continue to be the mainstay of Nigeria's economy in the foreseeable future" (Third National Development Plan 1975-80, p.63). See Table 1.

Yet the agricultural economy of Nigeria is predominantly the small-scale type based largely on the primitive hoe-and-cutlass method that is wasteful of human energy and time, and practically devoid of scale economies under the prevailing system of highly fragmented land use. As population pressure on land continues unrelented and the degree of farm land fragmentation with it, the need for complementary rural activity that is less demanding of land becomes more acute. It is against this background that the case for rural industrialization can be appreciated. The attempt in this short paper is to examine Nigeria's rural economic scene with particular regard to the prospects and the problems of industrial development.

Prospects of Rural Industrialization:

Manufacturing is probably the most attractive among the various economic activities that can complement agriculture in an integrated rural economy. Not only is it much less demanding of land; also it can conveniently be agricultural resource-based. Moreover, if properly related to the crying needs for employment generation, rural industrialization is capable of absorbing considerable agricultural labour and of making more land available for agriculture. Rural industrialization that is both labour-intensive and local resource-based is, in conjunction with agriculture, capable of giving rural Nigeria a diversified economy fostered through self-perpetuating cross-sectoral linkages. To be sure, linkages of this nature can be self-perpetuating if the industrial sector depends largely on the local agricultural sector for material inputs, thereby offering the agricultural sector the much-needed and unfailing outlet for its output.

With the successful establishment of this set of activity mix and employment outlet, the present rate of urban-rural migration can be drastically reduced. Moreover, ancillary services depending on such economic environment for their growth can be drawn in to further strengthen the attraction potential of the affected parts of rural Nigeria.

The Nigerian Federal Military Government recognizes the country's potentials for achieving much of these through its programme for small scale industries. According to the current Third National Development Plan "the main objectives of the Government programme for the development of small scale industries are the creation of employment opportunities, mobilization of local resources, mitigation

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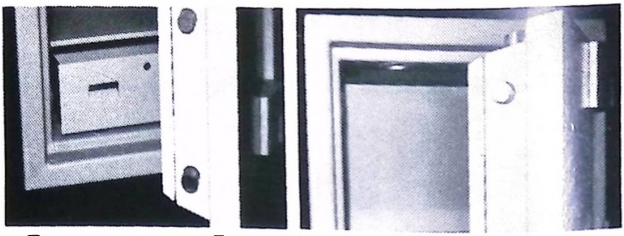

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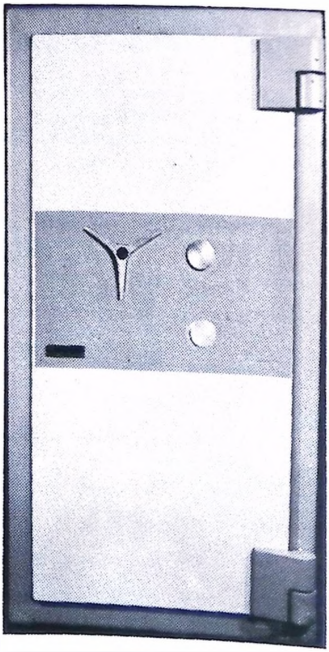

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TABLE 1
RELATIVE IMPORTANCE* OF THE SECTORAL COMPONENTS OF THE NIGERIAN ECONOMY, 1964/65-1974/75

Sector	1964/65	1966/67	1974/75
	%	%	%
Agriculture, Forestry and Fishing	59.2	54.9	23.4
Mining	3.2	7.2	45.5
Manufacturing and Craft	5.4	5.9	4.7
Electricity and Water Supply	0.6	0.7	0.4
Building and Construction	4.4	5.1	5.7
Distribution	13.3	12.7	16.7
Others	13.7	13.0	13.6
TOTAL	100.0	100.0	100.0

*Share of Gross Domestic Product at factor cost.
Source: Nigeria. *Second and Third National Development Plans.* 1970. 1975. Lagos.

of rural-urban migration, and more even distribution of industrial enterprises in [illegible] parts of the country". To that [illegible] incentives, by way of assistance [illegible], management and technical [illegible] been promised. However, the [illegible] which this policy will be [illegible] implemented remains to be [illegible] end of the plan period. It suffices [illegible] identify some of the many [illegible] in the way of substantial [illegible]. Although the analysis of such [illegible] very unlikely to influence the course of events during the current plan period, hopefully it could help prepare the way for a more realistic and result-oriented rural development programme for post-1980 Nigeria.

Problems of Rural Industrialization:

Problems of meaningful industrial development in rural Nigeria, as in the rural sector of most developing countries, are, indeed, many. But it would be sufficient to focus on six basic areas, namely,

a) Difficulty of capital mobilization;
b) Inadequacy, if not total absence, of the right type of technology and skills;
c) Poor infrastructural base;
d) Unstable resource base;
e) Weak backward and forward linkages of the country's industries; and
f) Inadequacy of government inducement to rural industrial efforts.

It is necessary to throw more light on each of these problems.

Capital mobilization problems:

In a country where per capita income is still below the US$400 dollar equivalent, and where, partly as a result, the capital market has not been well developed, the phenomenon of capital shortage for entrepreneural ends is only to be expected. As an economic activity with a high innovational content in an essentially traditional agricultural environment, industrial enterprise is generally regarded as more risky than most other economic pursuits. This is particularly so since the promoter contends with a great deal more of factors beyond his control, as will be shown later. In view of these, capital mobilization through the existing financial institutions is not easy, especially when amortization of loans is expected to make allowance for the "gestation" period of industrial take-off. Industrial investment financed without recourse to such lending institutions have been very few and far between in rural Nigeria. And in most of the known cases, particularly in the former Eastern Region, the actual amount invested soared far beyond the estimated capital funds expected to get the enterprise off the ground. Thus even when such funds come from lending institutions, and are sooner found to be grossly inadequate, it has often been very difficult to make up the difference from personal savings.

Lack of adequate technology:

One important prerequisite of industrial development is the availability of the right type of production skills. The country is as yet in very short supply of such skills. The development of the right type of technology for tackling our problem of meaningful industrialization is only beginning to receive official attention. What is now available is in many ways quite inadequate for rural industrialization. Firstly, it derives from technology designed for the more advanced economies where acute shortage of labour has necessitated the substitution of capital for labour. Such practice of capital-intensive production tends to negate public policy objectives in labour-surplus Nigeria, particularly its rural sector.

Secondly, the scarcity value of the much limited skilled manpower capable of coping with the present nature of technological demands in manufacturing leaves the rural sector at a disadvantage in the competition with the cities. A great deal of inducement is needed to attract such labour to a rural environment. Such inducements constitute part of the production cost and help to reduce entrepreneurs' interest in rural industrial projects.

Thirdly, a great deal of imported machinery and equipment requires some modification to suit local needs. This is more necessary in a rural setting where emphasis should be on small scale production units based on simple technology. In the absence of the skills for bringing about such adaptation, the wrong plant size and technological sophistication are tried out - often as an act of faith but invariably at much greater costs than would have been necessary.

Poor infrastructural base:

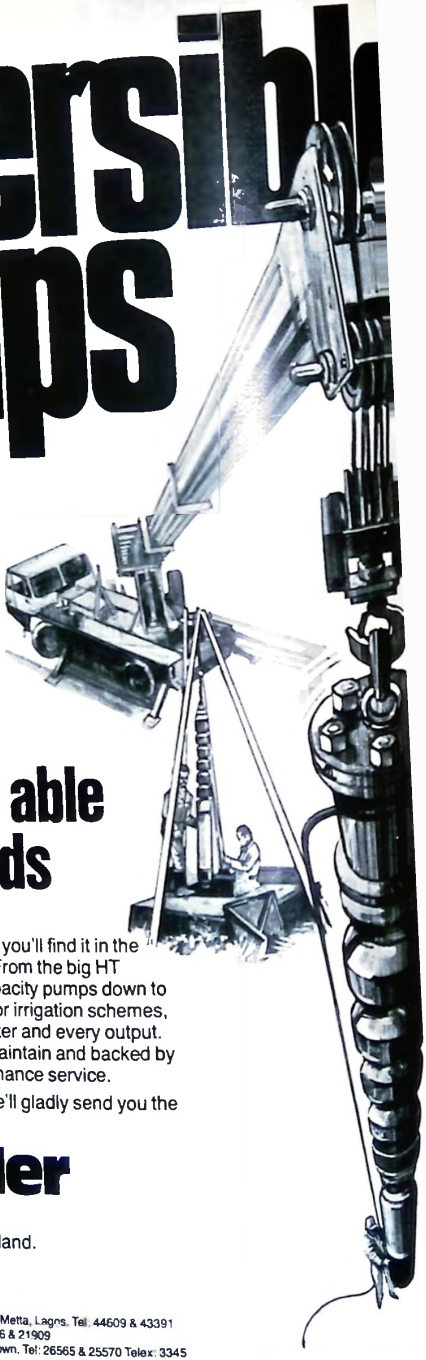
The infrastructure basic to successful industrial development includes piped water, electricity, good roads, postal and transport facilities. But unfortunately, this is grossly inadequate in rural Nigeria where it is available at all. Situations such as these frustrate industrial efforts. Private industrial promoters have been known to spend fortunes providing the facilities as part of their industrial development programme in their home areas. Only the very wealthy individuals like Chief J. Ugochukwu of Umunze in Anambra State of Nigeria, and some of the strong village co-operatives in parts of the country have managed to sustain rural industrial projects in this way. There are many small scale industrial projects waiting to spring into life no sooner these infrastructural facilities are provided according to state government promise. Some are known to have already started with portable generators which are dislodged at the end of each day's factory work for residential use in cooking, in lighting the entrepreneurs' homes and for operating radio and television sets which are now very common features of rural Nigeria, particularly the south-eastern parts of the country. Such makeshift arrangements for small scale industrial projects appear to have been stimulated by Government's installation of the long-awaited power grids expected to be operational, and to relieve the portable generator, in a year's time.

Instability of resource base:

Besides the problem of high population pressure increasing farm land fragmentation and reducing the scale of production, the gross inadequacy of storage and transportation facilities also contributes

Continued

submersible pumps



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ontinued
nmensely to the weakness and the stability of the agricultural sector as an dustrial resource base. Post-harvest astage of farm output through improper orage and through failure to secure timely vacuation of produce to demand centres is matter of common experience in this ountry. In the face of such a problem, all-ear supply of industrial inputs from griculture is hardly without serious nterruptions. Rural industrialization which ust largely depend on local agricultural utput, requires the extension of crop pre-ervation technology to all corners of the ural area. Not only is the smooth all-year low of industrial inputs assured thereby, lso steadier and higher income to farmers ill result and further encourage greater vestment in commercial agriculture. Thus provision of storage and transport and full commitment to the use of agricultural output as local industrial must be seen as very important the stabilization of local resource ural and urban industrialization.

Inter-industry linkages:

Industrial development in Nigeria has so far featured weak inter-industry and inter-sectoral linkages. This is mainly as a result of excessive dependence on imports, itself the consequence of local inadequacy of both the quality and quantity of technical skills. If urban industrial units are not such as can depend on inputs (intermediate goods) of other local plants, or the types that can produce such inputs for use in other production units, then much difficulty must be encountered promoting rural industrialization as a self-contained development package. But if, on the other hand, strong linkages exist both within the urban industrial matrix and intersectorally (between the agricultural and the industrial sector for instance), the demands of city industrial units can stimulate considerable development of intermediate goods production and finishing functions as a modern component of the rural economy. Such association with rural activity sub-sectors constitute the backward linkages of the urban industrial complex. Also the latter, by producing some of the intermediate goods like paints, chemicals and metal sheets, wires and rods easily used by rural as well as urban finishing plants, can sustain the much-needed forward linkages, to the mutual benefit of the rural and the urban sectors of the country's economy.

Unfortunately there is still too heavy leaning on the import of material inputs and intermediate goods that can be produced locally as the outputs of small scale industrial units suited to rural Nigeria. For example, the country spends millions of naira importing simple intermediate goods like matchsticks, ropes, craft paper, tiles, clips and nails. Also heavy imports of such simple consumer goods as toothpicks, foot-mats, brushes made from coconut coir, butter, cocoa powder, sugar, and animal feedstuffs have continued. These and similar products can be produced by rural-based industrial plants under a well-programmed industrial development policy.

Inadequate official documents:

Although as indicated earlier, Government promise of inducements awaits industrial promoters. Industries in the no spatial bias in the distribution of the bit of inducements that have so far reached industrial promoters. Industries in the less favourable rural sector need to be given more attractive inducements. This apparent failure by Government to recognize the greater difficulty of rural industrial promotion and, therefore, to provide more attractive inducements for rural industrial promoters has adverse implications for the much-desired rural economy diversification. Many cases exist where communal efforts in self-help (through the provision of such basic infrastructure as piped water and electricity) are either delayed or frustrated by official decisions. This has been the case in spite of Federal Government decision to encourage and foster such community development initiatives.

It has often been argued that Government cannot do everything for the people. Yes, but not if such community demands relate to the basic necessities of life and constitute the entitlements of every citizen; not after the rural communities have so heavily taxed themselves to meet the substantial part of total expenses to be involved; not if their urban counterparts get such basic amenities and facilities without such sacrifices; and, indeed, not in spite of Governments' policy objectives for industrial dispersal to the rural areas of the country!

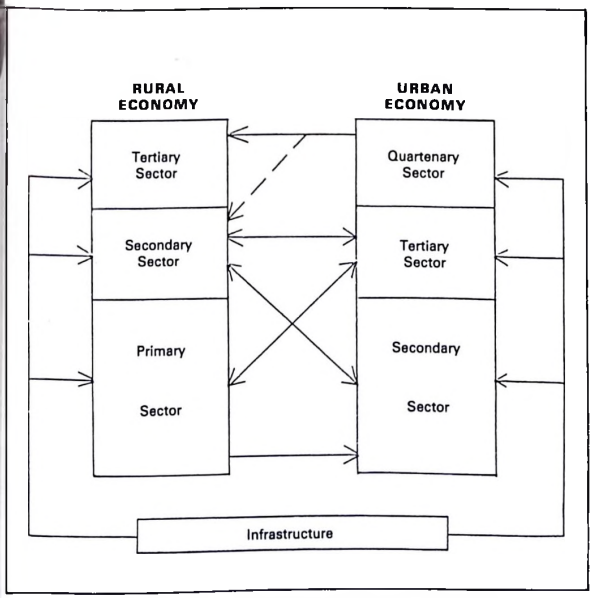

FIG. 2: INTER-SECTORAL LINKAGES IN AN ECONOMIC DEVELOPMENT FRAMEWORK

Conclusion:

The prospects and the problems of rural industrialization highlighted above, have important policy implications for gowth and development in rural Nigeria in particular and the country in general. Detailed resources survey and inventory will not only point to the immense prospects for rural industrialization; such can also help show the magnitude of opportunities that have hitherto remained unexploited and probably underscore the case for urgent policy strategies. In the face of such potentials for rural industrialization, Government has much grounds for encouraging rural economy diversification. The creation of favourable industrial environment through the provision of basic infrastructure and the fostering of linkage relations between the urban and the rural economies should be undertaken as vital objective functions. Doing this and at the same time strengthening the agricultural resource base will go a long way in removing the basis for the current general notion that rurality is synonymous with poverty. It is the author's belief that rural economy diversification in the fashion indicated in Fig. 1 and rural economic linkages with urban economic complexes (as schematically illustrated in Fig. 2) are important, realistic and feasible steps in the direction of meaningful national development. □

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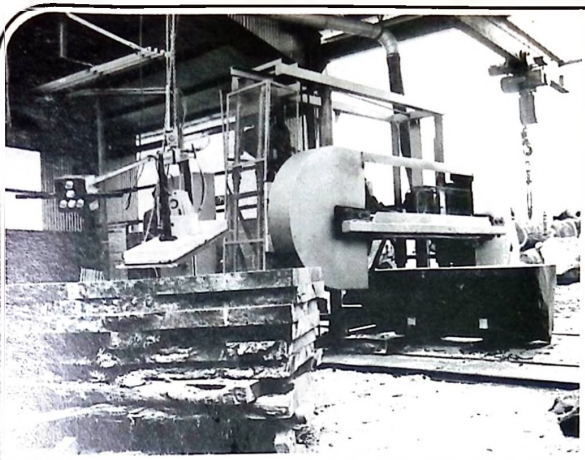

Tropical timbers are well known for good durability and strength, suitable for construc-

HIGH CLASS AFRICAN TIMBERS

The timbers mentioned here have largely to establish themselves outside their countries of origin. Interest in a new wood will only be stimulated, however, if and when shippers offer some guarantee as to the type and quality of the wood offered.

Among the African tropical timbers are many that are lesser-known on world markets except for certain specialised uses. For example, opepe *(Nauclea diderrichii)* is well-known as a timber with very good durability and strength, suitable for constructional work, especially in large dimensions. Seldom is it considered for other work such as high-class joinery or as veneer, and yet it slices well, has a good appearance, often with a mottled, moiré, or striped figure, glues well and finishes satisfactorily; and if it does require the use of Stellite or TCT saws, this is no different than is usually the case with dense tropical hardwoods.

There is one detracting feature, however, and that is its drying characteristics both in the open air and in the kiln, when surface checking, usually in the form of wavy checks following the grain, with some end-splitting and distortion is liable in plain-sawn stock.

In quarter-sawn stock these drying problems are minimal as a rule, and one is left with the conclusion that if the commercial name opepe was less-known, and well-dried, quarter-sawn stock under the alternative name of bilinga was presented to the trade in the normal dimensions suited to joinery, it would find a more ready market for, say, external doors, bank fittings and so on, because quite apart from the method of sawing the timber is very stable in service.

Change in sawing method

This is the crux of the matter; when ramin from Sarawak came up against problems during its initiation to the market steps were taken by the shippers to change the method of sawing, with results we all know about. If the market for opepe or bilinga is to be widened, then similar steps must be taken since the timber is capable of wider use.

Longhi and Aningeria Some of the world's lesser-known timbers suffer in that the names by which they are marketed are confusing. A good example is longhi, otherwise known as longui rouge, aniegre rosso, and on the Ivory Coast as aningueri. This latter name is frequently confused with aningeria, or agnegre as it is also known on the Ivory Coast, while longui rouge is a name also applied to species of *Chrysophyllum* from tropical America. They all belong to the Sapotaceae family and because of this have some affinity, but their characteristics are different although they may be offered for similar uses. While this capability may be factual, and the wood similar in appearance and somewhat similar by name, their properties are such that very clear distinctions must be made if they are to be considered properly.

Usable boles

Longhi is the product of *Gambeya africana* and occurs from Sierra Leone to Zaire, with the present principal supplying areas being the Ivory Coast, Congo and Cameroons. The trees produce usable boles some 15m to 20m in length but saw logs are more generally 5m to 10m long and 0·6m to 0·7m in diameter.

There is little distinction by colour between sapwood and heartwood, the wood being pinkish-brown when fresh sawn, assuming a yellowish-brown colour after exposure to light, often with a pinkish tinge, and showing faint, dark markings and frequently with tiny pin knots. The gain is usually straight but may be curly, and occasionally is interlocked, giving a fine stripe on quarter-sawn surfaces.

WEST AFRICAN FARMING

The wood weighs on average 740kg/m³ when dried, and all drying processes require care to avoid sap stain and splitting and checking. In other words, the timber should be anti-stain dipped, otherwise low humidities applied in drying to counteract the tendency for fungal staining to develop could encourage checking and splitting. Anti-stain treatment and relatively high humidity designed to reduce checking during kilning is recommended.

Aningeria is the product of four species of the genus *Aningeria, A. robusta* occurring in W. Africa. *A. altissima* occurring in both W. and E. Africa, while *A. adolpi-friederici* and *A. pseudo-racemosa* are confined to E. Africa. The trees produce saw logs somewhat longer than those of longhi and with larger diameters. The wood is a pale brown colour with a pink tint, and a faint cedar-like scent, sometimes showing a slight, mottle figure. The grain varies from straight to wavy and the texture is medium to coarse. The weight of the wood varies from 510 to 570kg/m³ wjen dry. Drying is said to be reasonably easy provided steps are taken to avoid sap-stain development.

Both longhi and aningeria produce good veneers and are suitable for joinery and furniture, but on the details given it would seem that aningeria, with its lighter weight and more straight-forward drying

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characteristics would offer better possibilities. However, this is not quite the case because of differences in the working qualities brought about by the silica content of the wood.

Longhi (longui rouge, aniegre rosso or aninguri), contains some silica but it saws very well, a little slower than utile but faster than guarea. It planes, moulds and mortises

Harder to work

Aningeria (*aningeria, agnegre* or *aniegre*) contains much more silica and, accordingly, is harder to work and machine. There is usually a moderate to severe abrasive action on tools and cutters. In crosscutting and boring, adequate support is needed to prevent chipping out. Care is needed in planing and moulding to obtain a smooth finish.

For high-class work longhi at about 740kg/m^3 compares favourably with both European and American walnut at 657kg/m^3. It is only a little heavier (about 6 lb/cy ft) than utile at 641kg/m^3 and since the wood can be stained and polished to simulate either, it has distinct possibilities.

WEST AFRICAN FARMING

In regard to plywood manufacture, longhi takes longer to prepare by steaming and softening than does aningeria. Furthermore, logs contining a lot of pin knots are not generally helpful in terms of appearance of the face veneer, so that aningeria is perhaps better for this purpose.

Once the distinction between the similar vernacular names is reecognised, it will be seen that both timbers have their particular attributes; particularly in the case of longhi for high-clas work in the solid, and in the case of aningeria, for general utility work in the solid, and for plywood and veneer.

Aiele Various species of the genus *Canarium* occur widely in tropical Africa. The British Standard name for the wood is African canarium but other local names are used, especially aiele, for the timber coming from the Ivory Coast.

Largely, canarium or aiele is used for plywood manufacture for which purpose it is ideal. It is mentioned here because current promotional literature suggests its use for low cost interior joinery and for furniture framing. Its pinkish-brown colour, something like a pale-coloured gaboon, its relatively light weight (about 500g/m^3) and reasonable drying characteristics, does suggest a much wider use. It is, however, inclined to woolliness in planing and moulding; a reduced cutting angle of 15 to 20° is essential if a smooth surface is a requirement.

Other applications

Much depends of course on what is meant by low cost, but if this was realistic then doubtless more interest would be

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shown. Since no sawn wood has recently been shipped, it would seem that enquiries for purposes other than for plywood are generally lacking.

Ovankol and bubinga Bubinga (*Guibourtia tessmanii*) appeared on the timber market many years ago, at one time under the misleading name of African rosewood and at others as an alternative to Andaman and Burman paduak. Since the 1930s it has become well-established under the names of bubinga, usually applied to sliced veneer; and more lately, when rotary cut, as kevazingo. Largely, the use of the species has been in veneer form, to some extent due to the rather widely scattered occurrence of the trees. But the fact remains that it is a very attractive wood suitable for the highest class of work. Not so well known is an allied species, ie *Guibourtia* [illegible] although this has appeared occasionally on the market over the last few years. The commercial names for the wood are ovankol, amazakoue, hyeduanini and perhaps more descriptively, palissandro, the name given the wood in Equitorial Guinea and suggesting the same interpretation as the French palissandre for rosewood.

WEST AFRICAN FARMING

Not that ovankol looks like rosewood. It is probable the further alternative name Mongoy walnut is closer by description, but these names do give an indication of the value of the wood in a decorative sense. Moreover, availability is usually better than for bubinga. There would appear to be adequate supplies of logs and lumber in Ghana, the Ivory Coast and Cameroons, and probably from Nigeria, Gabon and Equitorial Guinea.

Whereas bubinga is a reddish-brown wood marked with diffused brown or violet-coloured steaks and veins, ovankol is yellowish-brown to chocolate-coloured marked with grey to blackish veins; and with the occasional wider but less distinct veins with a copper tint.

Ovankol has a finer texture than has bubinga, while the interlocked or irregular grain often produces a beautiful moiré figure on quarter-sawn surfaces, or a fine fleck figure. The wood weighs on average 820kg/m³ when dry and is generally a little lighter in weight than bubinga. Ovankol dries quite well (and fairly rapidly) without excessive degrade. It is rather hard to saw although it planes and moulds to a good finish when cutting angles are reduced to 20°. It takes the normal finishing treatments and glues and nails well.

For period and boardroom furniture where perhaps there is a preponderance of solid wood, ovankol ranks with rosewood by weight; but where this is undesirable the use of the wood in veneer form is well worth consideration, the UF adhesives being quite satisfactory for bonding. The wood does not contain some white deposits in the pores and the faces of veneer may occasionally show some whitish streaks. These deposits are, however, soluble in water and can be removed easily by swabbing the wood lightly with very warm water. Ovankol can be used as an alternative to oak, teak and rosewood for all forms of interior high-class work.

Ekaba Ekaba or tetraberlinia (*Tetraberlinia bifoliolata*), is a mild, fairly lightweight wood which dries easily and works quite well without use of TCT tools. It weighs about 600kg/m³ when dry and is a medium brown to pinkish-beige coloured wood, with irregular yellowish-brown streaks or stripes. Its weight puts it in the ramin class, ie for general interior usage.

Many local uses

The wood has many local uses: as a light structural timber, flooring, furniture, veneer, plywood, joinery and turnery. There are some aspects of the wood which influence its use, not the least of which is its liability to pinhole borer attack in the log; and its tendency to produce irregular grain and cross-grain fracture commonly called thunder shakes. Pronounced interlocking grain influences its finishing qualities in planing and moulding when a reduction of cutting angle to 15 or 20° is generally essential, and also gives rise to raised grain when logs are peeled for veneer.

There is no doubt that ekabu could find a useful place on world timber markets at the right price. More attention must be paid to insecticidal treatment of logs immediately after felling and to proper selection of both saw and veneer logs. It would seem that adequate supplies could be had from Gabon and the Cameroons.

WEST AFRICAN FARMING

Kanda A very good new timber on offer is kanda, otherwise known as bitehi, nkonengu or bonzale. The wood is produced from various species of *Beilschmiedia* of the Lauraceae family which also produces greenheart. The various species of *Beilschmiedia* occurring in Australia and New Zealand in general bear no resemblance to those found in Africa. The timber of tawa, from New Zealand, for instance, is not unlike sycamore, while some of the Australian species are yellowish to greyish in colour although often with a brownish cast.

Straight grain

Kanda is presently supplied from the Ivory Coast, Cameroons and Gabon, where it is said to be comparable to agba in terms of standing reserves. Although several species contribute to the production, this apparently is not responsible for the variable colour of the heartwood which may be pinkish-brown to red-brown, or more or less dark brown with faint, lighter coloured growth markings. The grain is usually straight and the texture is medium to fairly fine.

Drying is straightforward but care must be taken in order to reduce the tendency for surface checks to develop. There is a high incidence of silica in the wood which rapidly blunts cutting edges, but it planes and moulds well and with its straight grain and fairly fine texture is capable of a smooth finish. It can be stained, polished and glued without difficulty.

WEST AFRICAN FARMING

Its weight, averaging 730kg/m³ when dry, and its high natural durability makes kanda a good alternative to timbers like makore, oak and beech, and the heavier type of Brazilian mahogany, for many if not all of their traditional uses; and of course the high silica content could be of advantage in marine applications.

Concluding note: The timbers mentioned here have largely to establish themselves outside their countries of origin. As with so many lesser-known woods the phraseology is used by potential shippers that if the demand arose supplies could be developed. This is simply another way of saying production could be stepped up if sufficient interest was shown by overseas buyers. Interest in a new wood will only be stimulated, however, if and when shippers offer some guarantee as to the type and quality of the woods offered. This is so in the case of sande referred to in last month's article. Colombian producers working in liaison with Madison, have ironed out the inherent difficulties attendant on the marketing of a new wood, and so have reduced the incidence of colour variations and degree of tension wood to manageable and economic proportions.

Work on secondary timbers

Research authorities throughout western Europe particularly, have carried out a lot of promotional work on secondary timbers. Much is known about them but a prospective buyer, while recognising some potentiality in many of these woods, nevertheless places more importance on the characteristics of the material likely to affect the smooth running of his flow lines, where additional operations in machining and finishing have a detrimental effect on costings and, more often than not, on his firm's bonus incentive schemes.

Basic cost of timber is one thing but production costs are more important, commensurate with the quality of the finished product. Many new timbers have excellent properties for a wide range of uses, but these characteristics must not be obscured by the admittance of features that detract from a decisive use of a new material. □

A GREEN REVOLUTION FOR THE SMALL FARMER

Professor Timmer of Harvard University's Department of Nutrition has served as adviser to the National Planning Agency of Indonesia. The following is adapted from remarks to a conference on world hunger held in Washington, DC

How can increased productivity in agriculture generated by scientific breakthroughs be translated into gains in nutrition for the 500 million people most in need in the world?

Hunger is not due to a shortage of food in global terms. Total grain production is now about 1,300 million tons. The global population is about 4,000 million. If evenly distributed, this would provide more than 65 grams of protein and 3,000 calories per day for every person on earth — and that's without taking into account vegetables, fruits, fish or forage-fed animals.

The fate of the Green Revolution demonstrates the importance of understanding the factors that determine access to food. The productivity potential of the Green Revolution, based as it is on higher yields for wheat, rice and maize, has enormous promise for solving most nutritional problems in poor countries. If the hungriest parts of the population had access to the increased grain supplies, the worst of the malnutrition could be eliminated. In some countries the Green Revolution *has* solved most of the problems of hunger and malnutrition in just this fashion.

Why hasn't this promise been translated into reality in more countries.?

The answer depends on factors unique to each country.

Each country is unique

The Green Revolution should be examined in terms of four effects: direct, indirect, roundabout, and what might be termed the "way out" impact.

I. The direct impact measures the effect on the nutrition of a peasant household that adopts Green Revolution technology and directly consumes most of the higher yield. At first, this would appear to be by far the most important nutritional impact from the Green Revolution; in China it has been, but in most other countries the direct impact has probably been quite small. In market-oriented countries the first users of Green Revolution technology are larger, profit-oriented farmers whose increased cereal output will mostly be sold in the market. The nutritional status of these commercial farmers and their families is seldom cause for concern. The most pressing cases of hunger are to be found among the smaller subsistence farmers, the landless rural workers, and urban slum dwellers. The direct impact of the Green Revolution on these groups is slight because they do not have the resources — land and money — needed to use it.

WEST AFRICAN FARMING

China illustrates the potential of the Green Revolution for eliminating hunger. Food grain production has not risen markedly faster in China than in a number of other poor countries where malnutrition remains a serious problem. The secret of the Chinese success is a more even diffusion of the new technology, coupled with much more equitable access to the output. China has managed to avoid urban bias in its food policy. By rationing food in the cities and providing incentives and productive inputs for agriculture in the rural areas, China has apparently succeeded in guaranteeing access to adequate cereal supplies to all members of the population.

II. Non-farm groups must rely entirely the indirect effects — through price and income changes — to improve their nutrition. The new production should make possible lower food prices, as demonstrated by the falling rice prices in international trade from 1968 to 1971.

Similarly, improved productivity leads to higher real incomes. These higher incomes can then be used to purchase a better diet. The indirect effects of the Green Revolution should be positive and, on balance, they probably have been. But reliance on the market opens several possibilities for individuals to miss out on the potential.

First, the flow of goods through markets is determined almost entirely by purchasing power, raising the opportunity for so-called "food imperialism." As incomes rise, people desire more animal products. They bid the grain off the plates of the poor for use as livestock feed. Whether these are the rich of the developed countries or the more affluent developing countries makes little difference to the poor.

III. The roundabout effect that most concerns economists is the changed technology of farming stimulated by the Green Revolution. The extent of change varies from region to region and country to country. However, the Green Revolution has set in motion unfortunate changes in some rural areas. In India, one effect was for absentee landlords to return to their farms to take over cultivation because of the greater economic return. Consolidation of holdings and mechanization permi landowners to evict their tenants, became landless and jobless.

Changed technology can reduce emp ment for landless labourers, cutting income and lowering their purchas cereals.

IV. The "way out" effects involve impact on social and political fabr poor soci One revolution may foment ch Static societies freque require a stimulus to break the quo. Succ the Green Revolution set up patterns of wealth eventually out the old ruling cliqu in the En agricultural and indu revolution. ure, on the other hand, set up ten between what is and might be.

Three important lessons emerge:

First, for primarily rural society substantial malnutrition, the important nutritional aspect of the Revolution is its direct potential to cereal consumption of small far households. Planners should aim at ex ing these direct effects as widel possible. This means bringing access Green Revolution to the smallest far These farmers must be given acce credit. In some regions, land reform a prerequisite. These are difficult tasks considerable research and experimen will be needed to find out how to do effectively. But this is where the most ful opportunities exist.

Second, the indirect effects from and incomes must be planned to negative nutritional effects on one and negative production incentives o other. Designing financial incentive farmers while maintaining access to grains on the part of the poor is one most difficult tasks for political leader

The third task is to anticipate so the roundabout effects of new agricu technology before they happen. Pla should be prepared with rural employ programs if necessary. Alternat research might question the desirabi widespread use of tractors and dis ment of tenants, for example. Pla should be prepared to remove interes of foreign exchange preference tractors, or limit the amount of lan citizen may farm.

Greater production alone will not nutritional problems unless mechanisms of food access change. □

andlord ractors

xpansion of its Landlord line garden tractors with a 12hp ydrostatic drive (Model 7012) ut has been announced by the mplicity Manufacturing Co. ccording to the company, the rive provides instant forward nd reverse without braking or utching. Speeds in both modes re infinitely variable.

andlord tractors, which he manual six-speed, odel 7010), offer a full ttachment capabilities ing, light construcrounds maintenance, farming activities and rticulture.

Both models have dynamically balanced Kohler engines to reduce vibration for smoother operation and driver comfort. A 45 amp hour battery and 12 volt dual circuit starting alternator enable quick starts in any weather. A rear power take-off is standard.

Post-emergence herbicide

Roundup is a water soluble formulation of the isopropylamine salt of glyphosate (N-phosphonomethyl glycine), which kills a wide spectrum of annual and perennial grasses and broad-leaved weeds, manufactured by **Monsanto.** The compound is a foliar absorbed herbicide which translocates easily from vegetative parts to underground roots, rhizomes or stolons of perennial weed species. It is inactivated on contact with the soil.

Roundup kills most annual weeds at a low rate, it is particularly effective on perennial grasses and most perennial broadleaf weeds, but at slightly higher rates.

Experimental results have shown that Roundup provides excellent weed control in pre-tillage or post-harvest treatments of annual crops or when applies as a directed spray in woody crops, such as vineyards, deciduous fruit, stone fruit, rubber, coffee, citrus, tea and oil palm. It can also be used in non-agricultural areas and for bush control in forestry, and has shown promise as an aquatic herbicide.

Controlled environment for day old chicks

The Commercial Coachbuilding Division of **Wadham Stringer Ltd.,** has recently introduced a vehicle which it is believed, will be attractive to the growing number of poultry rearing enterprises in Africa, where the speed with which poultry can be reared for the table is helping to raise protein levels in local diets.

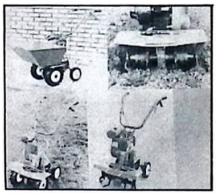
A two compartment body approximately 5.49 mtrs. long has been built on to a Leyland Boxer BX1000 383.5 cm. wheelbase chassis cab. Immediately behind the cab is a compartment housing a 220/240v petrol/electric generator and a condensing unit. The rear compartment is insulated with 10.16 cm. thick foamed polyurethane and provides enough space for 18,000 day old chicks in specially designed plastic boxes stacked eight high, each box containing 50 chicks.

The chicks' well being depends upon circulating fresh air at a steady temperature of about 70 deg. F (about 20 degs. F below ambient). In the past, this has been the responsibility of vehicle drivers who had only lever controlled ventilators in the body with which to allow varying amounts of air to be forced through the interior, according to their own judgement.

Lever controlled ventilator slots on each side of the front of the rear compartment are still controlled by the driver, guided by thermometers inside the body. With this system, the load on the fans is small when the vehicle is travelling at speed but they take over completely when the van stops, operating off their own battery which is charged by the generator through a heavy duty charger.

Cultivator converts to wheelbarrow

An all purpose powerful garden cultivator from **Westwood Engineering Ltd.,** is easily converted by plug-in attachments into a mechanised wheelbarrow/dumper or small tractor to furrow, roll, brush and aerate lawns.



In its primary role as cultivator, the Gemini is equipped with two pairs of thin-section spring-steel tines, strong enough to cope with thick weeds or hard soil. Fitted with its standard double tines, the equipment has a cultivating width of 480 mm. but the outer tines can be removed to reduce this to 330 mm. for operation in confined spaces.

For light work, the machine is used with its 175 mm. diameter wheels in position. For heavier work, the wheels are quickly removed so that the cultivator rests on a specially designed twin skid system which can be reversed from its normal position to provide for digging down to 255 mm. in particularly hard soil. No tools are required for any of these changes and the equipment is said to be so well balanced that it can safely be used by youngsters.

Offset disc harrows

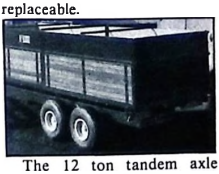
The 'Series 77' disc harrow range, from **Pettit,** has been specially developed for the most extreme cultivating conditions possible. New features have been incorporated like 50 mm. diam. disc gang axle shafts and 'beefy' heavy-duty, triple sealed bearings that make the 'Series 77' virtually indestructable!

A new depth control mechanism has been designed with double acting hydraulic ram to give you positive depth control at any setting plus the bonus of maximum weight advantage for the double disc

gangs by raising the pneumatic tyred wheels completely clear of the ground. Also included is a new self levelling drawbar that's simply adjusted by hand screw. Proven features like special heat treated discs that are available plection main frame have been retained. Positive mechanical locking of depth control equipment gives extra stability for the transport wheels when moving from field to field.

12 ton tandem axle tipper

Pettit trailers are well-known for their reliability and strength, the result of high quality materials and fine workmanship. Every board in the wooden floor of a Pettit trailer is one full length timber so there aren't any joins or cracks. As with all Pettit trailers these 12 ton tandem axle tippers have a tapered body which means loads 'unstick' quickly and eau sides. Whatever the load the trailer stays good-looking and hard-wearing. Chassis are made from heavy-gauge rolled steel section . . . the strongest there is. When ever possible, chassis components are welded together for absolute strength and reliability. But items that are subject to heavy wear and tear are made easily replaceable.



The 12 ton tandem axle trailer comes complete with factory fitted Pettit patented 3-line braking system. Every Pettit trailer can be fitted with specially matched braking systems. The range of brakes is wide enough to meet every need from strong, simple centre-compensating drum systems for smaller trailers, to heavy-duty double fail-safe mechanisms for the really big capacity trailers, like the 12 ton. The 12 ton tandem is also fitted with traffic indicators and road lights to RTA legislation.

More information may be obtained for any item by using the form facing page 196.

The Bell & Howell TQ III
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The measuring stick (at left) shows height of the two rows of experimental barley plants, a week before harvest, in a plot irrigated with undiluted seawater.

NEW AGRICULTURAL TECHNOLOGIES COULD HELP AFRICAN FARMERS

New crops which need less chemical fertilizer, ways to produce animal food from manure and using salt water for irrigation are three American agricultural projects which could aid African farmers.

At Iowa Sate University, scientists are experimenting with crossing soybeans and corn. Such a plant would — like corn, grow faster than most other crops and — like soybeans, require less fertilizer than non-legumes.

"Recent progress in plant cell culture methods allows the possibility of the direct fusion of corn and soybean cells. Such fused cells could eventually produce corn-like or soybean-like plants, retaining both the efficient photosynthesis of corn and the nitrogen-fixing capability of soybeans," said Professor Darryll Outka of Iowa State University.

"One of the major missions of Iowa State University is to improve food production. Our research has the potential of increasing the amount of food produced while decreasing the amount of nitrogen fertilizer needed to produce it. Because fertilizers are derived mostly from petroleum resources, reduced requirements for fertilizer would conserve energy and reduce costs," Outka said.

He noted that the development of plant cell fusion techniques is a recent breakthrough which allows new kinds of experiments to be performed. Under proper conditions, hybrids may develop from such fusions containing genetic information from both cell types.

At Cornell University in New York State, scientists report that animal manure may be used to produce food for animals as well as methane gas for cooking.

Protein from algae

A blue-green algae, arthrospira platensis, has been found to grow rapidly in the residue of swine waste following methane production. This algae, which is a small plant that grows in shallow water, has a very high protein content.

The potential of this algae as a source of high-protein food for animals is of interest because it grows rapidly on an available waste product using only the sun as an energy source. The arthrospira platensis that appears to have value as a high-protein food originated from a sample obtained several years ago in an African village near Lake Chad.

Cornell University Professor Wilson G. Pond said that the algae could be fed to animals in the same form in which it is produced, or it could be spread to dry, especially in tropical areas. He noted that the process requires little land and would not be competing with crop space.

WEST AFRICAN FARMING

On the subject of irrigation, agricultural researchers have found that salt water need no longer be an enemy of the farmer.

Plant physiologists at the University of California have succeeded in growing barley in sand dunes irrigated with sea water and are now studying the use of salt water for wheat and tomatoes.

Two researchers, Dr. Emanuel Epstein and J. D. Norlyn, have noted that although salt water will kill conventional crops, there is no fundamental biological incompatibility between plant life and highly saline conditions.

Norlyn said that barley is one grain that has shown some salt tolerance. He and Epstein selected the best barley strains from over 2,000 samples in their laboratory and planted them in sand near the Pacific Ocean. Each plot was fertilized before planting. Some rows were irrigated by pure salt water, others by diluted salt water and some by fresh water.

When the crops were harvested, the salt water-irrigated barley was smaller than that fed fresh water, but the grain was of satisfactory feed grain quality.

Since barley grows virtually everywhere in the world and there are 22,000 different strains of it, the two scientists said that the selection and breeding of salt-tolerant varieties could increase world food production and open up land not now devoted to agriculture.

"Evidence already at hand indicates that this genetic approach to saline crop production is applicable to crops other than barley," they said. □

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FORMATION AND DEVELOPMENT

Nigeria Limited was established 25 ... as a Company supplying a range ... specialised products and equipment ... by expertise and technical after ... service. It started in 1953 with a small ... William Street, Lagos with less ... dozen employees, and now occupies ... custom-built premises in Isolo with an ... warehouse, workshops, ... showrooms and offices. Over the last few years it has, in keeping with the Nigerian Government's policy of indigenisation, substantially reduced the numer of its expatriate employees whilst its Nigerian staff has grown to a total of over 230, divided between senior management and junior personnel, with Branches at Ibadan, Ilorin, Kaduna, Kano and Benin, all under Nigerian management. It is planned to open yet another Branch shortly at Owerri.

During a recent interview with West African Technical Review the General Manager outlined the Company's trading activities, which comprises the following Divisions:–

The Survey Division

The Company is the largest distributor of surveying and cartographic equipment in the country. The product range extends from complete cartographic installations to theodolites, levels, planimeters and ancillary survey equipment.

The Instrument Division

This includes microscopes, microtomes and other instruments for hospitals and research laboratories, water deionising equipment, haematology equipment, blood serum and culture media.

The Materials Testing and Meteorological Equipment Division

This supplies all types of soil and concrete testing equipment as used by the Construction and Civil Engineering Industries, and in the supply of meteorological equipment to Government Meteorological Departments and Airports.

Printing and typesetting Equipment

This distributes litho offset printing machines, photo typesetting machines and ancillary equipment.

The Diazo Division

This covers the supply of plan printing machines, drafting equipment, polyester films and sensitized materials.

The Copier Division

This embraces a wide range of electrostatic machines and electronic calculators.

The Fixing Products Division

This concentrates on the supply of a range of special tools and fixing products to the Construction Industry.

Reasons for success

One of the main factors which has contributed to the Company's successful development has been its policy to resist the temptation of diversifying over too broad a spectrum, thereby allowing it to concentrate its efforts on providing expertise continuity of supply and technical after sales service on its present product range. The Company looks forward to continuing its development in pursuance of its policy of specialisation. □

A Manufacturers' Listing

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Cables: TRANSATLAS Lagos.

Branches: Ibadan, Ilorin, Kaduna, Kano, Benin.

Addressograph-Multigraph Ltd., PO Box 17, Maylands Ave., Hemel Hempstead, Herts HP2 7ET, UK.

Aristo-Werke, Julinsstr. 10, 2 Hamburg-Altona, West Germany.

Thomas Ashworth & Co. Ltd., Sycamore Ave., Bushley, Lancs. BB12 6QR, UK.

Barrick Bros. Export Ltd., Compton Rd., Stevenage, Herts. SG1 2EF, UK.

C.F. Casella & Co. Ltd., Regent House, Britannia Walk, London N1 7ND, UK.

Elga Group, Lane End, Bucks HP14 3JH, UK.

Elite Manufacturing Co. Ltd., Elite Works, Station Rd., Manningtree, Essex, UK.

Engineering Laboratory Equipment Ltd., Eastman Way, Hemel Hempstead, Herts. HP2 7HB, UK.

Fisons Scientific Apparatus, Bishop Meadow Rd., Lougborough, Leics., LE11 0RG, UK.

GAF (GB) Ltd., PO Box 70, Blackthorne Rd., Colnbrook, Slough, Berks., UK.

IDEAL-Werk, Krug & Priester Maschinenfabrik, Schickhardtstraße 13-19 7460 Balingen 1, West Germany.

Kern & Co. Ltd., 5001 Aarau, Switzerland.

Franz Kuhlmann KG, 2940 Wilhelmshaven, Postfach 720, West Germany.

Overseas Apeco Ltd., 8 Av. des Grandes-Communes, PO Box 55, 1213 Petit-Lancy, Geneva, Switzerland.

Oxoid Ltd., Wade Rd., Basingstoke, Hants., UK.

Rabone Chesterman Ltd., Whitmore St., Birmingham B18 5BD, UK.

C. Reichert Optische Werke AG, Hernalser, Hauptstrasse 219, 1170 Wien, Austria.

Revue Thommen, Waldenburg, Switzerland.

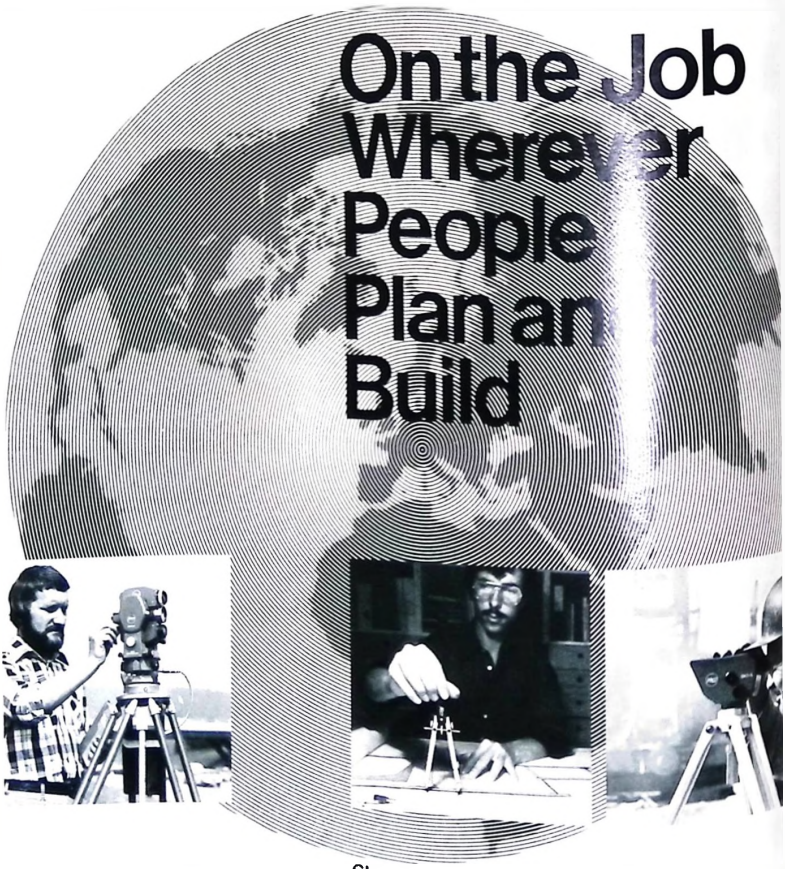
Soiltest Inc., 2205 Lee St., Evanston, Illinois 60202, USA.

Tornado Fixings Ltd., Colquhoun House, 27-37 Broadwick St., London W1V 2NE, UK.

Victor Intercontinental SA/NV, Ninoofsesteenweg 71 1750 Schepdaal, Brussels, Belgium.

Hermann Wdf GmbH & Co. KG, Postfach 13 03 88 5600 Wuppertal 1, West Germany.

Kern Instruments



Every day, Kern surveying and drafting instruments prove their reliability in the design and execution of major construction projects throughout the world – because they are accurate, rugged, and convenient to operate. And because a worldwide network of more than 130 Kern sales and service offices with factory-trained personnel warrants for the proverbial reliability of Kern instruments. There is a Kern representative near you. He will be pleased to provide the services you need.

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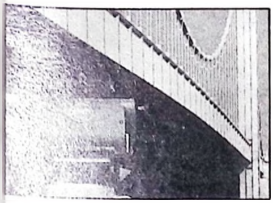
Isolo Industrial Estate,
Oshodi Express Way,
Isolo, Lagos

he GK23 ngineer's Level

ie GK23, manufactured by **Kern**, is the ht instrument for all tasks requiring a h accuracy. With the attachable optical crometer and an invar rod a mean error ±0.5 mm can be obtained for a 1 km uble run. Without the micrometer the strument is very suitable for use on less cise work, the GK23 is very much a ltipurpose instrument.



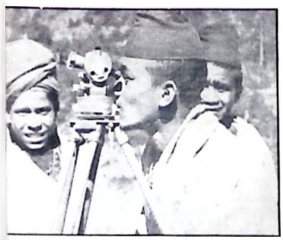
The highly sensitive telescope vial of ics ground glass tubing is cemented on ith sides to nickel steel fastenings, which sure at the same time a stress-free attachent for the vial. Cemented vials do not ack, and the bubble length is largely dependent of the temperature. The level al and telescope are housed in the same ght alloy die casting, which imparts xcellent stability over long periods.

The telescope with its 30× agnifications has excellent optical conection and produces a sharp high contrast nage. All optical parts have an antiflection coating on both sides.

In spite of its high accuracy, the GK23 as simple and safe to use as the construcon level.

DKM1 Small Triangulation Theodolite

The most remarkable features of the DKM1, from **Kern**, is its small size and its igh precision in view of its size. It is not urprising that the DKM1 was considered sensation in 1940 when it was introduced.



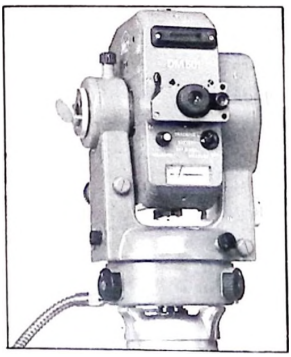
At that time the DKM1 was designed to rovide an angle measuring instrument for se where transport conditions were difficult. Every ounce of superfluous weight was cut but high precision was still maintained. Since then, the DKM1 has not lost any of its popularity because, even today, it is frequently necessary to carry survey equipment all day long. The destination of the DKM1 as a route and expedition theodolite is still valid. Moreover, even under normal conditions, a theodolite that can be carried in a briefcase has considerable advantage.

The DKM1 has been continually updated to reflect the latest developments of technology. Despite its small size, it is a rugged instrument. Shop maintenance or repair is seldom required. It is practically impervious to moisture and dust. These features account for its wide acceptance for military use.

DM501 Electro-Optical Distance Meter

The DM501, from **Kern**, is so small and handy that it does not disturb the normal manipulation of the theodolite and has no influence on its accuracy. The DM501 weighs so little, 1.6 kg, that it can be conveniently carried from station to station together with the theodolite and without removing it from the tripod.

The accuracy of the DM501 is ±(5 mm +5 ppm). Measurements are not affected by temporary interruptions of the light beam. Under normal atmospheric conditions, a range of about 1000 meters is obtained with one reflector and about 1600 meters with a stack of three reflectors.



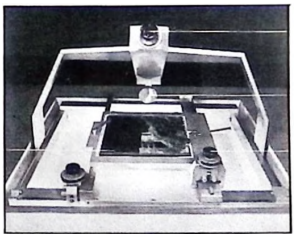
The DM501 attaches readily to the telescope of the DKM2-A one-second theodolite or the K1-S engineer's theodolite. Thus, these two instruments are transformed into extremely versatile electronic tachymeter-theodolites. The user will choose either the combination with the DKM2 A or the K1-S according to the required precision and the observation distances.

The electronic tachymeters DM501/DKM2-A and DM501/K1-S are cost-effectively used for every day surveys such as:

Layout and densification of control nets, traversing, detail survey and layout work for cadastral surveys, layout work for reallotment, construction and civil engineering, tunnel and gallery surveying, profiles and cross sections, photogrammetric ground control, cadestral surveys for utility lines.

Mk 2 Monocomparator

High production, high precision and low cost are the considerations that governed the design of the **Kern** Monocomparator Mk 2. Any one of these features by itself is very important but only a comparator that combines all three will enable you to produce successful and economical aerotriangulation using the fully analytical method.



High production has been assured by equipping the Kern Monocomparator with a plate carrier that is illuminated like a light table. No special care is needed to position the diapositive. It is simply placed on the stage plate and pushed against the stops. Two leaf spring clamps hold it in place. No time is lost in finding the fiducial marks or premarked points. A monocular observing microscope for maximum operator comfort. This allows the operator to change between direct and optically-aided observation of the diapositive quickly and easily.

A plate carrier drive that permits freehand movement to place any point on the diapositive within the field of view of the microscope. Coaxial clamping and slow-motion knobs are located so that operator never removes his hands from the X and Y freehand drives during the measuring process. The slightest rotation locks the disk clamps and the slow-motion knobs are found immediately above the clamping knobs.

High precision has been assured by linear, incremental glass scale encoders, reading directly to 0.001mm. There is no mechanical contract between the glass scale and the encoder head. Consequently, there can be no mechanical wear and long life with continuing high accuracy is assured. The scales are placed as closely as possible in the plane of the diapositive.

Continued

E 3000 Mekometer

present the most accurate electro-ical distance meter on the market from rn, is best suited for precision distance asurements encountered in geodetic and ineering measuring problems such as e line measurements, trilateration works and monitoring of industrial its and large-scale engineering projects ormation measurements) as well as rological and geological investigations. litional features: compactness, operat- convenience, minimum need of person- and time. Attachable to Kern auto- g tripods, trivets and centering interchangeable with all Kern dules.

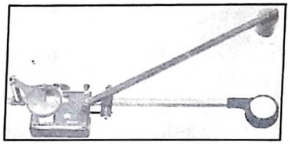
flectors: Single reflector for distances 1300 m, mounted on Kern target. arger distances one or two additional tors required. Height of target and tor corresponds with tilting axis of olites and Mekometer.

e distance measurement is based on hase difference comparison of the :d to the received modulated light of a Xenon gas lamp. In order to nine the phase difference of the lation wave, the length of the light vithin the ME3000 can be altered by iable prism system. The amount of is converted into decimal units of by a built-in computer and displayed ly. A compensator maintains the ation wave length constant, irrespec- pressure and temperature.

iimeters

Aristo Planimeters the determination surface area of irregular plane e.g., plans and diagrams, is more speedy and accurate than by any raphical procedures.

imeters are designed as Compensat- lar instruments, i.e., residual errors ustment can be compensated by ment from two different pole loca- The recording unit is completely d as a protection against damage at. The measuring wheel and its axle stainless nickel-steel and are ed in needle-point bearings. ism of the tracer arm and the wheel djustable. Readings can be taken to four significant figures by use of the vernier. The pole arm is connected to the recording unit by a ball and socket joint. The pole weight is held in place by a needle point, which establishes the reference pole.



The tracer arm can be used with a tracing point or with a lens. The tracing lens has a milled ring and is provided with a centration point for precise curve-following. Lens magnification ca x2. The use of the lens simplifies traversing of the profile, preserves the drawing and significantly enhances the accuracy of the measurement. All graduations are deeply cut, wiped in black into white plastics, thus permitting precise readings to be taken conveniently and without error.

Planimeters are delivered complete in case, with checking scale for calibration of the tracer arm setting, a table of constants and instructions for use.

Permaline Steel Measuring Tapes

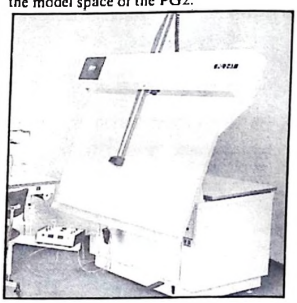
Steel measuring tapes from **Rabone Chesterman** are manufactured from phosphated tape steel, painted yellow, with a nylon coating to protect figures and graduations. Nominal finished thickness is 0.25 mm.

Graduations are in black and red figures and patterns 25 and 26 are supplied in PVC bonded steel case. Patterns 526-30m, 50m, and 60m size supplied on engineering plastic frame. Pattern 526-100m size supplied on chromium plated steel frame. Replacement tapes are also available.

Semi-Automatic Stereoplotter System

Since March 1974 **Kern** offers the photogrammetrist a unique, revolutionary stereo-plotter system. Revolutionary, because here in one instrument are combined for the first time the best features of the mechanical, analog stereoplotter and the latest state of the art electronics at a modest price. The PG 2-AT is properly called a system. The user can start out with the basic PG2 stereo-plotter and by adding one building block after another arrive at an integrated plotter system which will solve nearly all of the mensuration and plotting tasks found in a modern mapping organisation. The PG2 AT provides the first step towards economical semi-automatic plotting.

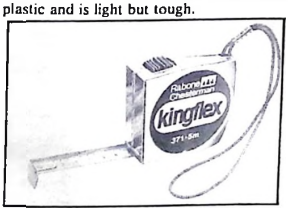
The PG 2-AT in its basic configuration consists of the PG2 stereoplotter fitted with X, Y, Z encoders and the AT automatic plotting table. The table provides in its standard execution a neat drafting area of 860 x 1360 mm and can be inclined over 90° from the horizontal to the vertical position. It is stepper motor driven from the impulses given by the X, Y, Z encoders in the model space of the PG2.



A hard-wired microprocessor serves as the link between the PG2 and the automatic plotting table. It contains two electronic scalers, so that the X and Y axes can be scaled individually. Scale factors between 0.1 and 9.9 can be introduced so that a maximum enlargement of 12.5 times from photo to plot is obtained.

Automatic return pocket rules

Rabone Chesterman manufacture a range of automatic return packet rules of varying lengths and widths. The Permaflex for example has a 13 mm wide blade with automatic return action and lock. The rule has phosphated yellow steel blade with expoxy coating over figures and graduations. The case is chromium plated ABS plastic and is light but tough.



The Kingflex has a longer length blade, and is extra-wide, 19 mm. There is a power-return mechanism and measurement markings are in black and red. This pocket rule has a handy carrying strap, belt clip and sliding tip fitted.

c. reichert optische werke a

Hernalser Haupstrasse 219, A-1170 Vienna, Austria.

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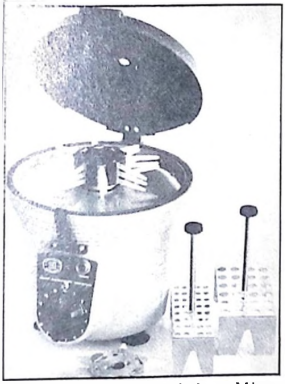
Micro Haematocrit Centrifuge

Packed volume of red blood cells (PCV) serves as an important indication of anaemia, hence primary and secondary polycythaemia. Blood that has been rendered non-coagulable is spun down in a centrifuge so that the red blood cells collect and pack against the bottom of the test tube. The percent red blood cells compared to the total blood volume is then calculated. As with many clinical tests, the introduction of a fast micro technique has considerably expanded the usefulness of the [illegible]. Micro haematocrits have now become a standard screening method eliminating the necessity for a red blood cell



The Gelman Hawksley Micro Haematocrit Centrifuge is fast, accurate and safe. Blood can be taken directly into a heparinised capillary tube from a finger prick or into a plain tube from a venous supply rendered incoagulable. In either case, only a maximum of 50 microlitres of blood is required and it is not necessary to measure an exact amount.

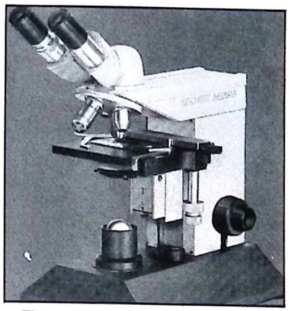
Studies have proved that higher gravitational force is necessary to give complete cell packing. Older methods and centrifuges often do not provide this force. The Gelman Hawksley Micro Haematocrit Centrifuge develops 12,000 x G — more than sufficient for all types of blood.

In no case is it ever necessary to centrifuge for longer than five minutes. This is not only an important initial advantage, but if a re-run is necessary the check reading is available in five minutes.

Neovar Teaching Microscope

The Neovar microscope, from **Reichert,** belongs to a new microscope line. Optics and illumination specially selected for the specific application make up the main difference between the individual models. The stand has been designed to offer ideal working conditions and therefore — irrespective of the price level — remains identical for all models.

Its size, the viewing position and the arrangement of the operating controls ensure — for the teaching microscope in the same way as for the high grade laboratory instrument — good results and strainfree operation.



The stand is produced of sturdy metal profile and the broad base ensures an extreme stability of the instrument. Mechanical precision and robust construction guarantee a perfect functioning throughout many years inspite of "rough" handling.

The illumination system is incorporated into the base plate. Reichert are using for the first time a 5 W low-voltage lamp. Compared to the mains-type lamp combination light sources generally supplied in this price range, it offers more light and increased contrast.

The condenser is interchangeable and can be moved in a sleeve for height adjustment. For optimum brightfield image quality Reichert only supply optical superior Abbé condensers with iris diaphragm. The viewing tubes are fitted to the stand by means of circular dove tails. The tube factor is 1X and the tube length remains constant.

The revolving nosepiece — for 4 objectives — has ball-bearings which make it highly accurate and maintenance-free. The objectives are adjusted in such a way that the object detail remains visible in the centre of the field of view when changing magnifications.

Oxoid Culture Media

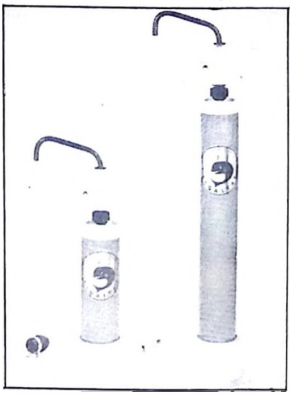
Dehydrated culture media, which constitute a major part of the **Oxoid** range, possess many advantages due to their economy, ease of storage and preparation, and most of all to the absolute constancy and tested reliability which can only be obtained by large-scale production allied to extensive quality control. For these reasons Oxoid media have become universally accepted and are especially recommended for use in standard methods or other purposes where standardization and reproducibility are of paramount importance. In addition, the ease of preparation of Oxoid dehydrated culture media has enabled laboratories to deal with an ever-increasing amount of work whilst actually reducing the number of staff engaged in the routine tasks of media production.

A special feature of Oxoid dehydrated culture media is that many of them are available in two different physical forms — tablets and powders.

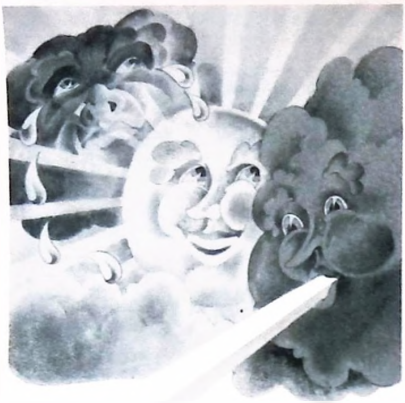
Tablets are a unique feature of the Oxoid range: each tablet contains a measured amount of mixed ingredients sufficient to make up 5 or 10 ml of medium. All that is necessary is to dissolve the tablet in distilled water and then to sterilize. Tablets are the most convenient form of dehydrated culture media for the preparation of small quantities of media in flasks or in test-tubes. Those who have suffered the labours involved in dispensing a hot agar medium will appreciate the convenience of merely taking a tablet, dropping it into the final container with the correct volume of distilled water, and sterilizing directly in the autoclave.

Cartridge Deionisers

Elgastat B125 and B126 from **Elga** provides purified water for small and medium sized laboratories. They are independent of mains electricity and therefore fully mobile. Purified water quality is monitored on an integral conductivity indicator. Flow rate is tap speed and water quality 0.25µs consistently. Flow starts instantly at the turn of a tap.



The tubing with quick-fix adaptor is connected to a cold water tap when purified water may be drawn instantly from the top outlet. Raw water enters at the base of the Elgastat, passes upwards through the mixed bed ion exchange cartridge, through conductivity indicator and water quality may be observed throughout the run. When the cartridge is exhausted this is exchanged instantly for a freshly regenerated one through an international cartridge service.

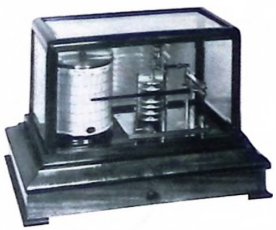


If you're talking weather you're talking Casella.

In more than 100 countries and every type of climate, Casella meteorological instruments are recognised for their reliability and high quality. Synoptic and climatological stations, universities, schools and government departments, professionals and amateurs continue to specify Casella.

The Casella range is wide and includes meteorological instruments for measuring and recording Temperature and Humidity, Airflow, Atmospheric Pressure, Rainfall, Dew, Evaporation and Sunshine. The instruments are precision built, reliable and backed by over 150 years experience of instrument production. Many are made to the design of the British Meteorological Office and some are used for setting international standards.

Catalogues for your particular requirements are available on request.



This is one of 5 different barographs available from Casella. An exceptionally attractive instrument, it is ideal as an aid to weather forecasting. Available for recording in millibars, inHg or mmHg.

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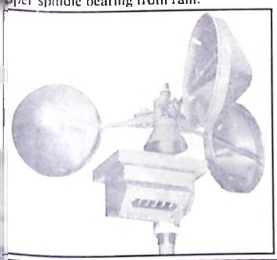
up Counter nemometer

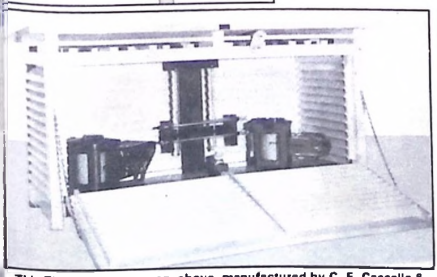
is instrument, from **C. F. Casella & Co. J.**, indicates on a mechanical counter the al run of wind past the observation int. By observing the counter reading at beginning and end of any period of erest, the average wind speed during the erval can be calculated.

Three conical beaded-edged cups 12·7 in diameter, attached by arms to a ntral boss, drive a vertical spindle at a ary speed proportional to the linear wind ed. The spindle is connected by worm ring to a train of counters, the gear ratio ch that the counters indicate the of wind directly in nautical miles, miles or kilometers. The counter are made of a self-lubricating plastic. The instrument ter- s in an external thread for screwing and the counter observing angled downwards at 45° to reading from below or vertically reading when the anemometer is sited to an evaporation tank.

Brass, copper, stainless steel and plastics used throughout the instrument to ensure freedom from corrosion and a long working life. The only maintenance required is annual lubrication of the top pindle bearing; all other bearings are self-lubricating. A conical shield protects the per spindle bearing from rain.



This instrument from C. F. Casella & Co. Ltd., indicates the total run of wind past the observation point.



This Thermometer screen, above, manufactured by C. F. Casella & Co. Ltd., is designed to house two recording instruments, usually a thermograph and a hydrograph, as well as maximum, minimum and wet and dry bulb thermometers of the sheathed pattern. In general terms the construction of the large screen is similar to that of the Stevenson pattern, the four vertical panels being double-louvred, the roof double and the floor consisting of overlapping boards. Both front and back panels are hinged to permit access from two directions, but when supplied the back panel is screwed up.

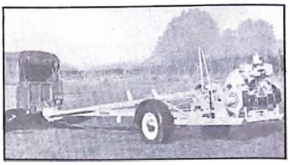
'Speedy' Moisture Tester

A quick and accurate method of checking moisture in road and building construction material, for example sand, clay, sub-floors, ores and pulverised fuel ash has been introduced by **Thomas Ashworth & Co. Ltd.**

These are the materials most often tested. The "SPEEDY" Moisture Tester is completely portable, non-electric and can be easily used by unskilled personnel. No graphs or conversion charts are necessary. The readings are direct readings of moisture content by wet weight. Adopted by most countries as the standard method of testing moisture content in building materials and over 50,000 are in use.

The Investigator 150

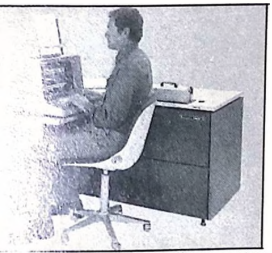
Modern construction developments call for fast and a accurate assessment of the underlying soil structure. The Investigator 150 drilling rig from **ELE Ltd** together with its optional attachments and tools, offers the widest possible choice in drilling equipment for site investigation, trial borings and general purpose drilling work. In the design of the rig and attachments, great attention has been paid to saving overall costs, many of the attachments being fitted to the single pendant, and drill heads being easily changed or used for dual purpose.



Within 15 minutes of arriving on site the rig can be ready for drilling. The legs are unlatched and walked out to the front, the brace bar is bolted on and the derrick winched up. When the two cross struts are attached, the rig is erected. It is just as quick and simple to lower the derrick and have the rig ready for towing away.

Comp/Set 560

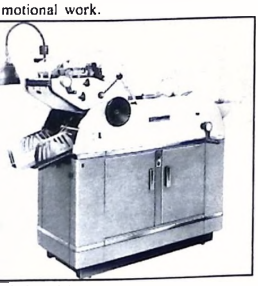
single source of supply is the aim of Addressograph-Multigraph Ltd., from text origination to printing in black and white or colour in a variety of formats, to high speed addressing of envelopes, bulletins, direct mail, etc., from embossed master record cards produced on AM Graphotype machines.



The Comp/Set 560 direct entry typesetter provides the source of text origination, being able to typeset copy in type sizes ranging from 5½ to 74 point. From the large, easily read, video screen of conventional keyboard layout, the operator can check exactly what is being set, before commiting text to the photypesetter. With four different type styles resident in the machine, the operator has 280 founts on line with unrestricted print size and type style mixing. For maximum productivity, optional extras include a punched paper tape record/playback module and 'floppy disk' module, both of which can capture all the keystrokes and keyboard commands for future use, or updating and revising uses.

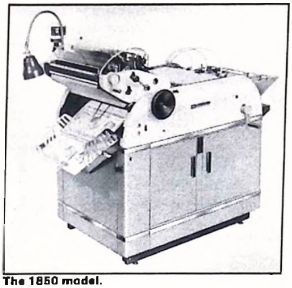
AM Multilith 1250

The printing of text can be handled by the AM Multilith models 1250 and 1250, which can produce a variety of printed matter, including typewritten reports, colour letterheadings, forms, bulletins, catalogues and process colour promotional work.



The 1250 model.

Both models enjoy the simplicity of a single lever control which takes the operator through the correct operating sequence. A variety of extras is available for both models, including chain delivery and receding stackers. For the Multilith 1250, AM collators can be added on-line for the high speed collation of reports, etc. Also available are numbering and perforating units, especially useful for part sets documentation. Perfect operating partner for the Multiligh 1250 is the AM Model 2300 MR Master Imager. Supplied with a choice of reduction ratios the 2300 MR makes conventional sized printing masters from the most commonly over-sized originals, i.e. A3 to A4. The 2300 MR produces high quality electrostatic masters for short run, high volume systems work, using the wide variety of AM masters and supplies.

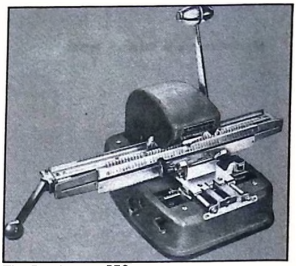


The 1850 model.

Embossing Machines

For addressing envelopes, letterheads, bulletins, etc., AM produce a range of addressing machines from small table-top models to the larger floor-standing units capable of addressing at very high speed. All AM addressing machines use metal or plastic master record plates, embossed with the relevant data, using AM embossing machines. The Model 350 Graphotype machine is a table-top unit which embosses data onto all kinds of Addressograph metal plates or plastic cards.

Outstanding features of this machine include light, easy handle action, which permits effortless operation and maximum output; easily removable type bank, enabling alternative type styles to be used; quiet operation; visible numbered line indicator; four rubber suction feet which hold the machine firmly to desk or table top. Lightweight and portable, the Graphotype 350 can be sited wherever it is needed.



The Graphotype 350.

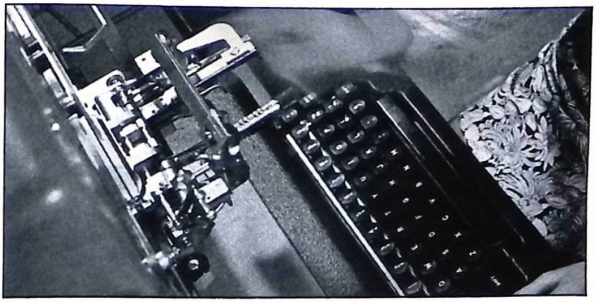
The 350 has a capacity of forty-eight characters — capitals and numerals, and is compatible with all styles of Addressograph card index master records. Graphotype Model 355, similar in all other respects to the 350, is designed specifically for the embossing of Addressograph plastic cards.

The Graphotype 6300

For higher volume requirements the Model 6300 Graphotype is used for high speed embossing that larger uses demand. The 6300 utilises a standard keyboard layout and when one key is depressed the corresponding character is embossed onto the plate.

Clear, deep and even character are formed of uniform type height. With its standard typewriter keyboard and space bar, operating speeds are readily acquired without the need for expensive, elaborate training. A wide variety of type styles are available, including OCR founts. Once checked and verified, the embossed plate or plastic card is a permanent self-writing record that gives typewriter-like results.

There are currently five Graphotype models within the Class 6300 range to suit most embossing or indenting needs.

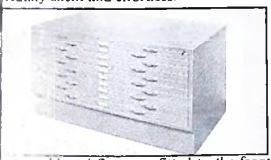


The Graphotype 6300 data plate embossing machine.

lap Storage Cabinets

ne basic unit, from **Elite Manufacturing o. Ltd.**, consists of a ten-shallow-drawer ction complete with fixed top which is mpled so that a second unit may be dded without inconvenience.

Plinths are separate and are only quired with the first unit. Drawers are ly 32 mm deep and move freely on tough astic glides. The drawer movement is rtually silent and effortless.



hinged flaps are fitted to the front drawer and a deep hood at the rear t drawings from curling upwards. esive metal dividers are merely into position to form compart- ts as required. The drawer bottom is from holes. Drawers may be opened ost full depth without appreciable sag.

Cabinets are very robust, durable and high quality throughout. Drawer inside dimensions permit the fitting of self adhe- sive dividers to provide compartments for virtually all sizes of drawing.

Bench stand for Drawing Board

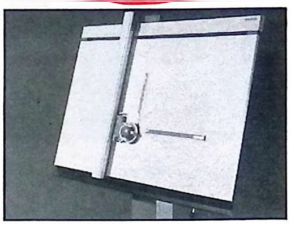
The **Holbro** Drawing Board Bench Stand is of simple construction, and height adjust- ment is attained by bearers sliding in two metal channels.

The board can be set up at any angle between vertical and horizontal by means of metal quadrants. Both the height and angle movements are controlled by locking rods.

The illustration shows the Stand mounted on a horizontal plane, e.g. the top of a desk or a bench, but the unit can also be fitted to a vertical plane if necessary.

The Kuhlmann 9

The **Kuhlmann** 9 is a free standing column drawing table with a minimum space requirement. The characteristics of the column table facilitate work place arrange- ments when combining it with other fur- niture. The drawing table has an optional +30° board swivel, is maintenance free and

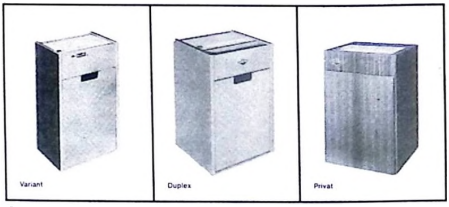


easy to clean and has easy height adjust- ment through ball bearing equipped plastic rollers with machined exterior diameter.

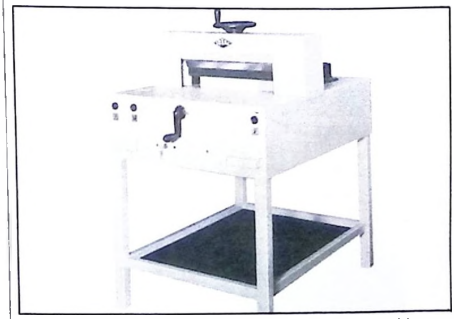
Shredders

The importance and role of the document shredder is now accepted by modern business. Shredding is the fastest, cheapest, safest and cleanest way of complete docu- ment destruction. It also produces valuable packing material. **Ideal** have introduced a range of shredders such as the variant- Duplex-Privat, a personal shredder, that has a fully automatic shredding mechanism. Beside your desk, these machines will replace the paper basket, providing on the spot disposal of all important documents.

The Garant is a powerful documentary shredder for every office and warehouse, with a unique feature of a fully automatic reverse action, eliminating overloading. The machine rests in an all metal housing, either on castors or as a desk top model



A range of ideal shredding machines.



The above shows an Ideal 48/2 paper trimmer and cutter with two electrical cutters of 47.5 ot 52 cm. cutting lengths and cutting height of 8 cm. There is a safe two-handed operation and automatic knife return. The cutter is complete with stand.

THE 245

From GAF-a diazo printer with many new features for the printroom with big repro problems...

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reproductions of drawings and data sheets in all sta
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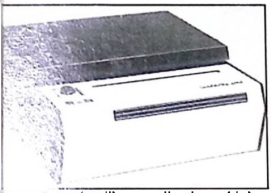
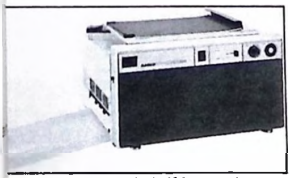


ion it will copy all coloured inks, point pens, all coloured stamps, and photographs and will pies on paper or on offset plates, nd clearly.

00 Bond Copier

ıe Apeco Bond Copier 300 out-performs ıer plain paper copiers, which cost more, e copy-quality secret is in the new ectro Masters and magnetic brush velopment system. There are no costly ums to replace. Just insert an inexpensive aster into a slot. It loads itself in seconds. ıe old master is ejected automatically. A ght flashes to signal when it's time to place masters to maintain optimum copy ıality.

Pre-load the paper of your choice into ıick-switch paper cassettes. Change from tter-size paper to legal size, color stocks, pre-printed forms in seconds. Cassettes ep paper neat, clean, wrinkle-free. They e easy to stack, easy to store.



Costs can be cut in half by copying on oth sides of a single sheet. Save on mailing osts, collating and staple time — even ling space. Make single copies on color ock, letterheads, odd-sized paper, etc. ithout changing cassettes. Simply insert neets into the by-pass slot.

Place your original on the copy top, set ıe dial for the number of copies you need 1 to 20), and press the "Print" button. lear, ready-to-use copies are counted out uickly and automatically. Turn it on in the ıorning, and after a short warm-up, it's eady to perform instantly all day long. So imple, anyone can get fine results the very rst try.

776 Apeco copier

With the new "dri-tone" copying process, **Apeco** goes farther than traditional "wet" systems. Now, even the slightest dash will come out neatly and sharply on the copy. Moreover, the general aspect is crisp, brilliant, and perfectly readable, making the *Apeco 776*, copies "luxury prints".

The 776 makes 14 copies per minute without warm-up time and has an autonomy of 670 DIN A4 copies/roll. The automatic count-down dial allows to preset the desired number of copies. Noiseless! after the last copy, a time-switch stops the main motor, yet keeping the machine ready to operate instantly.

The Apeco 776 reproduces photographs, drawings, books, printouts, letters or any documents up to 298 x 432 mm., including DIN A3 standard size. Roll-paper feeding and micrometric knife tuning allow perfect cutting to the desired copy size and insure a valuable saving on copy costs. Besides that, due to particularly rugged and sturdy design, the Apeco 776 guarantees efficiency and durability.

AM 610 Table-top Copier

The new compact AM 610 table-top copier, from **Addressograph-Multigraph Ltd.**, is a truly versatile machine which can tackle a range of copying jobs efficiently and economically.

AM 610 feeds copy paper from the roll to give completely automatic operation. One roll gives 500 A4 size copies — or cut-off length can be varied by a simple slider control. There's no paper waste with the AM 610. Roll width matches up with most computer print-out, too — so print-out can be copied conveniently without cutting the originals.

There's no "warm-up" time before you make the first copy — and the AM 610 will produce ten A4 size copies per minute. If you want more than one copy from an original, there's a pre-set dial for up to twenty copies.

One of the secrets of better copying quality is a high quality copying lens. The AM 610's lens was designed by the makers of a world-famous precision 35 mm. camera — and it is made to the same exacting standards, to ensure superior copying results.

A simple control enables precise adjustment of copy quality to be made for a wide variety of originals.

The AM 610 table-top copier.

Electronic Print Display Calculator

The **Victor** Model 332 electronic print/display calculator is a twelve digit desk-top electronic print/display calculator with puntuation, automatic accumulation and fully accessible memory. The machine operates with a snap touch, answering positive entry registration. All the add, subtract and cipher keys are enlarged to facilitate touch operation. The machine weighs 3.4 kgm and has dimensions of 23.2 x 30.8 x 8.9 cm.

Portable display calculator

The portable display calculator model 104R from **Victor Comptometer Corp** carries out addition, subtraction, credit balance, multiplication, devision, percent, square root, reciprocal, square, pi, one memory. There is an Input with an entry of 8-digit capacity through the standard 10-key pad.

The decimal system is fully floating and automatically positioned as required by the calculation. The memory system comprises of one memory which entries and results can be accumulated into an independent register without affecting standard addition, subtraction, multiplication and division operations.

MERIDIAN

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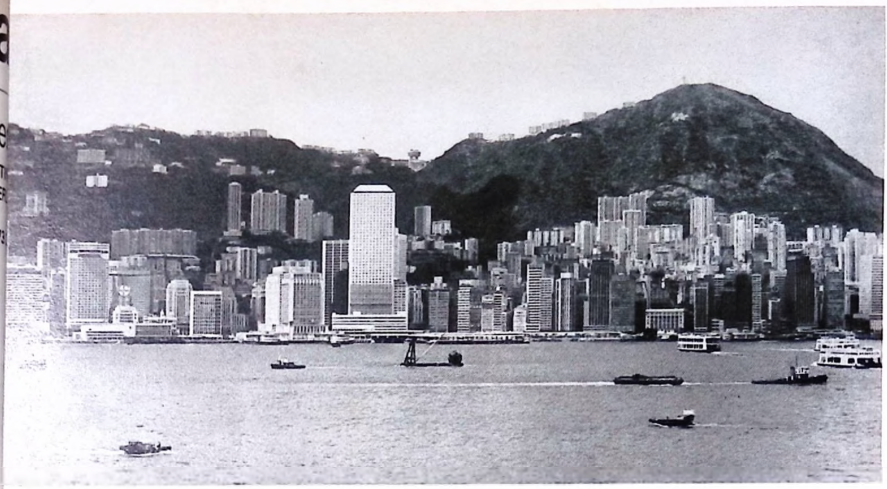

A view of Hong Kong Island seen from Kowloon on the mainland.

TO SURVIVE IS TO TRADE
The Hong Kong — West Africa example

By any account, Hong Kong is quite unique in the world. In fact its existence and continued survival is not much short of a modern miracle. Yet survive it does, and prosper too, by that singular — and to the local populace all consuming — activity called trade. In this article by C. Chapman, Economics Writer, Hong Kong Trade Development Council looks at Hong Kong's growing trading links with West Africa.

HONG KONG has a population of 4.51 million people most of whom can be found in the main urban areas around the central and southern tip of Kowloon peninsula and the northern shore of Hong Kong main island. This makes the territory one of the most densely-populated areas in the world since the bulk of this mass of people resides on about 12 per cent of Hong Kong's 402 square miles of mainly hilly land.

Added to its population problem, Hong Kong has virtually no raw materials nor natural resources and it grows only a very small proportion of its daily food needs.

Yet Hong Kong is not without its attributes. Geographically Hong Kong which sits at the southern-most tip of the great land mass of the People's Republic of China, serves as an important crossroad between the east and west. Geologically Hong Kong is blessed with a fine and deep-water natural harbour. And physiologically Hong Kong's population made up predominantly of Chinese, has proved to be extremely dexterous and industrious.

And it is these attributes which have helped Hong Kong rise from nothing more than an entrepot a quarter of a century ago to one of the top twenty trading territories in the world today as well as being a major commercial and financial centre in the region.

Hong Kong's Gross Domestic Product per capita, at US$2,333, ranked third highest in South East Asia (after Japan and Singapore) while its GDP totalled US$10,366 million (accountable as of calendar year-end 1976).

The total working population of Hong Kong at the end of last year stood at 1.95 million of which 775,000 were in manufacturing industries.

Dependence on trade

Because of Hong Kong's dependence on trade for its economic survival, its destiny is not really its own but is governed by the whims of the economies of its overseas markets — to which more than 90 per cent of its manufactured goods go — and by the economies of supply and demand.

As one of the last bastions of free enterprise, Hong Kong's free port status, where both goods and money can enter or exit free of hindrance, is not only uncontested but strongly defended by a liberal-minded government whose policy has always been one of minimum interference.

As a result free market forces have always played an important role in Hong Kong's financial and commercial activities. In practice Hong Kong's ability to manufacture and successfully export its products is determined by its competitiveness in pricing and quality and in its flexibity to switch from product to product, technology to technology and market to market when the demand dictates.

But of late free market forces seemed to have taken a back seat to political motivations in the world's economies as more and more countries, notably the United States and Western Europe switch to a more protectionistic trait and Hong Kong is finding its major markets becoming more

Continued

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They appreciate the superb design, perfect balance, dimensional accuracy and consistent high quality which distinguish Britool products from ordinary tools.

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ontinued

estrictive to the importation of its roducts, particularly in the textiles field.

Two major developments

This has led to two major developments ithin Hong Kong. One is the search to evelop more technologically-advanced nd therefore better quality products to xport in the hope of offsetting quantum estraints and the other is to search for narkets hitherto "unexplored" or under-tilised by Hong Kong for its export argets.

The development of the former depends n Hong Kong's ability to attract the ... kind of foreign industrial invest-... whereas for the latter strenuous ... have been put to develop such areas ... Middle East, Africa, South America ... Eastern Europe whose markets, ... not exactly neglected, have received ... emphasis in the past from Hong ... manufacturers and exporters than ... America and Western Europe.

... particularly western African ... like Nigeria and Ghana, is likely ... give the main impetus of Hong ... export drive in the years to come as ... focus of the territory's market ... diversification programme intensifies.

In fact, in last April to the middle of May this year, a group of 26 Hong Kong companies, organised jointly by the Hong Kong Trade Development Council — a quasi government trade organisation — and the Hong Kong General Chamber of Commerce, will be visiting Ghana and Nigeria on a business mission.

An example of flexibility in production, geared to export demand, can be seen in the above photo which shows a factory producing toy cars.

Visiting business groups

The business group will visit Accra, Lagos and Nairobi where product displays of the wide range of goods Hong Kong manufacturers will be staged in leading hotels. This includes the full range of garments, toys, electronic items, watches, electrical appliances, novelties and sundry items.

This is by no means the first business group from Hong Kong to have visited the region as missions as early as 1973 had been sent on an exploratory basis. They were followed by similar missions in 1974 and 1975.

Continued

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ong Kong — igeria trade

Of the countries in West Africa, in fact e whole of Africa, Nigeria is Hong ng's largest market. Total two-way ade between Hong Kong and Nigeria ached US$133.4 million in 1977, a rise of per cent over the previous year.

Following a substantial 48 per cent crease in Hong Kong's domestic exports Nigeria last year which amounted S$100.1 million, the country's ranking as global market for Hong Kong has shot to 12th position from 15th in 1976. On other hand, Nigeria regards Hong ng as its second largest source of supply (after Japan) and ranked last year oth to 20th on a global basis.

ugh the trade balance was very in favour of Hong Kong last year, s a reciprocal advance in imports g Kong from Nigeria of 60 per US$1.5 million.

Kong's main exports to Nigeria he consumer goods field such as clothing which in 1977 amounted US$32 million and showed a rise of 48 over 1976. It should be noted that Kong is one of the leading suppliers clothing to Nigeria. This category alone omprised 32 per cent of Hong Kong's otal domestic exports to this country.

Besides clothing, telecommunications pparatus exports from Hong Kong to Nigeria gained an equally impressive 81 per cent last year to total US$8 million while other major exports included watches nd clocks (up 62% to US$5.2 million); omestic electrical appliances (up 304% to US$5.3 million); and other electrical machinery and apparatus (up 105% to US$4.1 million).

Imports from Nigeria last year were dominated by cotton which rose from a mere US$10,200 in 1976 to US$1.5 million while traditional imported products such as synthetic organic dyestuff; textile and leather machinery; and crude vegetable materials dropped back to nil in 1977.

Natural market forces

This imbalance of trade was not due to any contrived barriers on the part of Hong Kong but to natural market forces. As Hong Kong is a free port with absolutely no restrictions on imports, the ability of a foreign producer to market his product successfully in Hong Kong is determined entirely by the competitiveness of his goods with regard to pricing, quality and current demand.

On the other hand, Nigeria does have some minor barriers against importation of certain Hong Kong-origin goods. Principally they fall on about 20 items which followed the enactment on April 1st 1977 of the Import Prohibition Order while the ban on certain textile products, certain glass and pottery products and some foodstuffs introduced in April 1976 remains in force. There are other tariff and non-tariff barriers as well which include the Insurance Decree and the requirement of specific import licences on certain items.

Textiles form a leading area for investment. Shown here is crepe de chine being woven on one of the 40 looms at Modern Silk Textiles Ltd.

"Natural" occurances such as port congestion, have sporadically hindered trade.

Investing in Nigeria

Besides the direct trade link, Hong Kong has been an exporter of certain technology in Nigeria via industrial investments. According to the office of the Nigerian Trade Commission in Hong Kong, direct investment from Hong Kong companies or individuals amounted to a total of US$120 million as of year-end 1977. These investments were principally in the fields of textiles, plastics, enamelware, steel rolling mills, batteries, electric wire, packaging and restaurants. And according to the same office, Nigeria's biggest textiles factory is owned by the Hong Kong-based China Dyeing Works Ltd.

Apart from Nigeria, most countries along the west coast of Africa are very much "under-explored" by Hong Kong's traders. The main inhibiting factor is the shortage of hard currency or problems with foreign exchange which most of these countries have, unlike Nigeria with its revenue from petroleum exports.

Of these countries, only Ghana, the Ivory Coast, Liberia, Sierra Leone and the Cameroon Republic represented markets where Hong Kong's exports totalled more than US$4 million last year. Exports to the other markets in the region from Hong Kong were usually below US$2 million per annum.

Ghana, to which Hong Kong's domestic exports last year amount to US$10.8 million, appears to be the next most promising market following an increase of 55 per cent over 1976's exports.

At the same time it is interesting to note that Hong Kong's re-exports of goods from other countries to Ghana, valued at US$17.7 million last year, was almost twice as large at Hong Kong's domestic exports to this country.

The main products that Hong Kong exported and re-exported to Ghana were in the textile field. Textile yarns and thread rose 161 per cent last year to US$3.8 million, clothing exports rose 168 per cent to US$2.1 million and textile fabrics (woven other than cotton) jumped 315 per cent to US$630.000. Imports from Ghana, totalling US$2.1 million last year, comprised almost entirely aluminium.

Hong Kong's exports to Ghana were also subjected to certain restraints which require import licences while others were banned outright.

After Ghana, the other markets included Liberia to which Hong Kong last year exported US$5.9 million worth of goods (up 50 per cent on 1976), Ivory Coast with Hong Kong's exports there worth US$5.4 million (down five per cent on 1976) and the Cameroon Republic with exports valued at US$4.8 million (down six per cent). □

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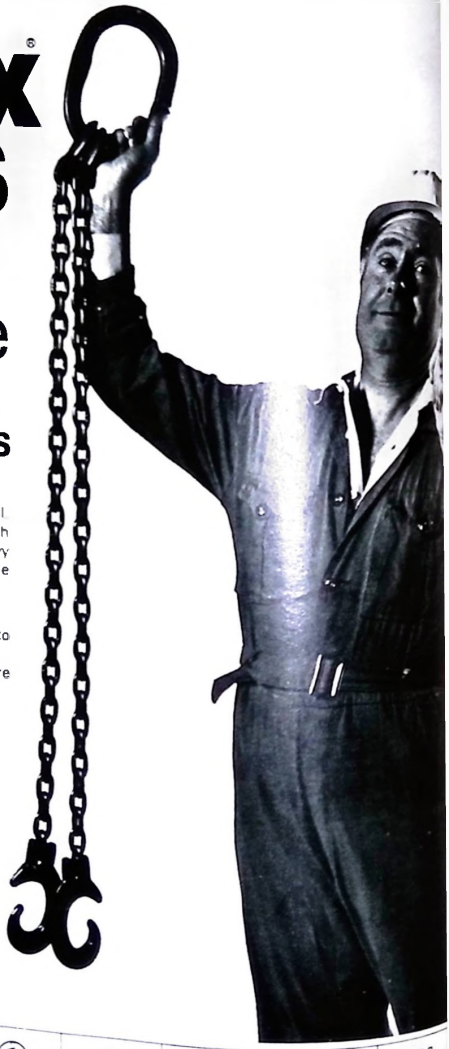

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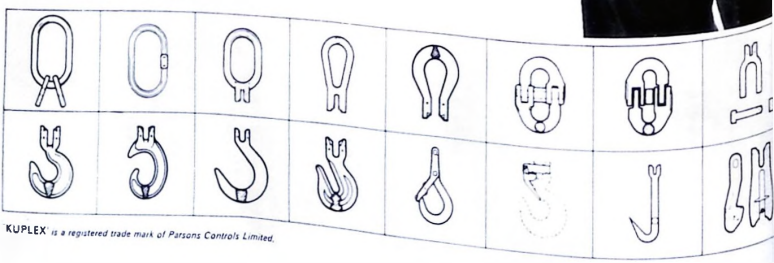

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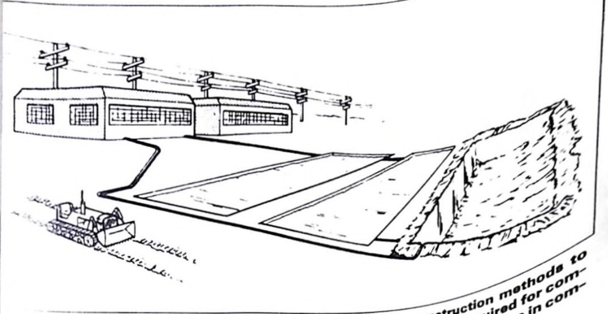

...solar pond array would use low-cost materials and heavy-construction methods to ... collection and storage of solar energy economical on the large scale required for com-... ...eration. A series of long trenches could be dug side by side over an area large in com-... ...to the heat diffusivity of the soil.

SOLAR PONDS

The collection of solar energy on a large scale for power plants or major facilities magnifies the incompletely solved technical and economic problems or residential solar utilization systems. It has been suggested that large ponds of water, made with bulldozers, could be used to collect and store solar heat. The ponds would act much like conventional collectors.

Solar ponds have a number of problems: The liquid must be kept free of dust that would impair transparency; the hot fluid at the bottom of the pond must not circulate (convection) to bring the heat close to the exposed upper surface of the pond where it is cooled by air; and heat-releasing evaporation should be minimized. It is also difficult to extract heat from such ponds, since the removal (to a heat exchanger) and subsequent replacement of the hot bottom liquid induces convection, which partially defeats the purpose of the pond.

Cost effective

In the concept illustrated in Fig 1, cost-effective solar ponds might be constructed inexpensively by digging narrow elongated trenches. These ditches would be lined with black plastic to enhance absorptivity and to keep water from seeping into the earth. The heat-transfer medium would be water pumped through thin-walled plastic tubes on the bottom of the pond. This would solve many of the problems with convection. To ensure good thermal contact with the liner in the trench, the fluid in the tubing should be made denser by adding a salt.

The free water in the trench, separate from the hot brine in the plastic tubing, would be kept clean and free from dust by an independent circulation system. The top of the ditch would be covered with an inexpensive transparent low-heat-transfer film that would also decrease evaporation.

A typical trench

Figure 2 is a cross section of a typical trench. The soil in the trench is covered with black polyethylene sheeting, and the tubing could be thin-walled clear pol-yethylene hose connected to a pump and heat exchanger (or directly connected to a heat engine). As the black liner is heated by the sun, the brine in the tubing is heated by

ab... tren... assen... their... roundin... For... tempera... arrange... energy of... periods for... pensate for...

Reducing heat loss

A cover should ... to reduce heat loss ... tion. A number ... followed: A layer ... equivalent, above ... water, just ... be filled with ... would prevent ... gel might be ... gelatinizing agent ... estimated at 1.6 ... require the use of ... across the trench to ... cover would probably ... prevent decomposition ... rainfall.

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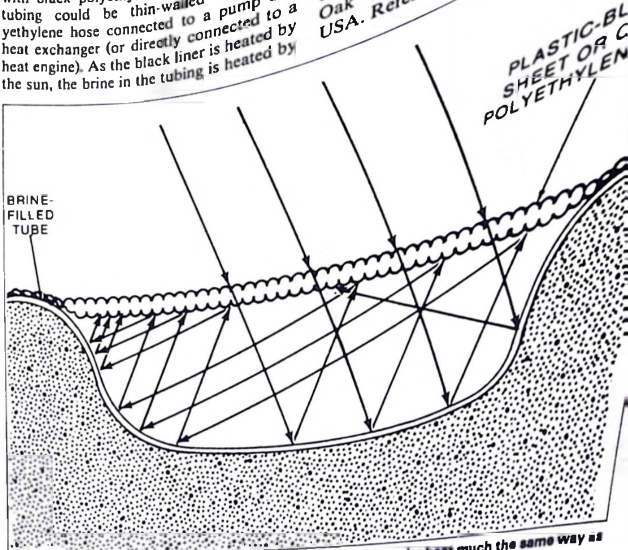
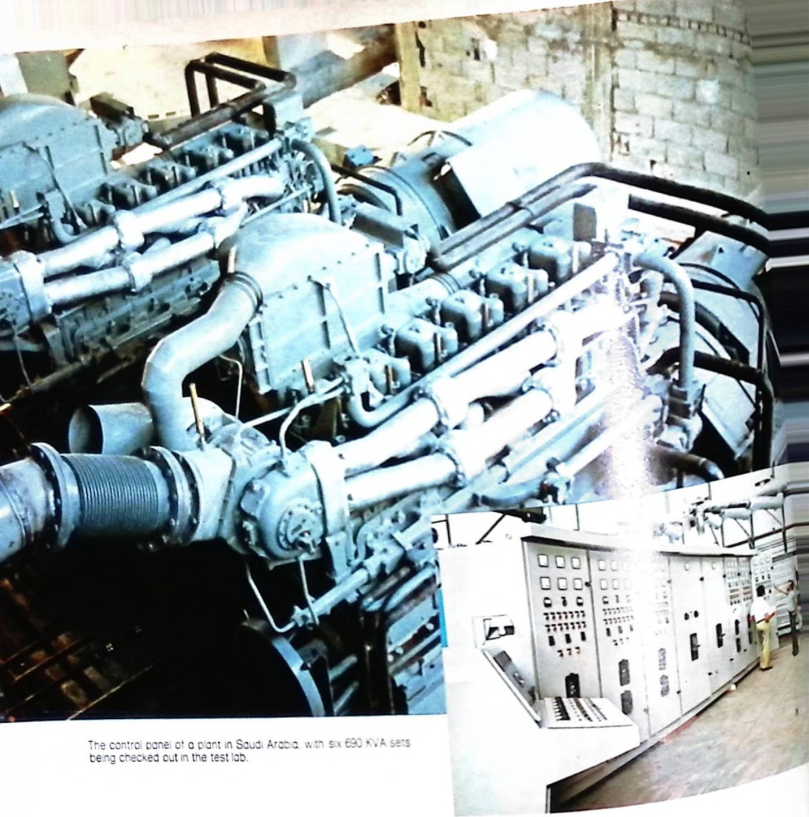


Fig. 2. A solar pond, shown in cross section above, would trap solar heat much the same way as a flat-plate collector. Heat would be transported by a brine-filled pipe running along the bottom of the pond. The temperature of the brine could be expected to reach about 90°C (190°F).



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A Coles 911 industrial mobile crane is highly suited to operating in confined conditions, the 911 is shown here handling diesel engines at a motor show.

INDUSTRIAL MOBILE CRANES

Material handling systems are growing increasingly specialised, requiring more efficient and more cost effective equipment. Wheel-mounted mobile cranes are still one of the most versatile material handling machines devised. In this article S. A. Anderson, General Manager, Product Marketing, Coles Cranes Ltd. looks at the handling capabilities and manufacturers of this crane.

RUBBER TYRED mobile cranes have been used for materials handling for close on a century. Many years ago, before the advent of the fork lift truck, lorry-loader crane, overhead travelling crane and gantry crane, the scope for materials handling mobile cranes was vast. Increased mechanization around the world has led to the widespread use of more specialised and highly developed materials handling systems and equipment and increased specialization has often meant more efficient and more cost'effective handling. Often but not always!

The wheel-mounted mobile crane remains one of the most versatile materials handling machines ever devised. Whilst other highly-specialized and *potentially* highly-productive materials handling machines are often properly applied and economically utilized, it is also true that one can also often find such machines and systems grossly under utilised. After all a materials handling machine is almost always merely a link in a long chain and the pacemaker in any process is the slowest and least efficient element of the system and the work rate of the other men/systems/processes/machines must be geared to this lowest denominator.

Today there are very few materials handling jobs which cannot be performed more efficiently by a machine other than a mobile crane. But "efficiently" does not necessarily mean economically or viably. The economics of the ownership and operation of a materials handling mobile crane are based on factors such as the following:-

- — The mobile crane can travel to where the work is.
- — By slewing through 360°, hoisting and derricking, the mobile crane can move materials without travelling.
- — The mobile crane can be used to transport materials by travelling with the load suspended on the hook.
- — The mobile crane can work with hook, tongs, clamps, grabs, grapples, electro-magnets, spreader beams etc., according to the materials to be handled.
- — The mobile crane can load and unload materials over a very large area.

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tinued

- The mobile crane can be easily serviced and maintained at ground level and can drive itself into a workshop.
- Mobile cranes have service lives which often extend beyond 20 and even 30 years.
- Mobile cranes command high second-hand re-sale values.
- Mobile cranes are easy to install at the place of work — requiring no foundations or power supply connections.
- — Mobile cranes are easy to operate and available with highly-developed safety devices to reduce the possibilities of accidents or breakdowns.
- Very few highly sophisticated or specialized components are used on mobile cranes, making replacements parts and service relatively inexpensive.

The Fuchs 118,18 tonne lattice boom mobile crane — features include hydraulic crane drive and outriggers with a wide range of attachments.

...e of mobile crane for ...ials handling

There are two basic classifications of mobile cranes for materials handling work:

a) Cranes which are mostly used for travelling with loads, ie. "Pick-and-Carry" cranes.

b) Cranes which are mostly used for swinging with loads without travelling, ie. Production Cycle Slewing cranes.

...ick-and-carry cranes

The main characteristics of these cranes e:

- — 2 to 20 Tonnes lifting capacity free on tyres.
- — Short Cantilever type boom (4-12 metres) either of lattice or telescopic type
- — Two axles: one driven and one steered.
- — Effective travel speeds of up to 40 kilometers/hour.
- — Driver's cabin mounted on the chassis.

However beyond these basic parameters ere are tremendous variations in design:

- — The boom on some cranes can be slewed through 360° to allow picking and discharging of loads at any point around the crane. On other cranes the boom can be slewed through a very limited arc of say 20° either side of the central axis of the chassis or, as is common on many Italian designs, cannot be slewed at all. With the none or semi-slew cranes the whole machine must be frequently maneouvred to the loading or unloading point but the cranes are, of course, relatively inexpensive.
- — Whilst many of the semi or 360° slew cranes are mounted on rectangular chassis with four wheels, most of the non-slew cranes are mounted on tricycle chassis with central steering wheels at the rear of the chassis.
- — Some cranes are low in overall height to allow them to travel through low headroom doors into factories etc., whilst others are quite high and mostly restricted to outside operation.
- — According to the position of the pivot point on the cranes chassis (either front, central or rear), the driver's seat or cab is mounted elsewhere — either front, rear, central or at one side of the chassis — giving the driver in almost all cases a restricted arc of vision, often according to the driver's neck twisting ability! Only a very few cranes of this class feature a driver's cab mounted on the slewing superstructure so that the driver swings with the load and many of the older designs of this type are very high cranes which cannot travel under low doors.
- — A few cranes of this type are also available with hydraulic outriggers or stabilizers which, when in use, offer increases to the crane's "free-on-wheels" lifting capacities. Of course, when the outriggers are lowered, the crane becomes a static lifting machine.
- — Some telescopic boom mobile cranes are constructed to allow loads to be carried on the decks of the chassis which can be a benefit when cranes are required to transport loads reasonably long distances.

Limitations in the capabilities of many makes and type of cantilever jib mobile cranes meant that until recently anyone requiring a crane with a) a slewing telescopic boom b) a 360° slewing driver's cab and c) good free-on-wheels mobile lifting capacities, had to invest in a telescopic rough terrain mobile crane. However whilst the "R.T." crane meets the above parameters it also features expensive characteristics such as 4 x 4 wheel drive and torque converter transmission which are rarely of use in materials handling environments.

To date only one company, Coles Cranes Limited, has responded to customer demands by introducing a small, inexpensive telescopic boom 360° slew mobile crane, with superstructure cab designed specifically for materials handling duties and suitable for work either inside of factories or outside in stockyards etc. The new machine the Coles Hydramobile 911 has a lifting capacity of 9 - 10 tones free-on-wheels through 360° slew and on a boom of 7.76 mt which can be telescoped to 13.72 mt length.

Who makes cantilever jib pick-and-carry cranes?

UK

- — Coles Cranes Ltd., Harefield, Uxbridge manufacture four different types of industrial cranes: a) Coles "Speedcranes" — 3 360° slew,

Continued

Coles Colossus 4000 handling heavy excavators into barges. This crane also operates with tower and high cab on container handling duties.

Continued

telescopic boom, compact mobile cranes of from 6 to 10 Tonnes capacity, b) Coles Aeneas and Adonis Mobile C diesel-electric lattice boom mobile cranes of 10 - 20 Tonnes capacity, c) Coles Hydramobile 911 hydraulic 360° slew telescopic boom mobile crane with superstructure cab and of 9 - 10 Tonnes capacity and d) Coles "Carrywell" non-slew mobile crane of 4/5 Tonnes capacity.

— Jones Cranes Ltd., Letchworth manufacture two different types of industrial cranes: a) Jones Iron Fairey — 3 360° slew telescopic boom compact mobile cranes of from 6 to 10 Tonnes capacity and b) Jones 77 and 11-7 diesel mechanical cantilever lattice boom mobile cranes of 7 - 11 tonnes capacity.

— Ransome and Rapier, Ipswich manufacture a range of three telescopic boom mobile cranes with side-mounted chassis cab and 360° slewing boom of capacities from 6 to 15 Tones.

W.Germany

— Demag Baumaschinen, Dusseldorf manufacture two telescopic boom industrial mobile cranes of 5 and 12 Tonnes capacity.

— Liebherr-Werke, Ehingen/Donau manufacturers one telescopic boom industrial mobile crane of 12 Tonnes capacity.

— Sennebogen GmbH, Straub-

The Liebherr L.I. 1012 12 tonne industrial telescopic crane showing horiz and narrow span outriggers.

ing/Donau manufa... telescopic boom indu... crane of 10 Tonnes cap...

— Buhler-Miag GmbH, B... manufactures two telescopic boom indu... cranes of 6 and 10 Ton...

— Palfinger GmbH pro... Tonne capacity 360° sle... boom mobile crane.

France

— PPM., Montceau-... manufactures two teles... mobiles cranes of 14 an... capacity with 360° sle... and cabs.

Italy

— Christanini, Verona pro... of non-slew telescopic b... cranes of from 8 to ... capacity.

— Bencini & C SpA., Fire... limited slew telescopic m... of 2, 3 3.5, 4, 4.5, 6 and ... capacity.

— Bolotti SpA., Genova p... slew telescopic mobile c... to 60 Tonnes capacity.

— Rago SpA., Verona, prod... non-slew telescopic b... cranes of from 8 to ... capacity.

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— Fargh SpA., Modena pr... slew telescopic mobile cr... 15,75, 20 and 28 Tonnes.

— GUA di Venerio & Elsa... Verona produce semi a... telescopic boom mobil... from 2.5 to 12 Tonnes c...

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— Sequani, Verona produ... 360° slew and non-s...

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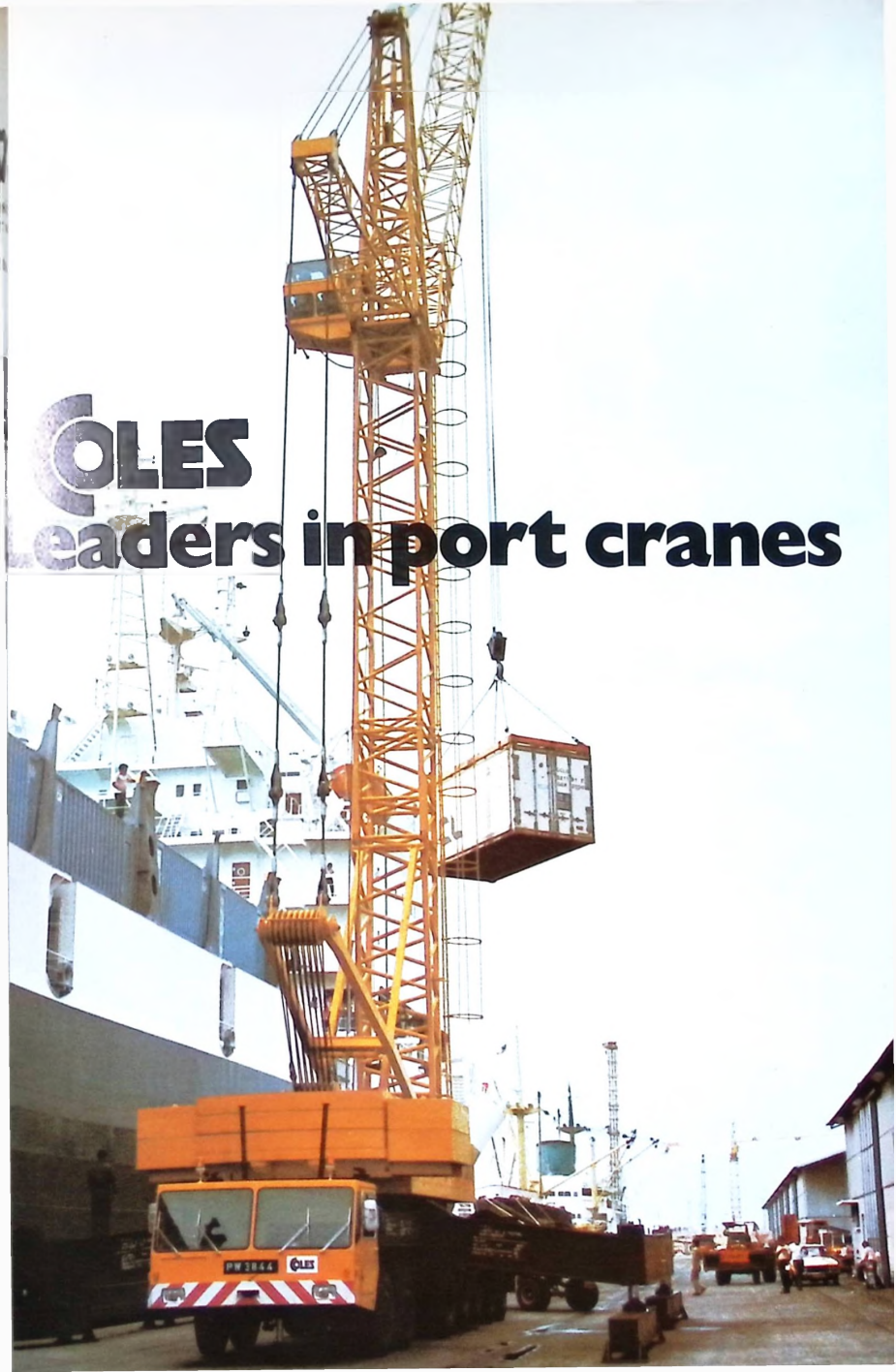
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Front cover A Coles Colossus 4000HLT in use at Penang Port, Malaysia. The 4000HLT is ideal for ports with limited container traffic, since it can be used for general cargo as well as for work outside the quay area on construction and maintenance.

Two Coles Vigorous mobiles operating in tandem discharging timber. With excellent reach capability, these cranes have no need to move from their position to finish the discharge.

Coles Hydra Huskies are essentially rough terrain cranes, but their exceptional duties and high degree of manoeuvrability also make them ideal for ports work.

The new Coles Hydramobile 911 is an ideal general wharf crane, with its good range of duties, high degree of manoeuvrability and very versatile telescopic boom.

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tinued

boom mobile cranes of from 6 to 15 Tonnes capacity.
- Li-Pa, Vicenza produce non-slew telescopic boom mobile cranes of from 8 to 20 Tonnes capacity.
- Manghi Gru snc., Fidenza produce non-slew telescospic boom mobile cranes of 1.5, 2.5, 4, 7.5 and 12 Tonnes capacity.
- Natino srl., Carbonara Scrivia produce non-slew telescopic boom mobile cranes of 3.2, 4, 5.2 and 8.5 Tonnes capacity.

A
- Drott Manufacturing Co., Wausau produce one 360° slew telescopic boom industrial crane of 5.4 Tonnes capacity.
- Grove Manufacturing Co., Shady Grove, PA produce a range of six industrial telescopic boom cranes of 1.8, 5.4, 6.8, 10.9, 15.9 and 31.7 Tonnes lifting capacity.

- Ishikawajima Koehring Co. Ltd., Tokyo produce two 360° slew telescopic boom industrial cranes of 5.5 and 7.25 Tonnes capacity.
- Shikoku Kenki Co. Ltd., Yokohama produce two 360° slew telescopic boom mobile cranes of 5 and 10 Tonnes capacity.
- Unic Corporation Tokyo produce two 360° slew telescopic boom mobile cranes of 5 and 10 Tonnes capacity.
- Kubota Ltd., Tokyo produce one 360° slew telescopic boom mobile crane of 4.5 Tonnes capacity.

The Repier HF17 hydraulic mobile crane with maximum capacity of 15 tonnes propped, 8 tonnes free on wheels.

'roduction cycle lewing cranes

Whereas the 'Pick-and-Carry' Industrial Mobile Crane discussed above competes or work with forklift trucks, straddle arriers, post cranes and overhead travelling cranes, the 'Production Cycle' Mobile ompetes with ship to shore handling achines such as Quay Cranes, Ships eck Cranes, Gantry Cranes and Bulk nloaders, plus materials handling ydraulic excavators, pedestal cranes etc.

The design parameters for these cranes are as follows:-
- Lattice construction luffing strut boom either mounted directly onto the cranes slewing superstructure or mounted at the top of a vertical tower for easier reach over ships rails or trucks.
- Cab slewing with superstructure through 360°.
- Outriggers (Stabilizers) providing a wide and stable base for static lifting operations.
- Fast crane motion speeds (slew, boom derricking and hoist).
- Sufficient diesel power and suitably arranged crane power transmission to allow simultaneous use of two or three crane motions eg. hoist and slew and derrick together — for maximum cycle speeds.
- A control arrangement of hand levers and foot pedals which allows safe and easy use of two or three crane motions simultaneously.
- Strong single line hoist rope pull for fast handling of large unit loads on hook or large double rope grabs.
- Large safety margins in terms of structural strength and stability.
- Comprehensive instrumentation and safety devices to protect crane against accidents and breakdowns.
- Precise and smooth control characteristics for use when making difficult, expensive or dangerous lifts.
- Quiet and cleanly functioning machinery
- Compact chassis with tight turning circle and a tyre/suspension arrangement which is safe and stable when the fully rigged crane travels.

Of the thousands of mobile cranes working on the quays and wharfs of the world, very few meet these design parameters.

The reasons for this are as follows:-

1) Mobile cranes are often brought in to assist quay cranes or stand in when there have been crane breakdowns and a ship's cargo must be unloaded. In such circumstances lorry-mounted construction cranes with lattice booms or even telescopic booms are hired into ports, etc. Very rarely do these cranes have an elevated can and therefore the driver's visibility is very limited. Also these truck cranes rarely feature a Tower type boom design and with their normal strut jibs have to stand back from the ships rail if the vessel is high in the water

Continued

The Ormig 12 tonne telescopic industrial crane with a non-slew boom.

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tyres have the stren
and stamina to ke
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on every kind of terr
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LAGOS

The Drott 4/5 tonne telescopic industrial crane with carrydeck.

...ss loosing capacity and causing ...njection on the quay. Also ...lescopic booms are not normally ...signed to take the *persistant* shock ...d side loads encounter on duty ...ycle work.

...ew of the 10-20 year old mobile ...anes supplied for port work were as ...fficient as today's mobiles.

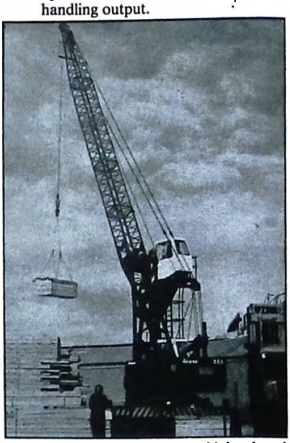
Comparisons reveal the following:-

— The old machines were underpowered by today's standards restricting their working speeds and the weight of grabs and single line loads which could be handled.

— Very few cranes had elevated cabs and the restricted visibility from a 'ground level' driving position meant reduced working speeds and more dangerous operation.

— Very few cranes had tower jibs to reach over high ships rails — effectively restricting both the size of ships which could be serviced and the conditions under which ships could be serviced.

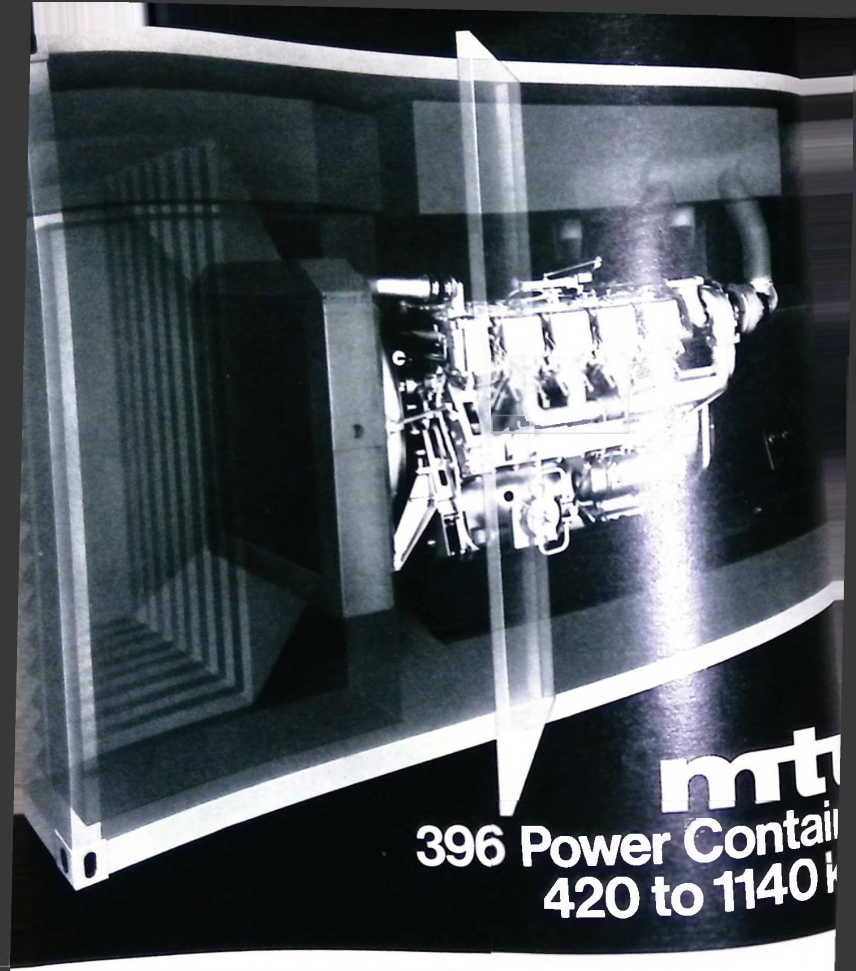
— Until recently only relatively small purpose-designed mobile cranes were available. This meant that they were restricted to small ships both by limited jib reach and limited handling output.



The Jones 565 HLB featuring a high cab and high boom pivot for quayside ship to shore rehandling work.

The new generation of mobile cranes which is now arriving on world markets is already making a strong impact and proving serious competition to Quay cranes and Container Gantry Cranes. The

continued



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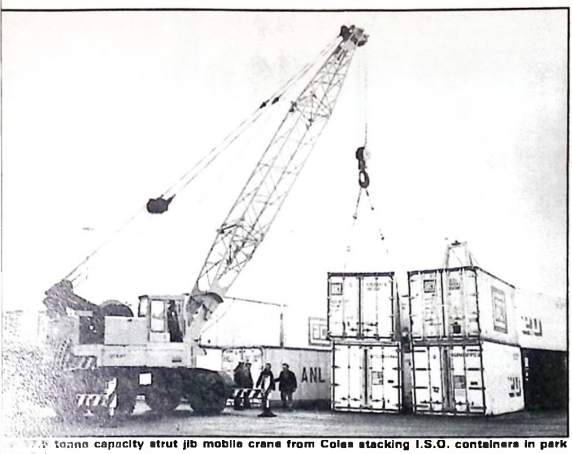

7.5 tonne capacity strut jib mobile crane from Coles stacking I.S.O. containers in park of the quay.

...ained
...achines retain the 'classic' mobile ...e advantages:-

- Mobile cranes move *to the work* instead of visa-versa i.e., ship coming to the crane.
- Mobile cranes can move anywhere in the port — to help other cranes unload a ship, stand in for a breakdown, work in the stockyard etc.
- A mobile crane capable of lifting for example 3 Tonnes at 25 mt radius can, unlike a Quay crane, also handle heavy lifts in this case of up to 40 Tonnes and so on pro-rata.

But the new cranes also feature:-

- Larger lifting capacities of up to 40 Tonnes at 30 mtrs radius allowing fast handling of 20-40 ft ISO containers, Heavy Grabs and Electro-Magnets and Single Line hook loads of up to 11 Tones.
- The cranes have the outreach and output potential to economically service larger vessels.
- The bigger cranes feature special large outrigger systems exerting very low ground bearing pressures to allow the cranes to work on even weak wharfs and piers without the extensive civil engineering work normally associated with rail mounted quay cranes.
- Elevated or elevator cab
- Tower type jib configuration
- Level load luffing
- High, co-ordinated working speeds due to larger diesel power installations and normally hydraulic crane drive transmission (Hydraulic mobile cranes are not normally subject to the very poor reliability/pollution records experienced by some other kinds of mobile handling equipment).
- High standards of comfort, including noise insulation and reduced service requirements.

Whilst these new Port Mobiles are fairly new to the market there is no mistaking their impact. Already over 100 Mobile Container Cranes large enough to handle 20 - 40 ft ISO containers at wide outreach are at work in the world's ports. This is not surprising when one considers that a relatively few ports in the world are handling sufficient cargo to keep their Gantry Cranes economically employed and a mobile crane a) cost one quarter/one third of the price of an equivalent size gantry b) can also handle heavy lifts of up to 200/300 Tonnes c) is normally available on a much shorter delivery and d) requires virtually no civil engineering/installation work at the port.

Who makes ship-to-shore port mobile cranes?

UK

- Coles Cranes Ltd., Harefield produce Strut-Jib Mobile Cranes of 12.5, 17.5, 41 and 76 Tonnes capacity for general cargo handling, a Mobile Container Tower crane capable of lifting 38 Tonnes at 30 Mtrs. radius and a Mobile Tower Crane of 36 Tonnes maximum capacity and capable of 4.15 Tonnes @ 24 mt. radius.
- Jones Cranes Ltd., produce Strut-jib mobile cranes of 7, 12.5, 15, 30 and 40 Tonnes capacity and Mobile Tower cranes capable of lifting 3.36 Tonnes @ 18 mt. radius and 4.1 Tonnes @ 24.4 mt. radius.

France

- P.P.M., Monteau-Les-Mines produce strut jib mobile cranes of 18 and 32 Tonnes Capacity.
- Haulotte-Pinguely, Paris produce a mobile Container Tower crane capable of lifting up to 28 Tonnes at 25 mtrs. radius.

W. Germany

- Demag Baumaschinen GmbH, Dusseldorf produce strut jib mobile cranes of 20.4, 55, 80 and 150 Tonnes capacity and Mobile Port Tower Cranes capable of 147T @ 9 mt., 16T @ 15 mt.; 36T @ 13 mt.; and 50T @ 22 mt.
- Leo Gottwald-Werke, Dusseldorf produce Mobile Tower Cranes in a wide range of size of from 8T @ 10 mt. to 36T @ 25 mt. radius capability.
- Bavaria-Gebr Hofmann, Wurzburg-Eibelstaft produce a range of strut jib mobile cranes of from 6 to 21.2 Tonnes capacity and a mobile Port Tower crane capable of lifting 10 Tonnes at 10 mtrs. radius.
- Liebherr-Werke, Ehingen produce strut jib mobile cranes of 80, 140, 200 and 300 Tonnes capacity and Mobile Port Tower Cranes capable of lifting from 16 Tonnes @ 18 mtr. radius to 50 Tonnes at 26 mt. radius.
- Sennebogen GmbH, Straubing/Donan produce strut jib mobile cranes of 5, 10, 15, 18 and 25 Tonnes capacity.
- Eisenwerke Weserhutte AG, Bad Oeynhausen produce strut jib mobile cranes of 18 and 25 Tonnes.
- Gross GmbH n Co., Schwabisch Gmund produce strut jib mobile cranes of 18, 30 and 40 Tonnes capacity.
- Johs Fuchs KG., Ditzingen produce strut jib mobiles cranes of 5.5, 10, 15 and 18 Tonnes capacity.

Holland

- Nellen Kraanbouw, Rotterdam produce strut jib mobile cranes of 10, 15, 21, 30 and 35 Tonnes capacity and mobile Port Tower Cranes capable of lifting 10 Tonnes @ 3 mt. to 35 Tonnes at 26 mt. radius.

Italy

- Fiorentini & Co., SpA., produce strut jib mobile cranes of 11 and 20 Tonnes capacity.
- GUA di Venerio & Elso Pasqualin produce strut jib mobile cranes of 4 and 10 Tonnes capacity.
- Italgru, Lecco produce strut jib mobile cranes of 15 and 30 Tonnes capacity. □

USA

- P & H Harnischfeger, Milwaukee produce a truck mounted strut jib crane for port work capable of lifting 27 Tonnes at 30 mt. radius.
- F.M.C. Corporation, Cedar Rapids produce strut jib mobile cranes of 31 and 40 Tonnes capacity.

Japan

- Kubota Ltd., Tokyo produce a 20 Tonne capacity strut jib mobile crane.

Eastern Europe

Strut jib mobile cranes of up to 63 Tonnes capacity are produced in Czechoslovakia, Poland, USSR, DDR, and Romania.

China

A range of diesel electric strut jib mobile cranes of limited capacity are produced in the People's Republic of China. □

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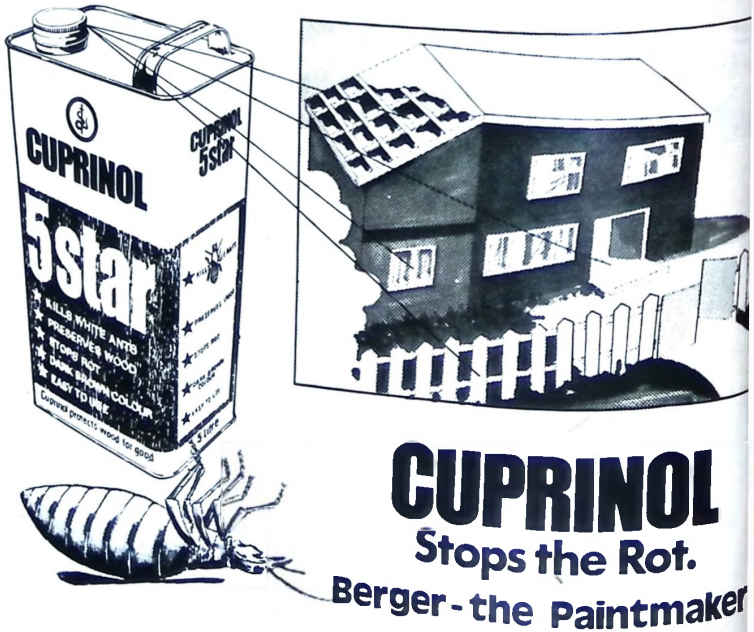

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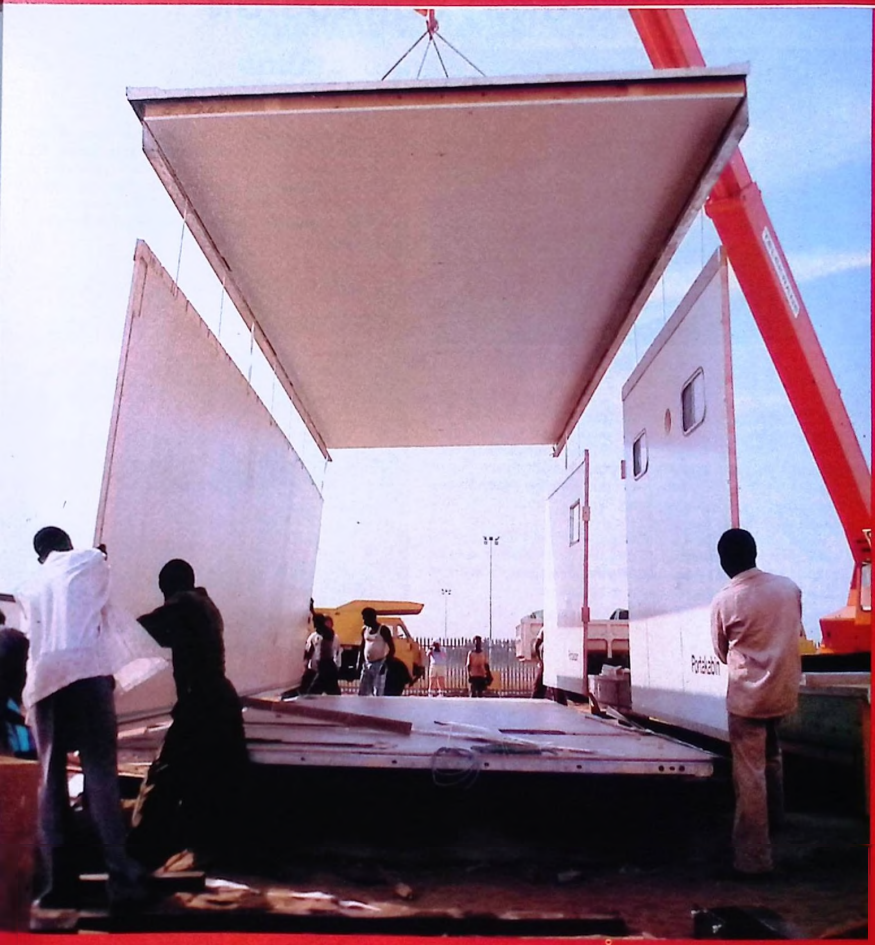
e Magazine within the Magazine

June 1978



In this issue

DORMAN LONG (GHANA

OFFER

SPRAYED METAL COATINGS FOR TERM PROTECTION OF IRON AND AGAINST CORROSION

The metal spraying process has mercial use in Great Br for over 4 introduced in 1922 several y Switzerland, France and many. Th metal coatings have been more and such a long period is a cl indication the test of time.

The protection of iron and steel against corrosion is a never ending problem and new methods and materials are continually being sought. Many of those which have been marked over the last 40 years have already gone out of favour and it is fairly safe to say that none has yet given any indication that metal spraying is likely to lose the high reputation that it has earned for itself in this field. Zinc and (under most conditions) aluminium offer electrolytic protection to iron and steel and as they are the cheapest metals to apply by spraying their use has far outstripped the many other metals and alloys which can be sprayed.

No treatment has yet been found t and steel from rust indefinitely without s so that the present trend is to employ syst minimum amount of maintenance. The and aluminium coatings eliminates the cleaning and scraping when long term m becomes necessary and a single coat of that is then required.

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DORMAN LONG (Ghana) Limited is a joint partnership between the British Steel Corporation and the Government of Ghana. The Company was formed in 1957 and has its offices and works situated off Ring Road West in the Awudome Industrial Estate.

At its beginning, the Company employed about 30 personnel and tackled only the lighter steel fabrications and small storage tanks. As the works staff gained more experience, larger projects were undertaken.

With the growing demand for our products the work-force has been increased to over 200 personnel and the factory has been extended and equipped with modern machines which will allow it to undertake almost any project requiring the use of steel. The Company also offers the services of experienced Engineers, Designers and Technicians who are available to give advice on any structural or other engineering problem in the field of steel fabrication.

Another successful element of the business is the manufacture of bodies for Road Transport. These include Pick-up Bodies, Tipper Bodies, Flat Bed and Cargo Sided Trailers, Bulk Cement Trailers, Pole Trailers, Road Tankers for the transportation of liquids, Conservancy and Refuse Bodies.

Having more than 18 years successful operating experience behind it. Dorman Long believes it knows the needs of Ghanaian industry. Aided by the technical resources of the British Steel Corporation and the encouragement of the Government of Ghana, it looks forward to playing its full part in the future development of the country.

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Braham Millar Crushing an Screening Unit move mountain

Mobile Crushing and Screening Plant

The Braham Millar mobile crushing and screening plant shown above is converting the shale slopes of a mountain into several grades of aggregate for a major contract. On completion of the contract, the whole plant can be packed up and on the road to its next site in a matter of hours.

These plants usually comprise a primary jaw crusher unit, a secondary selector screen unit with a gyratory crusher and a final three deck grading screen unit, feeding four stock-piling conveyors.

The quality and reliability of the Braham Millar range is stimulating a world wide demand.

2 Deck Vibratory Screen

Niagara's 40 years experience in the industry has resulted in a world renowned range of more than 100 standard models. Screens for special application built to suit requirements.

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Nigerian Agents: **Morpol Industrial Corporation Ltd.**, 4 Warehouse Road, P.O. Box 187, Apapa. Tel: 4380

CONSTRUCTION NEWS

JB introduce new range...

B have recently introduced a new range articulated dump trucks. All four new ks are based on the design of the D250 D300 models, their main features are:

- A nomenclature system denotes truck ly capacity in short US tons (for mple the D550 is a 55 ton capacity k (or 50 tonnes metric)). This is being to conform to industry practice in st major off-highway truck markets re truck sizes are compared on a US
- ncorporation of an oil-nitrogen self- suspension system on the front ether with the "Superflex" suspen- ed on the rear axles of the D275, 350, this now gives DJB trucks a ive six-wheel, all axle suspension ich reduces loading shocks and bounce as well as now being for the payload being carried in body. The D550 uses a new system of inter-acting oil both rear axles instead of the " design.
- OPS/FOPS sound suppressed standard on all four trucks. The 75 and D330 cab is also slightly wider longer than that used on the D250 and for improved operator comfort. In dition, all four cabs incorporate rubber untings for reduced vibration and proved sealing for less heat transfer into cab.
- The D350 features 26.5 × 25 radial es as standard with 23.5 × 25 optional.

The D330 articulated dump truck with a capacity of 33 tons.

A 'quarry truck' version of the D350 is also available with 18.00 × 25 tires and body wear strips as standard.

- The D550 features 33.25 × 29 radial tires giving this 55 ton truck optimum flotation and traction in the widest range of ground conditions. An oil cooled retarder is also standard on the D550.

Another area of change for the D275 and D330 is the new improved radiator area.

All DJB trucks are powered by Caterpiller engines — the torque converters and power shift transmissions are also Caterpiller as well as the axles.

The D550 is the largest articulated truck in the world and is claimed to be reliable in performance, operation and also product support.

abroad is quite simple. We believe in investing in markets — long term. Firstly, we invest in terms of people, putting experts wherever they are needed." The managing director went on to comment on the company's distributors, of which Afrotec Technical Services Ltd in Nigeria play an active role: "Our second investment is to develop long term associations with our distributors... That puts an even greater onus on us to support them. And support is the final investment."

Parker exports grow

Frederick Parker Ltd., manufacturers of plant for the construction industry have recorded remarkable rises in exports during the last nine years from £3m to £22m. Of the 80 countries the company exports to, Nigeria forms one of the leading markets. During the last three years Frederick Parker has supplied equipment worth ₦960,000 to Nigeria and £295,000 to Ghana.

Contract news...

Preparations are underway for the construction of the new federal capital in Nigeria. The **Federal Capital Development Authority** has awarded the first construction contract valued at £2m to **George Wimpey & Co (Nigeria).** The contract is to cover the construction of the field base camp that will house the development authority staff. Work will involve roads, power generation, water and electrical distribution in addition to a sewage system.

A contract worth £78m has been awarded to **Carl Ploetner,** a West German company for road works in Ghana and the paving of roads around Accra. The project is being financed by a group of European banks and the Government of Ghana.

The **Kwara State Government** has awarded a N5m. contract for the construction of the Offa-Igosun road, near the Oyo State boundary. The contract has been awarded to **Plisson Fisko Nigeria Ltd.** It is hoped the project will increase the economic and social tempo of the state through inter-state communication.

This month's construction cover shows a Portacabin accommodation unit being assembled. Emphasis is placed on ease of erection.

ynapac and Salco lerge

merger has taken place between two of veden's largest road construction com- nies. Dynapac, one of the world's leading mpanies in vibratory compaction of soil, phalt and concrete and Salco specialists road surfacing and bitumen handling uipment.

It is hoped that this merger will con- bute considerable possibilities in asphalt chniques as far as research, product velopment, service and technical con- ltation. Dynapac is marketed in Nigeria Henry Stevens Engineering Co. Ltd. id Salco by Niteco.

ompany Housing cheme Underway

ell BP of Nigeria Ltd. is to spend ₦1.9m r the construction of staff houses at the tellite town along the Lagos-Badagry xpressway. The company expects to build bungalows of 72 housing units on an timated 3 ha with infrastructural cilities. The units are to be allocated to nior staff and forms a direct response to e Federal Government's directive to nbark on staff housing schemes.

Generating success

Dawson-Keith, manufacturers of diesel generators, have received record worldwide export orders last year, especially from Nigeria. Recent contracts here include 10 generators to support a sophisticated telecommunications complex. Dawson Keith generators, together with their attendant switchgear are produced in a range from 3kW units for hand tools to massive 2mVA sets capable of supplying a factory or village.

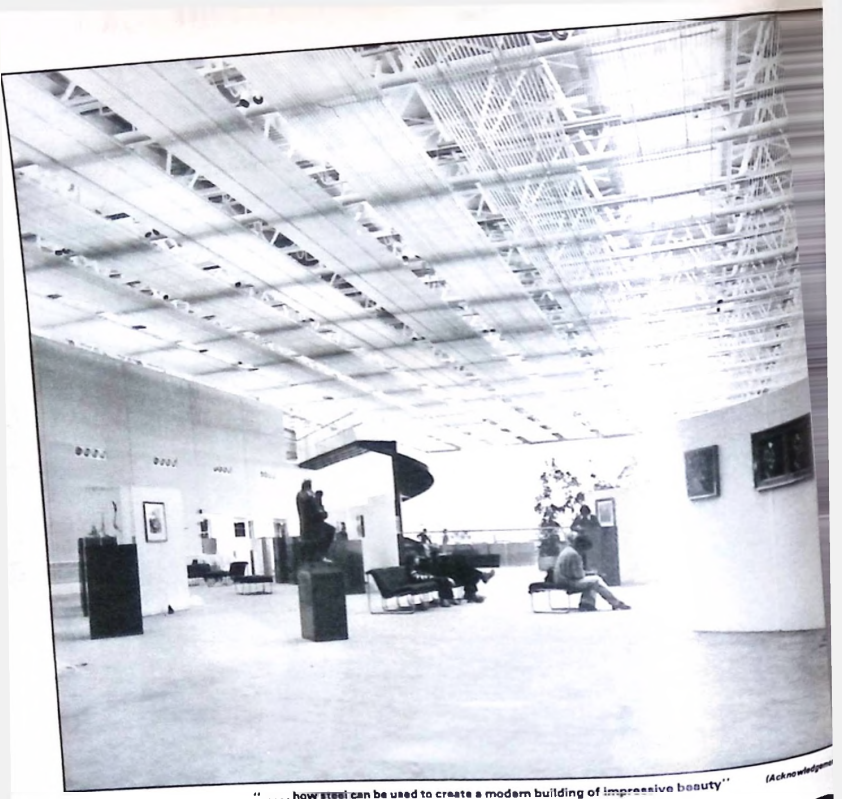
Dawson-Keith's managing director recently commented on the company's success saying: "Our philosophy for selling

Ready-made homes

"Modern Homes in Brick" are shortly to be manufactured by POCO Minerals Ltd. at Ogwashi-UKU, Bendel State. The company is offering ready-made buildings ranging from five bedroom bungalows to two-storey buildings. This is to be done by supplying all brick materials and timber requirements to complete any of the buildings from foundations to the roof, and will be the first of its kind in the country.

The initial planned capacity of the plant is to produce six complete three-bedroom homes per day using a labour force of 300. The project is estimated to cost ₦2m and is a joint venture between POCO Minerals Ltd. with majority equity shareholding, the Nigerian Bank for Commerce and Industry, the Financing Partner and Petrobras Comercio International S.A. Interbras of Brazil, the technical partners.

The architects of POCO have produced a number of designs to be submitted in advance to all major town planning and building authorities for approval ensuring that usual delays obtaining approval are eliminated.



"..... how steel can be used to create a modern building of impressive beauty" (Acknowledgeme

HARD AND COLI
AS STEEL

Steel is a precise material which lends itself admirably to precise calculation and t measurement. In this article, our architectural correspondent, Noel Moffett, looks a various applications and properties of steel in construction.

It all began with the spider. It was the spider who showed the engineer how to do it. Fragile-looking but certainly strong, a spider's web is woven with supreme confidence and certainty — in blind, instinctive obedience to engineering principles. It is surely nature's finest example of design in tension. Its net of thin strands, all acting together in tension, can straddle large spans, withstand strong winds and support heavy loads.

Bridge designers the world over and architects interested in lightweight structures have learnt a lot from the spider. For steel's greatest quality is its astonishing strength in tensions.

But before we look at buildings and bridges we must have a quick look at Bessimer.

The Bessemer process

Bessemer was an engineer who, in 1856, first produced steel economically and therefore cheaply. He discovered that by blowing air through molten pig-iron, thus oxidising some of the iron silicon, manganese and carbon present in it, a new material was created which had extraordinary qualities of strength and elasticity.

Although the Bessemer process has been superceded today by other methods of producing cheap steel (t methods) it dominated t for half a century and ma engineers and architec structural and a cla Bessemer also gave it hardness and toughnes which it still possesses.

"Hard and cold

Just as concrete is th building world, steel is expression "hard and co up well. It's a p Mathematicians and g

inued

s itself admirably to precise calculation exact measurement. It can be relied on, a ready-reckoner. And it will last for , or nearly so, if handled with affection understanding.

or designers steel is not an easy erial. It imposes a discipline on those use it, but it offers rich rewards to e prepared to submit, as engineer Eiffel architect Mies van der Rohe overed.

e Eiffel Tower

s perhaps surprising that Paris, one of world's romantic cities, should have ted the Eiffel Tower, an outstanding mple of the dramatic structural use of l, as it's symbol. It's sheer size is of mpressive (when it was built in was the tallest structure in the but its shape is not. However it was dramatic demonstration of the tensile strength of steel. To something of this drama M. ant should not be looked at, it e felt, experienced. To ascend by the narrow, top-most platform, to straight down and to be conscious of ble in-curving of the structure and to see, far below, the great splayed, like leg pushing out into the city; these rewarding experiences. But to sense the drama created by the steelwork itself, drama of inter-penetrating space, over- ping planes and simultaneity, it is essary to descend, slowly, by the rcase which seems itself to be posed cariously in space. Here one feels a fly caught in a giant spider's web.

ss is more

Mies, I suppose, could be called steel's hitect-high-priest. His philosophy of

"Each flat is slotted into a structural steel grid one room high and one room wide."

"less is more" was evolved during a lifetime of work in highly-industrialised Germany and in Chicago where he taught and practised. He is the Mondrian of the building world. He preached an architecture of the straight line and the right angle, an architecture of classical purity and refinement and of exact measurement, a thin, elegant architecture of economy, which eliminates the inessential and uses — both as structure and as decoration — the thin sections of steel.

It was natural that steel should be the preferred material of such a man.

Like Eiffel Mies used steel to create space, but space of a certain kind: huge space unencumbered by walls or columns (as at Houston's art gallery); flexible space capable of sub-division by screen or curtain (as in the IIT school or architecture in Chicago); space which flows outside the building itself through the glass wall which ineffectively defines it; or small cellular space, as in his blocks of flats, where each dwelling is slotted into a structural steel grid one room high and one room wide.

"A fairly typical arrangement of a steel beam and stanchion structure."

Acknowledgement: British Steel Corporation.

Art gallery hanger

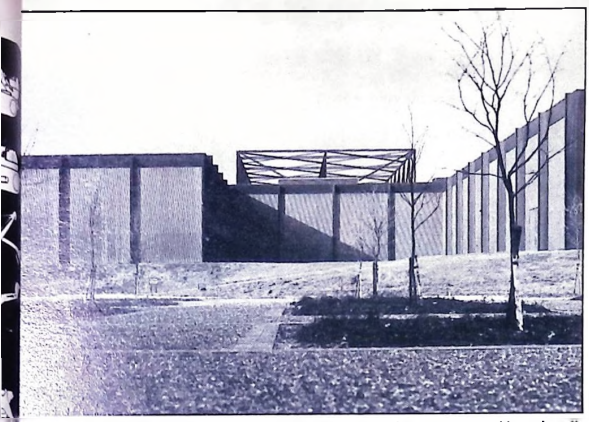
It is interesting to compare Mies' buildings with those of the London architect Norman Foster. Foster is neither a purist nor a classicist but, like Mies, he understands the nature of steel and its dramatic structual possibilities and he knows how to exploit them with imagination and force — and with a humanity which gives his buildings a warmth which Mies' work lacks.

His new Sainsbury Centre for the visual arts at the University of East Anglia campus, built to house Sir Robert Sainsbury's impressive collection of modern art, is a tour de force in steel. Looking like a giant hanger it has a series of huge pyramidal trusses, each spanning 36 metres and each supported by open-work pyramidal columns, bringing back memories of the lacework intricacies of the Eiffel Tower. Here Norman Foster and his engineer Anthony Hunt have together demonstrated how steel can be used to create a modern building of impressive beauty.

Space-frame

Engineers have used the tensile strength of steel in another effective way; they have brought the triangle and the pyramid together to form the space-frame. A multi-directional roof structure, the space-frame

Continued



...ncrete factory where the "rust stabilising process is at present taking place." ...J. Roof).

...ivable few contacts with the ...chitects have used it, sometimes ...effect, for exhibition buildings, ...kets and sports buildings.

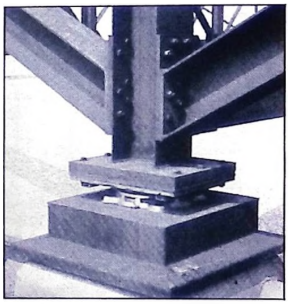
...ssful recent example is the ...'s first international fair at ...rtoum. Here the Architects Co-...rtnership and Exhibition Consultants ...ited of London have designed a series ...pavilions each of which is roofed by a space-frame built up from the same structural steel components as that of its neighbours. The roof in fact plays the dual role of acting as a common visual language and of giving a sense of unity to a number of exhibition buildings of different design and different function.

The space-frame components were manufactured at Stratford-upon-Avon, shipped to Khartoum via Port Sudan in the Red Sea, assembled on site into their final form by supervised Sudanese labour and jacked up into position in one piece

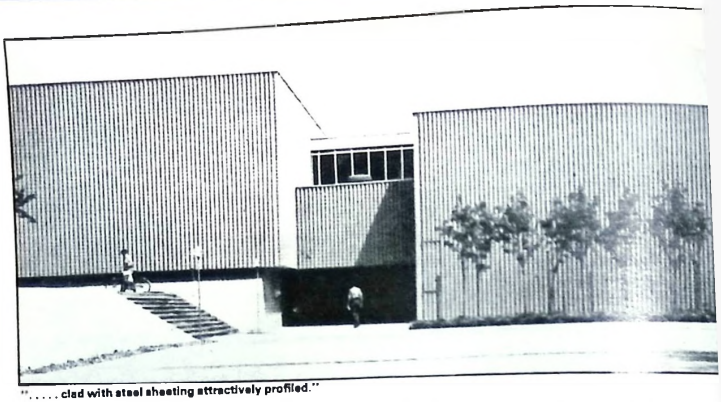
Fire protection

In most countries fire regulations require that structural steelwork must be encased in concrete or otherwise satisfactorily protected against fire. These requirements do not as a rule apply either to single-storey or to temporary buildings. This is of course the reason why the steelwork of the Sainsbury Centre and the Khartoum International Fair is exposed, as the engineers designed it.

Continued



Steel is not in itself an attractive looking material. A typical column base. *(Acknowledgement: Constrado).*



"..... clad with steel sheeting attractively profiled."

Continued

These buildings are the exceptions. The steel frames of most buildings throughout the world are covered by some fire-resistant material and hidden from view. Once this steel frame has been designed the architect has two choices: he can fill in the spaces between beam and stanchion with brick, concrete panel, timber, glass or composite sandwich; or he can hang on the face of the frame a curtain-wall of glazing or other material of his choice. In these buildings — they are to be found everyshere — steel plays its usual important structural role, but plays it in a modest, hidden way.

Rust

Steel has one fatal weakness — it rusts when exposed to air or moisture. Rust is chemical decomposition, leading to the actual disintegration of the material and it must therefore be taken seriously. The traditional answer to the problem has been to paint it — and keep it painted. Today the excessive cost of this — the Forth Bridge and the Eiffel Tower have a permanent gang of painters clinging like flies to the steelwork — has led chemists and manufacturers to seek other solutions.

There seem to be two main attitudes : combine the steel with other materials during manufacture, so that the steel component need never be exposed; or encourage and accelerate the rusting process.

Cladding

Steel is not in itself an attractive-looking material: it has little beauty, its surface is dull, with none of the pleasant graining of timber or the weathering qualities of brick, and you can't, economically, pour it into a mould, like concrete.

However, by plating it with other metals or coating it with a colourful plastic skin, its range of use has recently been greatly extended, particularly as wall cladding. It's relative cheapness and quick availability are in its favour and today one sees all round the world factories, warehouses, aeroplane hangers, swimming pools and storage buildings clad with steel sheeting attractively profiled or hiding behind colourful plastics.

Weathering steel

"Weathering steel" is the name euphemistically given by the manufacturers to a special steel — somewhere between ordinary and stainless — which rusts much more quickly than usual and, after 4 to 10 years, stops rusting and will not start again.

The great advantage of weathering steel to the building industry is that its use eliminates maintenance. But some people may think that the price paid for this is too high: the building looks what it is — rusty. And it creates problems for the designer: the "stabilising" process depends for its success on alternating wet and dry periods of weather and so it can only be used in certain climates; the rate of rusting varies with north, east, west or south aspects and so it is necessary to "design for staining"; and the rust runs down the face of the building and stains everything at ground level (to counteract this one architect in Chicago recently specified rust-coloured gravel at the foot of all the steel colums).

The process was used notably in the huge Wills cigarette factory near Bristol UK, with Yorke Rosenburg Mardall and their engineer Frank Newby, where most of the steel work is exposed internally and externally, as the building is single-storey, and the rust stabilising process is at present taking place.

Steel in the tropics

Weathering steel cannot of course be used in any tropical or sub-tropical country, as the alternating dry and wet weather requirement cannot be met.

In hot dry climates steel creates few problems. It has been used successfully, exposed and untreated, with no sign of rust, all over northern Africa. The sponsors of the International Fair at Khartoum will have no maintenance costs and are assured and their fram

dec to keep the ing

In hot humid ma der no circ the ther. It m cov or used in no ng materi

Bridges

S us return t In amazing in the ciples of s hav been most who the engineer the rld of build has concentrated o particularly susp structures seem paradoxically perh ner has had a mathematical cal determined the for been allowed to sho

Spinning st

I don't think Jo steel cable suspens who, in 1883, disc steel wire on the j — into the great Brooklyn Bridge one majestic sw impressive, after use.

Roebling's spi something very been used by o bridges over m statistics of som take the breath bridge has a mai longest in Europe wire were used The Humber bri truction, has a s resident engineer there believes th bridge design "but", he says, got we could, th span suspension

The new FL 14-C. For contractors who prefer making money to spending it.

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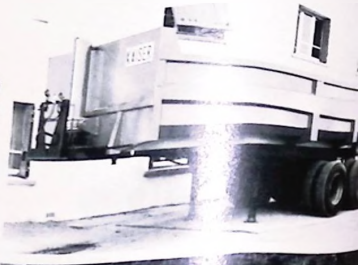

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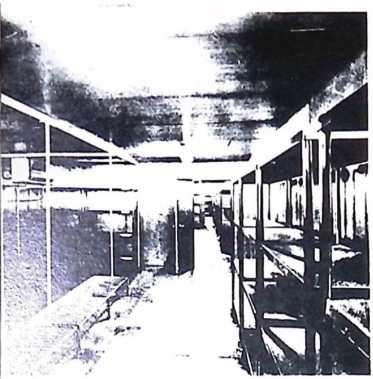

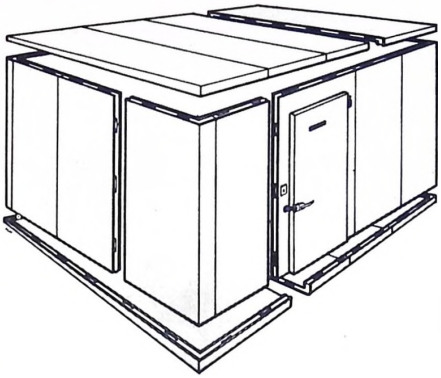

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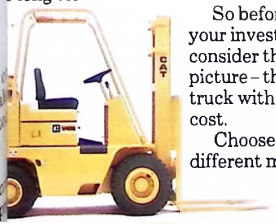

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CATERPILLAR

The erection of a 76.2m type B20 Callender-Hamilton Bridge from Balfour Beatty across the Niger at Kainji. This bridge was built to provide temporary access during the construction of a dam.

CROSSING WATER

Man has always needed to cross water. The simplest most obvious way is by the bridge. The art of bridge building has been developed for thousands of years, a general graduation from the days of early China and Rome. Bridge design is now a sophisticated art; designers have turned their hand to architectural engineering where a bridge is deemed to be of artistic merit. WATR sketches bridge designs available to today's engineers. They may be expensive, slender masterpieces of prestressed concrete, or ungainly but effective pontoon structures. Whatever, they are today's simplest way of crossing water.

ransportation has been a social problem s long as man has been on this planet. fan has needed to communicate for com- nerce; to travel for food; and to travel to ar. Simple concepts, yet man's ingenuity as stretched to find ways across water. unnelling beneath river beds can be ostly. Boats are not always available, or n time. Crossing water by a bridge is the asiet answer.

Bridge engineering has extended greatly ver the last century with the technical xpertise gained in use of concrete, steel nd prestressing. Shrewd deployment of hese now common-place structural techni- lues have changed the face of society.

Materials may have changed but some rinciples have not.

Four fundamental forms

Fundamentally the bridge is of four forms — the arch, the beam, the cantilever and the suspended form.

The arch has no tension. In Roman and Mediaeval times this form was adopted with scientific practicality-built in stone. However, history credits the first stone arch as built in Smyrna, Turkey reportedly crossed by Saint Paul in the ninth century BC.

A beam is the bridge's simplest form - as a span between piers. Its shape can be hollow, I-shaped and in any material — timber, steel or conrete. It can be a simple span between two piers, or continuous over many.

Suspension bridges are the world's longest span structures, where steel cables suspend the bridge deck. Engineers claim suspension bridges are the most aerodynamically complete of all structures. But is not a novel technique.

It was the first water crossing technique used. Man swung over chasms by vines. Next, he tied the vine on the other side for the return journey. Several vines tied together, slats laid in between and a bridge. Taut bamboo cables were used in India. In West Africa entwined rootes from the cables, suspended from trees on each river bank. The concept is simple.

Continued

There's a little bit of Land Rover in every L

This is the Leyland WF truck on the 'road' from Port Sudan to Khartoum. The new metalled surface soon gives way to deep rutted sand, and boulder strewn desert.

Half way along lies the infamous Akaba Pass: a precipitous climb with only the occasional pot hole and loose boulder to give any grip.

And the only route through the Red Sea Mountains.

The WF which is still known throughout the Sudan as the 'White Austin' has been proving itself in conditions like these for many years. And many modifications and improvements have shown that it has benefited from the experience.

So much a reputation and econom Land Rover.

Which surprising there's a litt of Land Ro every Leyla

WF Model range: 420WF 4265kg GVW, 600WF 5349kg GVW, 830WF 9[illegible]

Further details of these and other

tinued

efore the mid-nineteenth century there little flexibility with materials in bridge struction. This was the limiting factor. onry was the material and the arch the form; for wider crossings more onry piers were built to support more onry arches. Sometimes timber beams e laid between piers.

WEST AFRICAN CONSTRUCTION

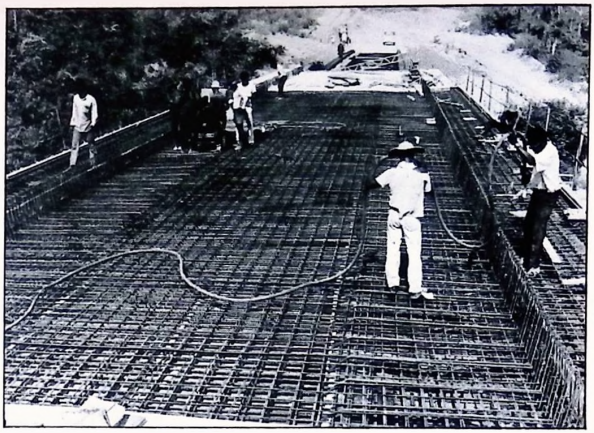
Timber was the only option for masonry image a masonry beam not arched! nber trusses were developed at the turn the eighteenth into the nineteenth ry yet, before then, trusses must have ed by the Romans as temporary s to carry their stone arches.

vulnerability of timber bridges to ucture meant a shorter life.

today, seeking a permanent, long-life structure have dismissed practical material. Yet it did a long time as a pioneering the man with axe and adze, hammer.

truction

Turning to iron . . . Western Europe has en clammered that its engineers roduced iron in the mid-nineteenth ntury. Travellers in India and China



Bridge construction by ABU in Sierra Leone using pre-stressed and post-tensioned concrete.

between the first and sixth century BC chronicle that wrought iron links were used as chains for suspension bridges.

Yet cast iron, which was surpassing timber and masonry by the mid-nineteenth century, had little future. A brittle material, it is suspect for sudden tension cracking. Cast iron was preferable to wrought and tentatively stepped into timber's role. But the future of steel was near. In 1856 Henry Bessemer discovered the "Bessemer Process" of reintroducing carbon into melted wrought iton . . . the product was steel. Only from 1877 onwards did the UK's Board of Trade permit the use of steel in bridge construction.

Concrete had been sparingly used as a bridge material. However the daring Swiss engineer, Robert Maillarts was practising

Continued

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tinued

theory of reinforced concrete. He built first bridge in 1901 to span 30 metres. ny people believe the art has progressed le since then.

After the Second World War prestressed d post-tensioned concrete practice ged ahead. These techniques were the oducts of experiments by Eugene eyssinet. (He first successfully applied king to a bridge in 1907).

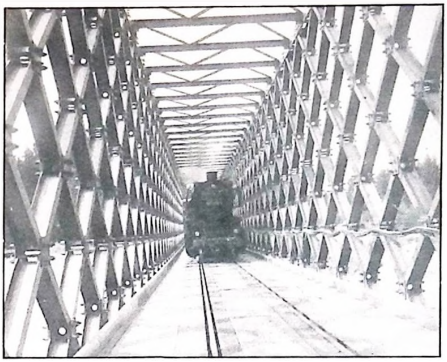
Modern bridge design is now considered art form. Yet many contractors, faced h hostile country need bridges only nporarily.

War provided the incentive for develop- t of the Bailey Bridge, the most widely temporary structure in contracting . It has square, braced panels, ck to the concept of the truss at o limit excessive shear. Panels are gether, forming a rigid beam that ut from the approach bank. To span or loading capacity the ngthened or more panels added the width. Easily used for spans metres, Bailey bridges can in fact metres. Post-war civil engineers mainly as temporary cross- plant and materials. Another bridge is the Callendar-

loating bridges

Floating bridges are similarly thought of temporary structures where clients have cash limit. However, where river beds are ry weak and currents gentle, a floating ridge can last for decades. In May, the rgest floating bridge in the world was mpleted over the Demarara river in uyana, South America. The £6.5 million ructure replaces a ferry service. With an verall span of nearly 2000 metres the ridge provides a two-lane span arriageway and pedestrian footway. Built ntirely in steel, it uses Acrow Panel bridg- g and 802 Uniflote floatation units. It ncludes two retractable 45 metre spans hat can be wunched open for a navigation hanel. The bridge is articulated at the nding bays to cope with the three metre de rises.

Modern designers in Europe allude



Modern bridge design... The Man/Krupp D Bridge MS317/3 which is single storey, double truss with 3rd chord, double lane with roadway hollow multistrut steel plates.

disparagement of reinforced concrete bridges. Although they may not admit it, its European and American future as a bridge material is limited. However, in expanding countries such as Nigeria a reinforced concrete bridge is often the simplest and best form of construction. With an on-site batching plant installed, rc piers and superstructure can be the simplest mode of construction in the bush. In an urban environment with a good supply of ready-mixed concrete they are still the most common and popular bridge structures to build.

Turning back the clock to the turn of the 19th century, designers were looking for ways to distance themselves from using mass concrete above the ground. In 1808 Ralph Dodd embedded wrought iron bars in concrete to give this material greater tensile strength. The rc pioneering in this century was boosted in 1894 when Swiss Engineer Edmund Coignet published his elastic design theory. It was a design basis for T-beams, having both corrision and fire resistance.

Wherever contractors are in the world they will be aware that the future of their bridges to cross water lies with prestressed concrete. Short spans — say to 12 metres — will only be in rc. Structural steel can span up to 650 metres. But the vogue is that steel is ugly, cumbersome.

Prestressing concrete pares a structure's weight. The control of stresses and strains is put to better use. Off-site fabrication is uncluttered; on-site movable forms are used.

To choose between precast concrete segments or in-situ concreting with horizontal slip forms depends on cost analysis for transportation, labour and materials. Precasting needs a permanent yard where multiple use of equipment should be guaranteed. In-situ concreting means slip form carriages: expensive equipment, where the one-off design needs adjustment for the next structure of different dimensions.

As we approach the end of the century concrete bridges in cantilever segmental or cable-stayed design will prolificate.

Cantilever segmental designs have tendence buried in the top flange. The super-structure soffit is either straight or curved, but for long spans this design has excessive weight.

The construction of a cable-stayed bridge needs less material. However, erection, with intricate connections, is a complicated task.

The principles of cable-stayed design spot-lights a current academic battle between the use of orthotropic steel decks and concrete box forms. It depends on the span: 500 to 600 metres is often quoted as the parameter for changing from concrete to a steel deck.

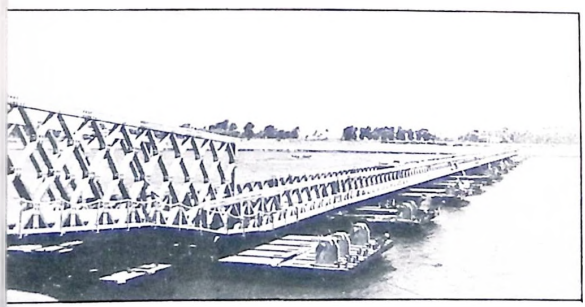
Design questions are debated. Towers in concrete have compression strength. Concrete decks are heavier.

Steel takes both compression and tension. For this reason, cable stayed steel bridges have proven simpler to design.

However, with more sophisticated prestressed technology now available concrete ranks well with steel.

It certainly appears that, cantilever segmental and cable stayed concrete bridges are the vogue for the future. Of architectural elegance they will be the way that man will cross water. With the new techniques such as travelling waggons, and fast precasting yards, they are becoming more adaptable to a wider range of spans and encironment.

Man can still cross water by bamboo vines. But in his techniques he has progressed far. □



An example of a floating bridge, considered to be a temporary structure, but some can last for a decade or more.

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INSTANT AND SYSTEM BUILDINGS

The increasing need for accommodation on construction sites is worldwide, consequently the instant building has become a recognised answer to many housing needs. This article defines the term 'Instant building' and looks at the wide variety of units suited to West African conditions.

HE UNITED Nations estimate that, by e year 1980, there will be a housing deficit 300,000,000 units in developing countries.

A phenomenal growth industry in both 'estern Europe and in North America — stant building — will help to reduce this ficit.

After the Second World War, there was e sudden burst of expected pre-fab tivity which slowly died under the scorn politicians, planners and architects. Pre-bs were fully factory-built but expensive short runs and it was promised that they ere a short life expediency to be replaced y permanent structures in less than fifteen ears. Then came an increasing need for ccommodation on construction sites all ver the world and the site hut became spectable. The instant building became cognised as an answer to many accommodation problems and over the last few years the industry has doubled and trebled. For example, in the UK alone there are now over two hundred companies manufacturing pre-fabricated buildings. The units they produce are used for offices, dormitories, libraries, restaurants, toilets, schools and shops. Specially designed and equipped buildings are provided as surgeries, renal dialysis units, laboratories — even as sand blast units and glass walled squash courts.

Countries with a growing instant building industry have experienced astonishing export increases. From available figures it appears that UK exports of instant buildings in 1976 were nearly four times greater than in 1975.

This is a healthy trend for the UK and Europe but West African users of instant buildings may not always be completely thorough in considering the implications.

The Specialists

Over the last twenty five years there has been a hard core of European manufacturers compiling an admirable expertise in designing and building pre-fabricated units for particular environments. They have the first hand knowledge of African requirements far beyond the geography book climatic definitions for tropical savanna, rainforest and steppe.

The danger is that some company highly successful in selling buildings into Europe will take a high pressure swing at West Africa without knowledge other than that gained from short period testing of materials.

Continued

scapable utility

e box-like instant building is an apable solution to many accommoda- problems in developing countries. e international contractors on turn-key cts are now providing accommodation building hospitals, universities or other e-intensive complexes, the accom- tion units placed on site to accom- te construction workers afterwards me houses for the university or tal staff. They must be of a high lard — and usually they are. Neither ruction workers nor medical person- ll accept less these days.

here is no doubt that instant buildings e great advantage to the modern world. ve been found to be indispensible prefab houses for population oses in renewal areas, as ommodation on land desig- re non-housing development ging use for 'sterile' land. to solve some agonising opulation drift and the tion of natural resources.

me that alien boxes have to problems. Could not the more manufacturers cultivate a better tion of local social customs and Could they not encourage designs self help programmes? Could pay more attention to the dichotomy een traditional and non-traditional ns? Can they make concessions to nal architectural styles?

e importance of a tight ecification

here is little doubt that instant buildings even system buildings suitable only for perate climates are being sold to and in tropical countries. In European ntries low specification units are too uently bought because the capital cost w or the delivery is short. To do this res the cost of maintenance and the life. The cost of maintenance can be ageously high and the life of the unit re it becomes a shabby derelict, appall- y short. Both these low quality tcomings are compounded by the re to press a tropical specification.

low can a manufacturer claim a ical specification without proving com- ability with the following conditions il to a units intended site:—

. Air temperature (The AMR annual mean range is far less important that DR diurnal range).
. Relative humidity and rainfall.
. Wind characteristics.
. Solar radiation, ultra violet radiation intensity.
. Air pressure.
. Dew point. Evaporation.
. Atmosperic salinity.

y should some manufacturers ignore possible corrosion of metal cladding, ticularly in tropical marine environ-

A typical heavy duty tropicalised caravan from Rollalong.

ments; the degradation of carbon based plastics due to ultra violet radiation; the incompatability of some metals accelerating corrosion in high humidity (i.e. aluminium with copper); termites and wood-boring beetles, wood destroying fungi and wood discolouring moulds; the inadequacy of some bituminous roofing marerials in tropical climates; — and the flat roof problem?

A Pre-Plan International Bungalow from Rollalong.

European manufacturers claim a twenty to thirty years life for their instant building in normal (temperate) conditions. An occasional manufacturer speaks blithely of sixty years life. At least instants can no longer be called temporary although many English architects plan on only fifteen years use for the units they specify. But tropical conditions can pull down unit life expectancy to half those expected in temperate sheltered climates.

A manufacturer should in any case supply the following information for instant buildings to be sold anywhere in the world:—

1. Dimensions
   a. Overall Length
   b. Overall width
   c. Overall height
   d. Internal length
   e. Internal width
   f. Internal height
   g. Skid dimensions if fitted
   h. Leg centres if fitted
   i. Floor area
   j. Floor height.
2. Weight empty.
3. Can they be double-stacked?
4. Can they be linked?
5. If stacked, can internal or external staircases be fitted?
6. Type of chassis or skids if fitted. Is a towing eye fitted?
7. Type of jacking legs if fitted. How operated.
8. Are there slinging points for craneage?
9. What foundations are required, single

Continued

A Hallam Panelpac bachelor dormitory accommodation factory clad with aluminium alloy.

Our wheel loa
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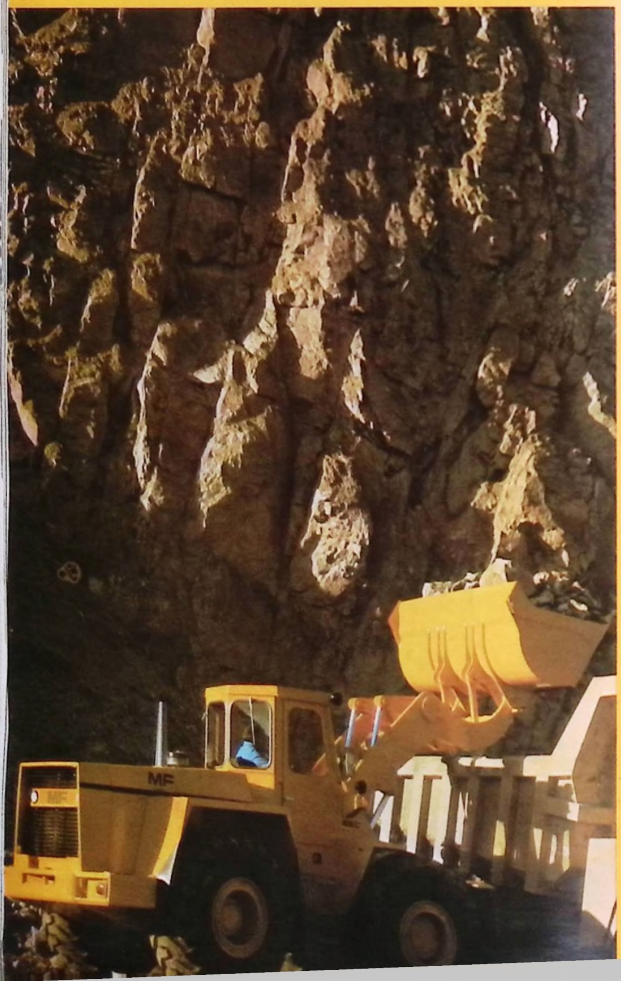
back for mo



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MF 77C	

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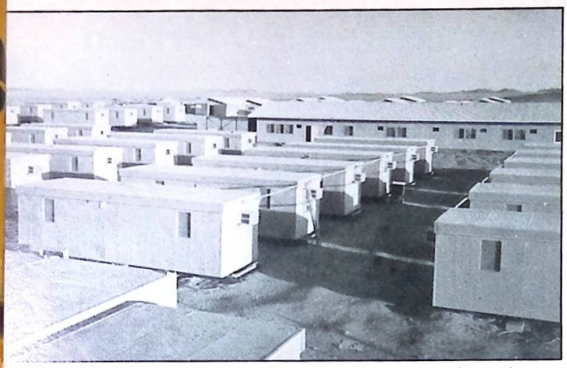

'Supaklid' 'Supercom' and 'Supalite' accommodation units 'on site' for a major company.

Choice and definitions

Choice of instant buildings is enormous and confusing. And confusion starts with definitions. What is instant? What is a transportable building or a mobile one, or a transportable one. What is system building?

One indication of the confusion is the UK Government's definition of a "mobile home" — one without wheels — as being the same as that for a caravan!

There is no easy answer to the problem. Strictly speaking "instant" should mean "instant" and the widest definition of the word should only allow it to be applied to buildings which are completely factory-built and are transported fully erected to be placed on site by one man for instant use with all services attached the same day as delivery.

However, the flat-pack is always classified as an instant although it can take three men two or three hours to erect.

Three basic descriptions are needed for pre-fabricated buildings

1) Instant, fully erected.
2) Instant, site erected.
3) System.

System buildings are site erected from system components.

'Transportable' buildings must really be instant buildings unless you accept that a pile of bricks is a transportable building. And a 'mobile' building should have wheels!

Instant buildings are restricted in size by transport regulations. They usually range between 1.8m × 2.4m and and 3.7m × 18.22m. Flat pack buildings obviously offer considerable savings in shipping costs and only two considerations should prevent them being first choice.

Firstly, special fittings may be needed for technical purposes or special furniture provided. In these cases the unit is best shipped fully erected with the shell acting as a packing case.

Secondly, flat packs need craneage and labour on site. If the site is remote and the provision of an appropriate crane and suitable labour impossible then again, the unit must be supplied fully erected. The alternative to this is to have flat packs erected and completed at the port and then transported.

Instants are either skidded or have jacking legs. Erected instants do not normally need cranes. If they have skids they can be winched off and sited. Jack units can usually be offloaded and sited in about half an hour by one man. The lorry drives on to site, the driver lets down the four jacking legs, drives the vehicle from underneath, then lowers the building using either manual or hydraulic jacking.

Continued

The compactly designed bathroom area of a caravan accommodation unit.

The interior of a Southern Mobile accommodation unit, compact and pleasantly designed.

The VOLVO BM 860 Articulated Du
negotiates even the most difficult te
and wins out in the long run
even on dry, deeply rutted haul road

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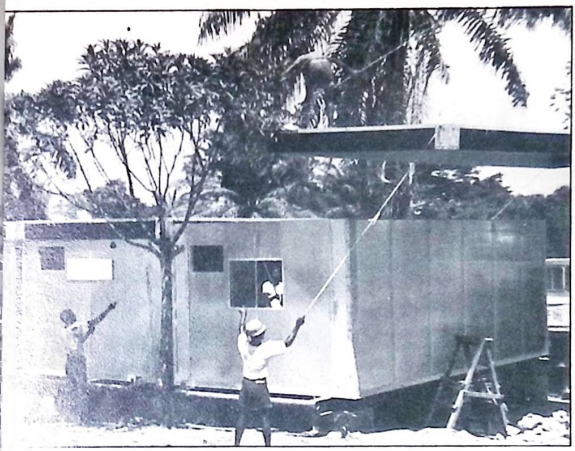


A Terrapin unit being assembled near Monrovia with evident ease of operation.

or double-stacked.
Dimensions, material and construction of framing, if any.
Dimensions, materials and construction of wall panels, interior and exterior.
Type of inner lining.
Material and construction of floor.
Material and construction of roof and ceiling. Can pitched roofs be supplied? Can additional eave overhang be provided?
Exterior and interior finish. Paint specification.
What wiring, lighting and heating fitments?
What plumbing if any?
Dimensions, material and construction of doors. Description of door furniture.
Type of window frames. Glass thickness and type of glass. Insect Screens? What vents and ventilators? Are shutter grilles available?
What type of floor covering?
U-values (thermal transmittance) in Wm^2 deg C for Walls, floor and roof.
Imposed load for floor in KN/m^2 or kg/m^2.
Imposed load for roof in KN/m^2 or kg/m^2.
Wind Loading.
Fire resistance. Surface spread of flame.
Describe weather tightness and damp-proofing.
Describe condensation checking.
Describe solar protection.
Describe durability. What is the expected life of structure for a given site?
Will roof and floor timbers require preservative treatment to achieve this maximum?
What regular maintenance will be required?
Frequency of repainting?
Method of fixing and removing wall panels.
Material and construction of partitioning.
What unique features does the building have?
Are there any anti-vandal features?

Fitness for purpose

Naturally the highest standards in instant and system buildings for use in West Africa come from those companies with high international reputations which have had time to evaluate the quality of their buildings over very long periods on African sites.

The best system buildings are superb. They offer strong but light units with flexible partitioning systems. They are pre-wired pre-plumbed and require the minimum of unskilled labour to erect. They have metricated panels which can be easily replaced when damaged — And it is important to remember that maintenance and replacement can prove costly or even impossible if a manufacturer has not considered after-sales service when preparing original designs.

The future

The concept of the instant town has become a reality. It is now possible to clear a site and provide domestic accommodation, administration units, health facilities, shops, recreation, schools, laundries — providing lighting, power, water distillation and heating — for thousands of people, and all within one week from start to finish.

There are now a number of international companies able to offer instant towns on a turn-key basis. They have the resources to provide not only the instant and system buildings but also the electrical and mechanical site services.

The future will bring an increased capacity for specialised companies to provide this type of service.

But more important advances will come from the ability of instant and system building companies to provide individual buildings to fill the housing gap with locally compatible products.

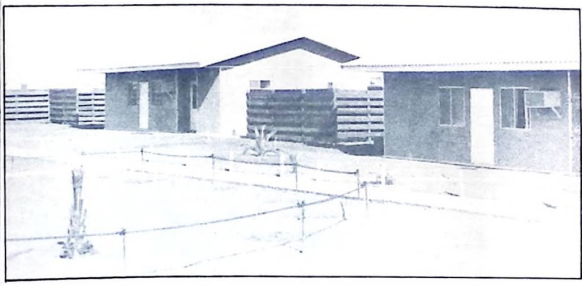
The use of technologically advanced materials will combat difficulties from extreme climates.

The one-piece sandwich construction for wall panels is now becoming widely used. This consists of sheet steel outer skin and ply inner lining bonded together by a rigid foam core. This gives an insulation U-value of 0.57 Wm^2 deg C. The outer skin is protected by silicone polyester enamel baked on.

Cladding of OCS (organic coated steel) will be more widely used, although the correct method of edge protection, maintenance, cleaning and repair of damage will have an important effect on durability particularly in tropical climates.

It will also be interesting to watch the new uses of GRC (glass reinforced cement) replacing all but primary loadbearing concrete, timber, sheet metal, etc. Also GRC spray applications to cheap substrates (e.g. unbonded clay block, chicken wire, etc.) as thin skin reinforcement, site applied.

For West Africa the real breakthrough will come with the development of indigeneous instant and system building industries using techniques and designs to meet local tastes and local needs using local materials. □



Lesser Building Systems (Export) fully tropicalised bungalows — 'Supalite' as supplied to IMEG working on the Nigerian Products in Nigeria.

DEMA

Demag Industrial Yard Cranes, owing to their compact design and outstanding manoeuvrability, are welcome on jobs where space is restricted. They transport loads through low-clearance doors, handle loads in narrow aisles and other hard-to-get-at places.

Long reaches, high capacities, great lifting heights, and an exceptional working stability pay off in the safe handling of unusual and awkward loads which Demag Telescopics take right in a stride.

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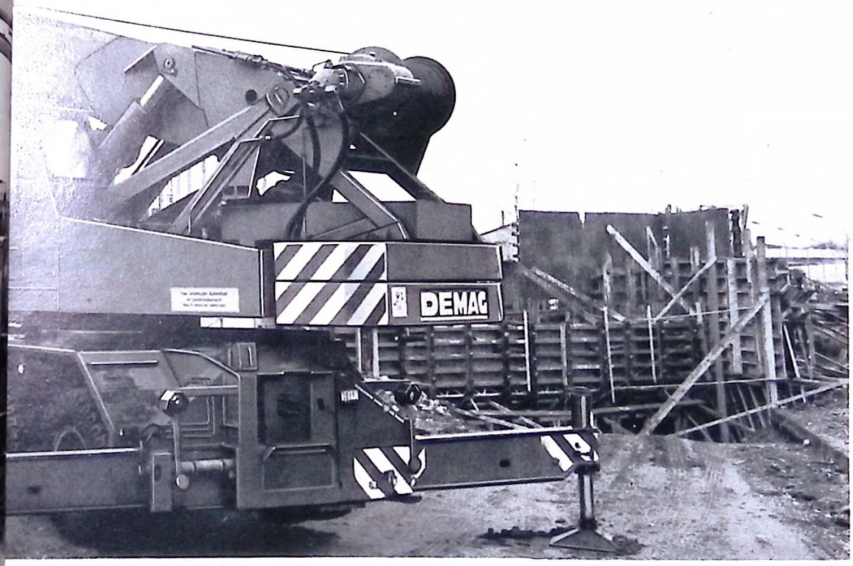

Getting the load high up very fast, that's what counts now on short-run erection jobs. Demag Telescopic Cranes are rated "tops" for erection assignments with competent building contractors. They move to the job fast and are ready for action at once.

Demag Telescopic Cranes save manpower and the expenses for boom-carrying vehicles. So they are also "tops" in terms of low-cost performance.

llent DEMAG service greatly es to the reliability of its s. Keeping hard-working equipment in tip-top operating is the primary concern of the world-wide DEMAG organization with service facilities in every corner of the globe. It assures prompt service to DEMAG-equipment owners wherever located.

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4299 e

Part of ABU's bridge construction programme in Sierra Leone

FORMATION AND DEVELOPMENT

IN 1965 five medium sized German companies in Frankfurt joined together and formed a new company. Allgemeine Bau-Union GmbH & CoKG to start work overseas in West Africa. In less than ten years, ABU has developed into one of West Africa's most promising construction companies, undertaking major projects throughout Mali, Sierra Leone, Liberia and Nigeria.

So far, projects undertaken by ABU have fallen into three distinct categories, those dealing with road and bridge construction, open-cast mining operations and industrial structures such as pilot plants for the production of rutile and bauxite.

ABU's major activities have been centred in Mali, with the 220km, Faladie Segou Reconstruction Road and the $120m Barrage de Selinge. The extent of ABU's operations in Mali are seconded by their operations in Sierra Leone, where the company has played a major role in the road development programme. ABU commenced work in Sierra Leone during October 1967 with the construction of the 58km Tonkolili-Kono road, completed in 1971. This project has been promptly followed up by others, listed in table 1.

Major Success in Sierra Leone

ABU has established a highly successful record in Sierra Leone, regularly winning international tenders. The company claims that this is due to an efficient operation and above all the ability to complete in time. At present ABU employs some 400 local personnel and between 20-50 expatriates, allowing for a seasonal fluctuation. The company insists that the expatriate staff have played an essential part in providing expertise and training local labour, so that over the years the company has succeeded in building up a highly skilled and reputable workforce maintaining European standards. It is for this reason that ABU insists on retaining all staff even during the rainy season when productivity falls off on the earth moving, and road construction projects. The bulk of road construction is therefore undertaken between November-June.

Given the existing climatic conditions in Sierra Leone, reliable and enduring machinery also plays an essential part in company success. ABU uses a wide range of international construction equipment from which the company estimates to obtain 4-5 years constant usage.

At present the ABU claim to have invested Le.2,000 in spare parts in Freetown. Spare parts do pose a problem for more often than not, local agents are unable to supply the necessary parts as

ABU's road construction in Sierra Leone involves the crush rock b- method.

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ABU has also been involved in open cast mining operations, and were one of the first companies in West Africa to mine iron ore using scrapers.

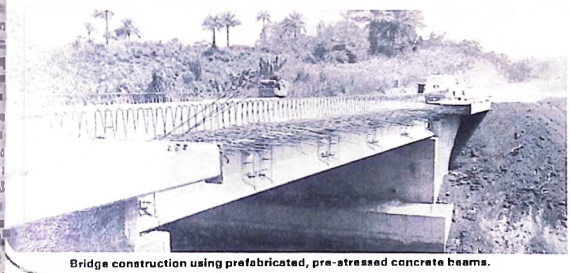
The company worked closely with ELCO until 1975 and has also been involved in projects for the processing of rutile and bauxite in association with IRONCO, a Swiss company.

Financing of Projects

The majority of construcion projects undertaken by ABU have been 67% financed by German concerns and 33% locally. Some projects however have been financed by the World Bank such as the Freetown highway and the Faladiè Segou reconstruction. The Mano Bridge was financed by the African Development Bank and the Barrage de Selinge in Mali, financed by an EEC body. Various pilot plant projects have been backed privately.

Table 1 ABU's major contracts

1967-71	Tonkolili-Kono Road	SIERRA LEONE
1971-73	Lunsar-Mokeni Road	
1973-74	Mokeni-Matotoka Road	
1973-75	Bo-Kenema Highway	
1974-77	Freetown Waterloo Road	
	Pilot Plant Rotifink	
	Dam project for Sierra-Rutile	
	Sierra Leone—Liberia Lioke Road	
	Faladiè Segou Reconstruction	MALI
	Barrage de Selinge	
	Boug Mine Industrial Structures	LIBERIA
	Tubman Bridge—Bomi Hill Undercrush	



Bridge construction using prefabricated, pre-stressed concrete beams.

Future expansion

ABU briefly outlined for the WATR the direction that future developments would be taking in West Africa. The company hopes to extend its activities in to the neighbouring countries of Sierra Leone and Liberia. At present ABU has undertaken new projects in Liberia, involving the Monrovia Bomi Hill Road, which it is estimated will take 30 months to complete. In Freetown, ABU is to undertake the 'Town Road Improvement Programme'. Within the next six months, further international tendering will be taking place in Sierra Leone for the 72m Makeni-Kenema Road, which ABU hopes to win in the face of international competition from UK, Italy and Germany. □

The 4-5yd^3 (3-4
TEREX 72-5

The 4.5 yd^3 TEREX 72-51B. A new design for loader performance and dependability.

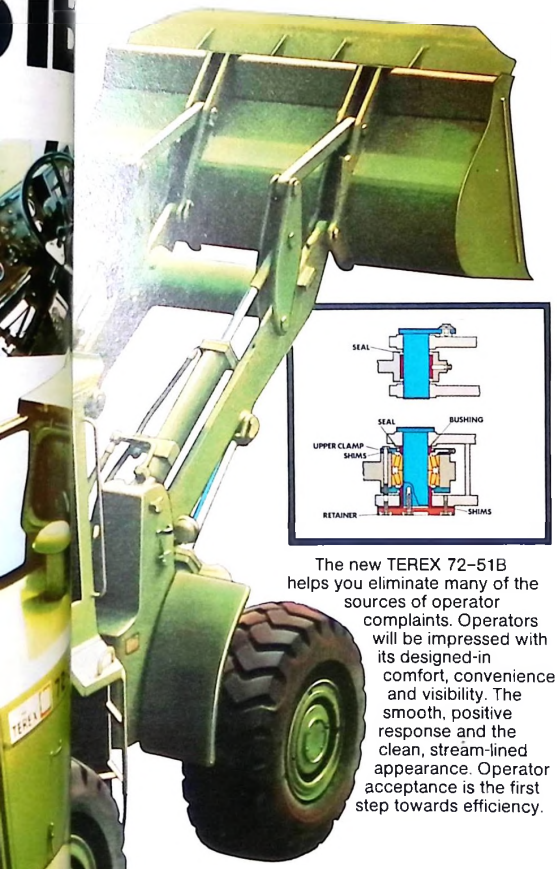
Yesterday's tools are hard pressed to handle today's jobs. The new TEREX 72-51B loaders have been designed for the performance, operator acceptance and dependability you need to be competitive in today's markets.

Nominally rated with a 4.5 yd^3 (3.4 m^3) general purpose bucket, the new 72-51B is a versatile tool. With 231 hp (172 kW) net power from the Detroit Diesel 6V-71T turbo-charged engine, it has plenty of power to handle heavy work.

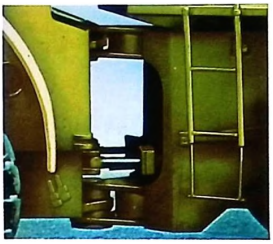
It's been designed to provide all the manoeuvrability and flexibility you'll need to adapt it to almost any type of material handling job. Pivot-steer design gives you 49 degrees of bucket swing to function well in tight quarters and reduce cycle times.

And the Allison Soft-shift transmission, with power-on-the-go shifting, helps to smooth out forward to reverse changes and reduce shift shocks to the operator and powertrain.

new design for loader performance and dependability.



The new TEREX 72-51B helps you eliminate many of the sources of operator complaints. Operators will be impressed with its designed-in comfort, convenience and visibility. The smooth, positive response and the clean, stream-lined appearance. Operator acceptance is the first step towards efficiency.



You won't lose your edge on performance through excessive down-time either. Pivot pin and bucket linkage have been designed for extended service intervals through new geometry and seals. And its new hydraulic system was designed for good serviceability.

Everything about the TEREX 72-51B is designed to help you stay ahead - single plate lift arms - in line linkage - remote mounted tilt cylinders - greater pivot pin separation - high strength fabricatio.is - greater rim pull. You'll need every trick in the book to be competitive in today's economy. And you can't afford the luxury of inefficient and obsolete tools. Call your TEREX dealer and find out how the new 72-51B can improve your loading picture.

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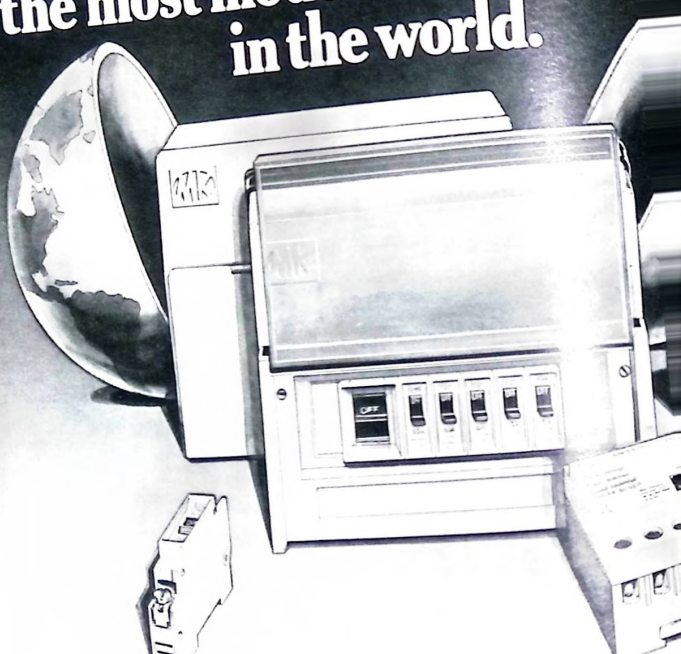

The new MK Sentry system is the result of a new design philosophy for consumer units. It meets today's requirements for domestic, industrial and commercial installations . . . and tomorrow's too.

Sentry is a complete range of MCBs, ELCBs, Mains Isolator Switches and Enclosures which you can use separately or build up into a wide range of consumer units and distribution boards. The modular concept to which Sentry is designed makes the system uniquely flexible. You can build up exactly the unit you require, quickly and easily, using a standard range of products which are proven, tested and readily available.

Sentry is easy to install as well. Fe generous wiring space, simple connec numerous enclosure knockouts make easier for contractors.

In short, the MK Sentry system is forward in consumer unit technology highest standards, with ease-of-instal user-safety in mind.

Only the most modern of consum cope safely and reliably with the con modern installations.

And, the new MK Sentry system modern of them all.

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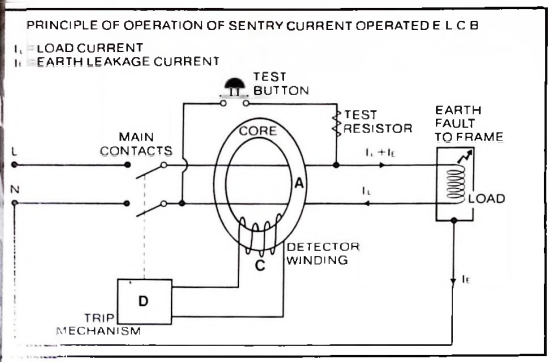

...owing the operation of an earth leakage circuit breaker based on the electronic

...E CURRENT SUCCESS OF ELCB's

...current operated earth leakage circuit breaker is accepted world-...e, and is based on two principles, the electronic and the polarised. ...is article P. F. Meir, Commercial Manager, Technical Products, MK ...tric Ltd., looks at these two types of ELCB's, and discusses their technical standards.

...rth leakage circuit breakers (ELCBs) ...lectro-mechanical devices intended to ...ct either people or equipment against ...ges of electric current to earth.

...ere are two types of ELCB, the ...ge operated and the current operated. ...voltage operated ELCB has been used ...y and still has an application where ...equirement is to restrict the voltage ...n the frame of a piece of equipment in ...vent of a leakage to earth. However, ...e protection is required for a person ...portable equipment, where there is a ...er of people touching frayed cables or ...e multiple earthing systems are being ... the voltage operated ELCB cannot be ...anteed to give protection.

...e current operated ELCB has now ... accepted world wide and it is this type ...LCB on which I intend to concentrate ...s article.

...neral principle

...ere are two types of current operated ... leakage circuit breaker both based ... the same principle.

...he electronic. (2) the polarised,

... of which can be made to give ...onal, or fire and equipment protection. ... both work on the current balance ...ciple (see diagram 1). The phase and ...ral cables (assuming a single pole and ...ral load) are passed through a toroid ... onto this toroid is wound a detector ...ling. Whilst the load and the cables ...ng it are healthy the current to the load balances the current returning down the neutral. If there is a leakage to earth from the load or through a person's body to earth a voltage is introduced into the core (as in the case of the current transformer) which is picked up by the detector winding and operates a tripping mechanism.

Electronic type ELCB

In the case of electronic types of ELCB the voltage from the detector winding is fed into an amplifying circuit which at a pre-determined level closes a small relay. This relay is in turn used to operate an isolating device such as a circuit breaker or contractor via a tripping coil.

The electronic ELCB has a number of advantages such as versatility and that the tripping device can double as an overload device but has the disadvantages of a separate amplifying supply being needed and that it is relatively expensive.

Polarised ELCB

The polarised ELCB is more widely used and is the type of ELCB marketed by my own company.

From the detector winding of the toroid current transformer the signal is fed to a similar winding on a permanent magnet. This magnet is designed so that it restrains a trip latching mechanism when there is no current on the detector winding. The detector winding opposes the magnetic field of the permanent magnet so that when there is an unbalance between phase and neutral currents in the load cables (ie a leakage to earth) the detector winding demagnetises the permanent magnet and at a predetermined setting releases the latch of the tripping mechanism thus allowing the ELCB main contacts to open by the pull of the main spring. The total time from initiation of the earth fault to the isolation of the supply is in the region of 30 milli seconds.

Construction materials

All the important parts of good quality ELCB trip mechanisms are of stainless steel, refined alloy or non corrodable material for heavy duty.

The fixed contact would probably be of silver graphite with a layer of nickel and moving contacts of silver tungsten nickel with a layer of nickel. This combination of materials in the fixed and moving contacts is safe against welding and freezing which is very important in a life protecting device and where the ELCB has to have a short circuit breaking capacity when it is used as the incoming isolating device to a consumer unit or distribution board. In the case of the MK ELCB there is a short circuit breaking capacity of 2000 amps.

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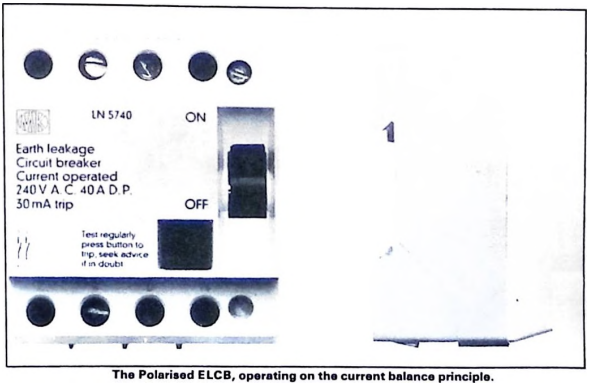

The Polarised ELCB, operating on the current balance principle.

Crabtree at work..

Crabtree electrical products are always at work—in the home, in the office and in the nations of West Africa and in many other countries of the w

The extensive range of wiring accessories includes lighting switches, socke shaver supply units—and a new cooker control unit.

Crabtree miniature circuit breakers are protecting numerous electrical installations, earth-leakage circuit breakers are providing protection against fire and shock.

The motor control gear range comprises starters, contactors, relays, push buttons and pilot lights for a variety of industrial applications.

Crabtree electrical products
For good design, reliability, safety in use and ease of installation

J. A. Crabtree & Co. Ltd., Aldridge, Walsall, England.
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...inued

...he toroid would be made of mumetal ... the sealed permanent magnet system ...le and assembled in a clean dust free ...m and the pole pieces and armature ...und and honed by hand before ...embly.

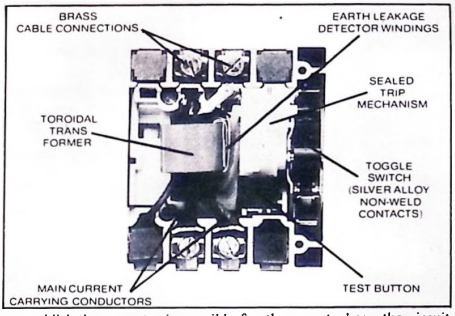
...he sophisticated materials as described ...ve plus the testing of every ELCB for ...pliance with its parameters and the ...t-in life expectancy of 20,000 opera... ...is are of course a necessary feature of a ...ice on which people are relying to ...tect their lives.

...chnical standards

...EC Publication 479 (1974) "Effects ...current passing through the human ... is a generally accepted standard ...ompares shock current and its ...n with its effect on the human body. ...amine the graph which is re... ...d below you will see that it is ...into different zones and that zone 2 ... is "usually no damage to health". ...words one could take 100 milli ...ps for 100 milli seconds or 30 milli amps ...00 milli seconds. However I think that ... will agree that it is desireable to keep ...actual time for which a person is receiv... a shock to earth to a minimum and for ...s reason the majority of polarised earth ...kage circuit breakers trip in the region of ... milli seconds which can be seen on the ...aph puts the curve of the 30 milli amp ...CB within zone 2 for all practical ...rposes.

A 100 milli amp trip also comes sub...antially within the zone 2 but for a ...fferent reason it may not give the desired ...otection to a human being. To explain ...is we should remember that the leakage ...current to earth is dependent upon the ...oltage of the supply divided by the earth ...op impedence. This earth loop impedence ...cludes the resistance of the person's body ...om live conductor down to the floor, any ...otwear which this person may be ...earing, such things as carpets and floors, ...nd the actual resistance of the ground to ...e earth point. Therefore, if somebody is ...rotected by a 100 milli amp trip and is ...anding in a place where there is a sub...antial amount of earthed metal such as in ...e kitchen it is very possible that if they ...id come in contact with a live conductor ...en they would probably touch one of the ...ther earth appliances and their resistance ...ould be low enough for over 100 milli ...mps to flow. If however the person were ...orking in a garden shed, in the garden ...self or in the living room of a house using ...y a portable drill then it is possible that ...e resistance of the person, the footwear, ...e carpet etc could be of such a level that ...e earth leakage current could be ...estricted to below 100 milli amps, and in ...is case the earth leakage trip would not ...perate.

The resistance of the human body ...epends upon the condition of the skin and ...e voltage which is being applied but it can ...e assumed to be between 1000 and 2000 ...hms and a good average could be con...idered to be 1500 ohms. Using this figure it is relatively simple to establish the correct sensitivity of the earth leakage trip providing that the resistance of the other parts of the circuit such as carpets, floors etc are known.



A cross-section of a polarised ELCB.

Where fire or equipment protection only is to be provided the sensitivity need not be as low as 30 milli amps, indeed such a high sensitivity may be undesirable and a 100, 300, 500 or even 1000 milli amp sensitivity may be used depending upon the circumstances. However it must be remembered that a 1000 milli amps or 1 amp leakage at 240 volts gives 240 watts leakage to earth at unity power factor and this is enough to cause a fire.

Another factor which must be taken into account in the use of earth leakage circuit breakers is the standing earth leakage of the system which is being protected. This standing earth leakage may be due to faulty apparatus and in this case, of course, the fault should be rectified. There are, however, certain applications where a standing earth leakage is likely to be in existance from block storage heaters, MICC cables and to a smaller extent electric cookers. In this case care needs to be taken that the standing earth leakage on these devices is not in excess of the proposed setting of the earth leakage circuit breaker. If this is the case, it would be neccessary to fit a less sensitive earth leakage trip otherwise it would be impossible for the user to keep the circuit switched on with the standing earth leakage connected. Where there is a device with a standing earth leakage the actual protection level is the setting of the earth leakage trip minus the standing earth leakage on the system so that it is possible to get fairly close protection using a less sensitive device where there is a reasonably substantial standing earth leakage. Unfortunately a problem will arise if it is possible to switch the standing earth leakage out of the circuit at will and this of course would mean that the protection level would then revert to the less sensitive setting.

Using a single ELCB to protect a group of circuits nothing can be done about this problem except to attempt to minimise the danger and to make the user aware of the situation. However where a more comprehensive system can be installed it is possible to use a less sensitive device say a 300 milli amp ELCB feeding the complete installation and have a 30 milli amp ELCB feeding the most vulnerable circuits such as the ring mains and any circuits which are feeding outside installations.

It can be seen from the above that the choice of the earth leakage circuit breaker is very much in the hands of the person designing the system taking into account the particular parameters of that system and knowing the type of person who will be using it.□

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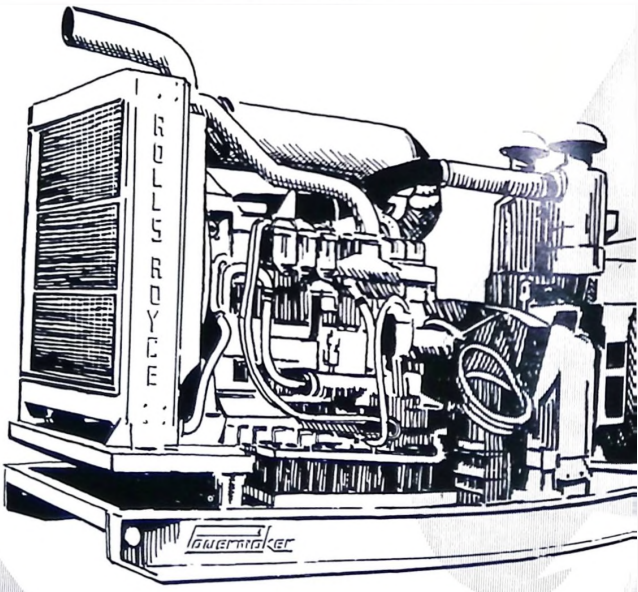

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troduced as the CP 222, tool has been designed for site use among con- and plant hire where numerous exist for both breaking out. It 9.98kg and accepts dard 22.22mm 82.55mm forged interchangeability with machines the same shank pped with latch quick and easy steel

The CP 222 provides an cellent power to weight ratio, ering a high surface impact e with less operator fatigue an traditionally heavier achines of comparable perfor- ance. It incorporates a closed ndle cast to generous propor- ns to allow the operator to ear heavy protective gloves mfortably, while an externally cated trigger mechanism duces the risk of accidental eration while being carried. r further information contact **ewac,** Apapa.

Mobile concrete pump

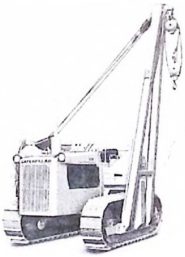
self-contained trailer-ounted concrete pump eveloped by **Ritemixer Ltd.,** is aimed to offer an economical eans of placing concrete over long vertical and horizontal distances. Called the Ritepump Model 30, it is powered by a four-cylinder 45kW (60hp) diesel engine giving a maximum delivery rate of 30m³/h over nominal distances of up to 70m vertically and 250m horizontally. In actual operating conditions the pump has delivered concrete at the rate of 20m³/h to the 16th floor of a tower block, a vertical distance of 48m.

The pump is charged from a 0.35m³ capacity hopper which is readily accessible to the delivery chute of an on-site concrete mixer. The robust and simple pumping mechanism incorporates twin chromium-lined 200mm diameter concrete placement cylinders linked by a fulcrum valve. Maximum piston speed is 12 strokes/min, and the maximum hydraulic system working pressure is 14MPa (140 bar).

A wide variety of concretes with aggregates of up to 50mm can be easily handled and placed exactly where required through delivery pipes of up to 150mm diameter. Standard equipment includes reducing pipe and hose sections for the gradual channelling of the flow emerging from the pump's 150mm diameter discharge adaptor into 125mm and 100mm diameter delivery pipes or hoses, as well as 45° elbow units and snap-on couplings with corresponding diameters. Reducing units enable smaller diameter — and therefore lighter — delivery hoses to be used.

Track type tractor

The new **Caterpillar** D5 "Series B" track-type tractor incorporates many features of the company's larger models: Combined hand lever and braking controls; hydraulically-released, oil cooled steering clutches; hydraulically-boosted brakes; single lever bulldozer blade and tilt control; sealed and lubricated track; more comfortable environment.



Simplified operating controls improve the production potential of the D5B. Hand levers give total control of the steering, combine steering clutch disengagement and braking through a hydraulic master valve. Hydraulically boosted foot pedal brakes control braking without steering clutch disengagement. Pedals suspend from the dash for easy floor sweep-out, eliminating floor openings which can transmit noise, heat and dust to the operator's compartment.

The D5 Series B machines have sealed and lubricated track, the track so successful in extending the undercarriage life and reducing upkeep costs on the larger Cat track-type tractors. Sealed and lubricated track virtually eliminates internal bushing wear as a critical wear item.

An important new optional attachment is the sound supressed ROPS cab. This cab is similar to the cabs so well received by the industry on larger Cat-built tractors which include features such as filtered fresh air pressurised inside the cab to help keep out dust, a comfortable cushioned seat, adjustable fore, aft, up and down to meet each operator's particular needs. For further information contact **Tractor and Equipment,** Lagos, Accra, Freetown and *Libtraco,* Monrovia.

Unique trencher

Simplicity and low maintenance are the key features of the trencher from **Radahl Industrier A/S.** There is just one working part, a unique digging wheel which carries 10 easily replaceable cutting teeth.

In operation, the action of the wheel is similar to a chain digger in that the soil is not cut and lifted in a bucket but is brought to the surface by the saw-like action of the teeth mounted on the wheel. However, the design offers all the advantages and economies of a wheel-type trencher. Because soil is carried only a short distance the power requirement of the Radahl trencher is extremely low when compared to other ditching equipment.

Excavator for underwater dredging

O & K Orenstein & Koppel AG, are to produce another high-capacity hydraulic bucket excavator mounted on a pontoon for underwater dredging.

This hydraulic bucket excavator is fitted with a monobloc boom of 15m length and equipped with the following: one backhoe system of 4m³ capacity on a dipper of 4.3m length for rock dredging up to 13.7m water depth; one backhoe system of 2.2m³ capacity on a dipper of 9m length for rock dredging up to 18.4m water depth; one digging grab of 1.5m³ capacity on a dipper of 9m length for a maximum digging depth of 20m; one crane system for 12 tonnes payload.

This special-purpose floating dredger will be used for dredging rivers and canals and will have to remove grown rock material which is difficult to dislodge and cannot be excavated by dredgers of conventional design. For further information contact **Niteco,** Apapa and *Mechanical Lloyd,* Accra.

More information may be obtained for any item by using the form facing page 196.

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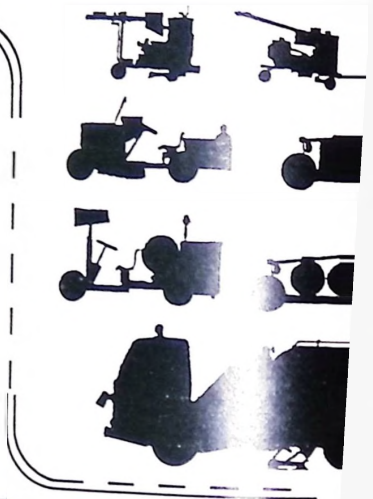

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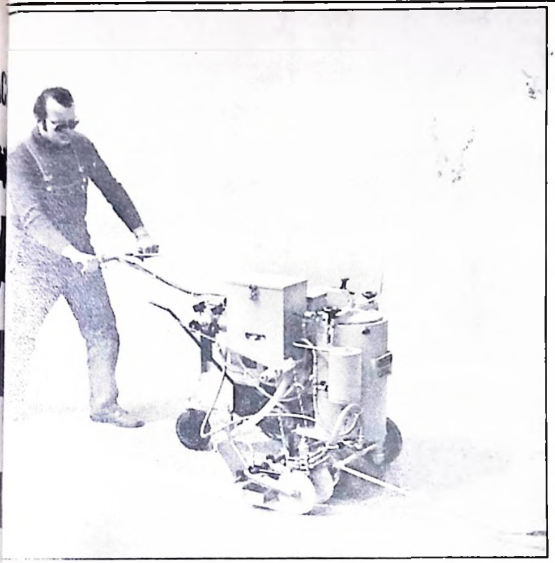

Hofmann H8 road-marking machine for wide lines up to 50 cm and double line 2 x 10 cm up x 15 cm.

ROAD MARKINGS IN NIGERIA

ior to April 1972 vehicles in Nigeria ove on the left side of the road. In 1971 it as decided to change over to right hand iving to conform with other West African untries, in preparation for increasing sociation and passage from these adjoin- g countries.

At that time, there were very few miles Nigerian roads which had any markings all. The safety committee set up for the hange over advised that at least a centre ne should be marked to guide road users way from the centre into their correct ne. Arrows were also required to show e correct direction for traffic flow.

Early 1972 was then a time of frantic ctivity in road markings. The Ministry of Works (Roads) painted twenty times more oad markings during the two months pre- eding April than in the whole previous ear.

For this operation paints based on hlorinated Rubber ("Alopreme") were sed. This had the advantage that it could e easily applied by hand with unskilled abour under supervision.

The change-over from left to right was nade very successfully, despite the words f doom quoted by its adversaries before he date.

With the five year Development Plan came a great increase in the building and maintaining of roads. Better standards, wider carriage-ways and lane markings were all specified on the new highways being built. Road marking could therefore not continue to be a hand painted operation and machine painting was introduced.

Various machine, large and small using 'Paint' were employed by Ministries and contractors to complete the hundreds of kilometres of markings now being required.

These machines like the "BTM. DWC. 10" applied lines of from 10 cm up to 15 cms. Some machines applied "Balotini" Glass beads as a 'drop on' reflectorisation to give immediate light reflection under night driving conditions.

Most machines sprayed the road marking paint at film thickness of up to 60 microns which is about half as thick as the page you are reading followed by the application of ballotini beads. Speed of application was limited to the speed of the operator who walked or sometime rode behind the machine.

Nigerian Drivers are notorious for changing lanes and for driving on the lines, not between them.

Heavily over-loaded trucks and sand on the roads seriously affect the life of the painted road lines. On heavy trafficed urban roads life expectancy falls below 3 months for paint.

Re-painting becomes a continual battle between the road markers and the Unending traffic. The drivers refuse to be delayed and newly applied paint lines are marked before they are dry.

New faster methods of application are now being introduced. Improved marking materials, white plastic sprayed at temperature of 400°F give much thicker coatings, of up to 1.5 mm.

Sprayed plastic dries quicker in less than one minute. At 400°F it melts and fuses to the tarmac top coats. The same ballotini beads are sprayed onto the hot plastic to give reflectorized road lines.

The durability even in Nigeria of sprayed plastic is 4 - 6 times that of sprayed paint. Re-painting times are therefore less frequent and less irritating to the road user. The large spray machines such as the Springwood County 2500 type can spray lines at up to 8 kilometres per hour. Single or double lines being sprayed at the same time if required.

To feed these large spray machines a back up truck holding two Preheaters to bring the plastic up to spraying temperature follows the "County 2500". The back up truck protects the newly laid line for the fraction of a minute it requires to harden and cool. This system then interrupts the traffic less and has to be done less frequent than paint.

For the future road marking in Nigeria there will be increased use of lines. Lane lines on dual carriage-ways, double lines to prevent over-taking on dangerous corners and hills. Another major contribution to safety will be the use of edge lines to guide the traffic from the edge of the road especially on approaches to bridges.

The ballotini beads applied to the road marking lines give good visibility at night. To complement this the use of 'Catastud' cats eyes between the module of the centre line improves the visibility and give super durable road marking. Catastuds can out last the life of all present road marking materials.

Nigerian road engineers need to standardise on their marking methods. Different contractors produce their own module of line and gap which are accepted by various engineers in different parts of the country. This makes it difficult for Nigerian road users to learn and appreciate that continuous lines — mean danger, long lines and short spaces — take care! and short lines and long spaces — good visibility. Double lines to prevent overtaking have not yet been seen in Nigeria. Would they be obeyed?

They would for sure save lives as many accidents are caused by overtaking lorries on bends and hills.

The increased use of road markings requires an increase in the knowledge of vehicle drivers. The requirement to obey the road markings, which are signs to safer motoring, is not yet built in to Nigerian drivers.

One day, who knows, there may be double yellow lines to prevent parking being obeyed in Lagos Island.□

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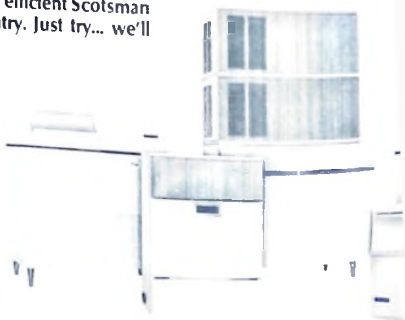

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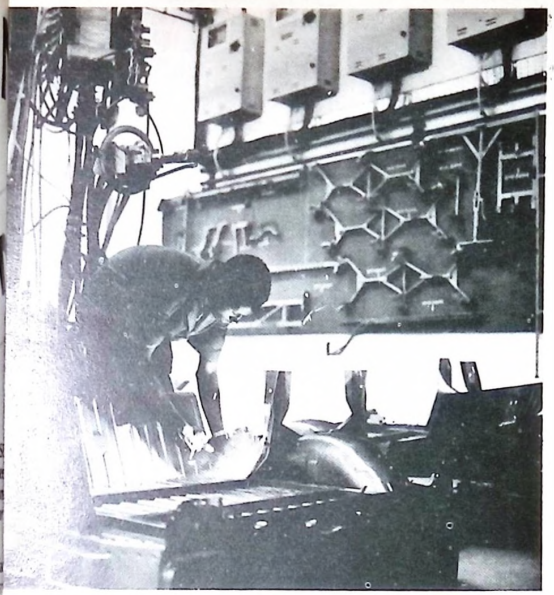


...method in Africa, electric resistance welding on a vehicle body shell.

WELDING IN VEHICLE ASSEMBLY

...any developments have taken place in car body assembly, ...th a definate move towards fuller mechanisation and ...tomation, using more long life materials. In this article a ...ecial correspondent looks at the various welding proces...s in use on the assembly line.

...E ASSEMBLY of vehicle bodies for ... car industry places many differing ...hands upon the manufacturers of join... equipment. For instance, for assem... of low volume or specialised motor ... bodies, such as the Reliant, or in ...eloping industrialised countries, the ...nufacturer may turn to glass-fibre ...ising a high percentage of manual ...olvement. For conventional assembly ...volume cars such as the Chrysler, Ley... d, Ford or General Motors saloon ...s, the need is for high speed welding ...ipment with varying degrees of auto... tion. For the newer, high production saloons such as the Fiat the production has been designed around the use of automatic robot welding devices. However, in both these cases, the majority of the assembly is carried out using the resistance welding process with some application of gas and/or arc welding for particular joints or for the attachment of small lugs or brackets.

In resistance welding, heat is generated across the whole cross-section of the joint. The electric current which generates this heat may be introduced to the work through electrodes with which the work makes contact or it may be induced by a fluctuating magnetic field surrounding the work. This latter process is known more commonly, however, as induction welding. A variety of resistance welding methods exist, depending upon the different ways of creating a locally high resistance so that heating may be concentrated at this point. The actual resistance depends upon the electrical resistivity of the material and the geometry of the conductor. Since the resistivity is fixed by the workpiece materials it is usual to restrict the current path between the parts to be joined to create a local high resistance. In addition to the physical contact between the current-carrying electrodes and the parts to be joined, pressure is required to place the parts in contact and to consolidate the joint. These features distinguish resistance welding from most arc welding processes.

Resistance spot welding

The most commonly used resistance welding process is resistance spot welding whereby overlapping sheets are joined by local fusion caused by the concentration of current between cylindrical electrodes. It came into use at the beginning of the twentieth century and may be carried out either on a fixed machine or on a portable gun. In either case, the work is clamped between the electrodes by pressure applied through levers or by pneumatically operated pistons. Current is generally applied by a step-down transformer, the work electrodes and arms of the machine being part of the secondary circuit.

Breakdowns of assembly process

Turning briefly to the design of the car body, this is broken down into a number of major assemblies such as doors, bonnet, roof, front and rear end and underframe. Each of these assemblies is thus composed of a number of sub-assemblies. For instance the underframe complete assembly consists of three sub-assemblies, namely the front end, main floor and dash upper. In turn, each of these sub-assemblies can be broken down further into a number of small panels. These panels are frequently welded on stationary pedestal resistance welding machines to form the sub-assemblies which are then taken to a series of jigs or fixtures to be welded into the larger assemblies. These jigs or fixtures may be stationary units or they may be in the form of mobile tables mounted on a carousel. In the first case, each jig or fixture will have one or more portable welding guns hung above the table while, in the latter case, the mobile jigs are either pushed or mechanically propelled past a number of spot welding stations where one or ore welds may be made at each station. Once the assemblies are com-

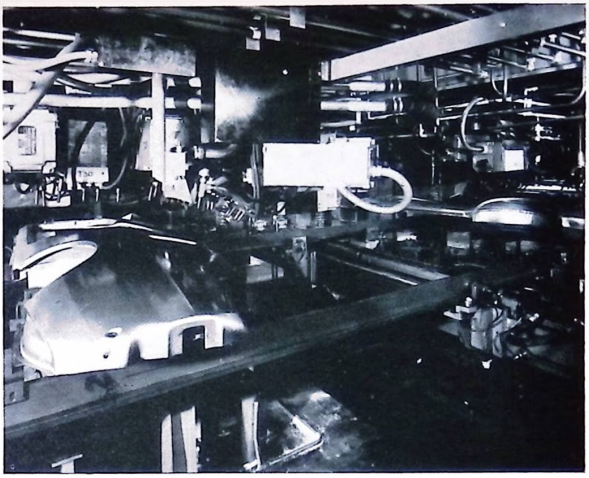
Continued

Inued

they are brought to the final assem-
rea. Here again there are two differ-
approaches. Volvo, for example,
returned to the principle of groups of
kers assembling complete cars in dis-
areas while the majority of other car
ufacturers utilise a final assembly
approach.

al assembly

this case, the underframe assembly
placed on a mobile trolley which
moved down the line through a
of welding stations. Here again
the welding will be resistance
ding in the form of portable weld-
In many instances, the compo-
bles such as doors, bonnets
will be brought to the final
by an overhead conveyor
the body sides, these may be
separate gatelines, each gate
suspended jig. On the Ley-
line, for example, these
comprise fourteen weld-
equipped with twenty-four
guns and two semi-
welding units. Once complete,
transfer to the final assem-
where they interlock with the trol-
carrying the underframe. The roof
windshield are then fitted and
ded.
t will be noticed that some use of



A panel assembly prior to welding in the welding press.

semi-automatic lines has been mentioned. This is becoming more popular on car body assembly lines particularly for situations where access is restricted to one side. Metal Inert Gas (MIG) or CO_2 welding has also been used for some time for the attachment of small brackets and lifting lugs, but on the British Leyland Range Rover all the welding operations on the frame have been designed around the use of CO_2 welding. Of over 50.8 metres of welding required, more than two-thirds is carried out on automatic welding fixtures. One problem here is that unlike resistance welding where, providing that the welding flanges are aligned, any gap between them will be

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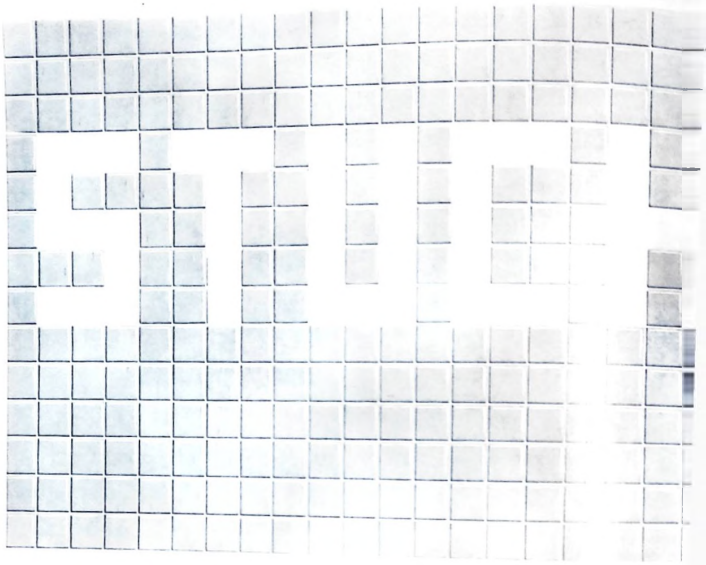

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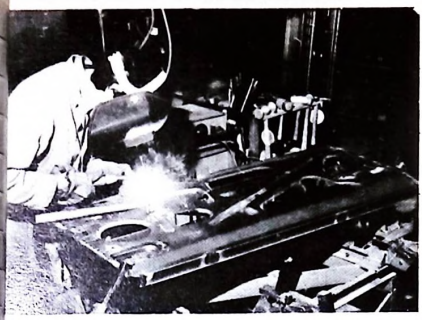


Metal Inert gas (MIG) welding on a car door assembly.

hen the welding pressure is ith arc welding only a limited tolerated. On the Range Rover pressings are 1.5 metres long ired to be formed to within ortion is also a problem, parthin the automatic welding d design tolerances have to inkage up to 0.150in.

of

nstance of arc welding on a saloon car is in Leyland's Allegro. In former years welded the exterior bodywork were with a tin-lead solder to provide a ooth finish for painting. However, the dern health and safety legislation kes this practice unacceptable and so rnative welding techniques had to b nd which would give an acceptable ld surface finish. On the Allegro, the f. rear quarter panel and rear decking all welded in a single jig using plasma welding. Other instances exist where s job is done by Tungsten Inert Gas IG) welding but a comparative evaluan was undertaken between TIG and sma welding.

It was felt that reduced torch downe, less distortion and faster welding ed of the plasma arc welding process upled with the additional benefits of the ht from the pilot arc on the plasma rch enabling the operator to position e torch and filler wire accurately, stantaneous ignition of the welding arc hich eliminates starting problems, no ntamination of the tungsten electrode d a greater tolerance of torch-toorkpiece distance variations all made asma arc welding a better proposition.

gap between the panels of 1½mm ± 5mm is maintained on the 20 swg thick ild steel panels and low carbon steel ler rods of 2.4mm and 3.2mm diameter e used. After welding only light disc nding is required prior to painting.

lecent developments

Probably one of the most important novations in the welding of car bodies is e application of robots. Probably the iggest user of welding robots is Fiat, who recently have placed orders for over 100 robots from Unimation Inc. for their various car body assembly plants. At the present time, the majority of welding robots used in the car industry are employed on resistance welding, although in Japan, Kawasaki who work with Unimation Inc. have applied modified robots to the semi-automatic welding both on car bodies and on motor cycle frames. The first application of a welding robot within the British car industry has been the Unimation Unimate robot which is used to weld the parcel shelf and backlight rail assembly for the Leyland Princess. Probably one of the most successful aspects of this particular application has been its ready acceptance by the shop floor work force.

A Land Rover assembly line

A number of other companies have developed robots for welding operations including Sciaky, ESAB in conjunction with ASEA, KUKA and Trallfa. The majority of these, however, will still be used for spot welding, and in fact on the production line being manufactured for the new Leyland ADO88 mini small car, robots will be introduced for spot welding for the first time as a production machine tool. While they are not in fact using their own robots on this project, Sciaky do offer their own robot for use in similar installations. It is developed on a modular basis for installation on either a linear basis or on a rotary basis and can also be mounted in a variety of positions on overhead frameworks for ease of access of the welding heads to the car body as it passes along the production line.

Another development has been in the various approaches of the different manufacturers to increasing the life of car bodies to combat corrosion. In the past, the average life expectancy of a car body has only been ten years and it is estimated that each year approximately 15 million old cars are scrapped. This policy does not comply with the modern day approach to the conservation of natural resources and materials other than mild steel have been used. The biggest problem, however, is economics since plain mild steel treated and painted is still the cheapest mass production material for this application.

The use of galvanised steel and aluminium

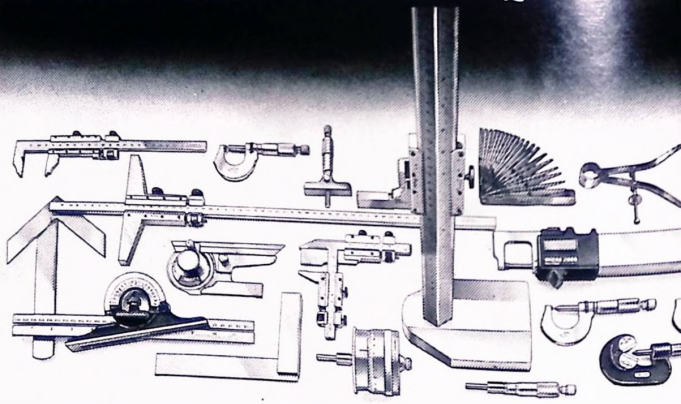
Some manufacturers have turned to the use of galvanised steel in an effort to maximise the return from the life versus cost equation, while others have looked at stainless steel, aluminium alloys and plastic. The first cars to be built with stainless steel bodies were built in the USA in 1936 and attained a life of about 25 years and 600,000km without any appreciable damage. Similarly, a car built in Germany in 1967 is said still to show no signs of rust. One advantage in the use of stainless steel is that it can be satisfactorily recycled and also it can be readily resistance spot welded. Problems do arise, however, with deep drawing the panels.

Aluminium car bodies have been fabricated successfully for many years, the Land Rover has featured aluminium panels since 1948. In both the UK and Germany cars have been built with a steel body fitted with aluminium alloy doors, boot lid, bonnet and wings. In the USA, in an attempt to reduce the vehicle weight typically over 1.5t compared to about 1t in Europe and to thereby decrease the fuel consumption — the USA national average fuel consumption is about 14 mile/gallon compared with nearly twice that amount in Europe — much consideration is being given to the use of all aluminium alloy cars.

Porsche have now introduced a sports car with a completely hot-dipped galvanised steel body which comes complete with a six-year guarantee against corrosion of the underbody and support components. The body is constructed from double-sided hot-dipped galvanised steel having a coating of 10 on each side with particularly vulnerable parts having twice this thickness. Any problems normally associated with the spot welding of these materials due to vaporisations of the zinc and contamination of electrodes is said to have been overcome by the use of copper-chromium-zirconium electrodes.

In conclusion, although many developments have taken place in car body assembly, the next few years will probably see a move towards fuller mechanisation and automation with the incorporation of more long life materials□

SKILLED HANDS DEMAND QUALITY



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Protection against an industrial explosion is essential. The above photographs show part of the Graviner Ltd. explosion protection system guaranteeing increased safety for plant operations.

PROTECTING PLANT AND FLAMMABLE FLUIDS FROM FIRE!

The first three articles of this series dealt with active means of fighting fires — with portable hand-held extinguishers, fixed equipment and alarm systems and fire fighting vehicles. This last and final article of the series deals with the relatively passive but equally important aspect of protection, especially of plant for storing and processing flammable fluids.

HE WHOLE world is stirred and moved compassion by such disasters as ppened in a chemical works in Britain at ixborough in 1974 and at Seveso in Italy 1976. But the fact is, of course, that for ery disaster of such magnitude and verity there are many that do not reach e headlines because they are not so amatic as the plant involved is on a much naller scale and the number of people ncerned is much smaller. But whatever e size of plant and the number of people esent the occurrence can be completely rrifying and literally devastating in its sults. An example of this is a fire in otland in 1977 in a comparatively small ctory. Butane gas that had leaked from e plant mixed with air and formed an plosive mixture, which came into contact ith a hot wire by which it was ignited. lames engulfed the workroom and nine omen and two men fled screaming to afety, beating out the flames on their lothing. They managed to escape just efore the whole workroom exploded. Fortunately there was no loss of life but the damage to property, plant and materials and the interruption to production was very costly and serious.

This one example also indicates a fact that is not always realised — that all fires, like all accidents, do not just happen — they are caused! In the case of this example, had there been no leakage of butane and no hot wire to ignite it all might have been well. Similarly in the case of the Flixborough disaster if the temporary pipe installed as a bypass linking two reactors had been installed knowledgeably and with a full awareness of the temperatures and pressures to which it would be subjected there would have been no disaster.

It follows that successful protection of plant against fire requires not only a great deal of experience and knowledge of the various methods available but also much imagination and awareness of all that could possibly go wrong. For this reason methods of fire and explosion protection are often easier to apply to a new factory or a new works on a new site than to an existing one. The reason is partly that the layout and relative positions of the various units of plant on a site have a definite bearing on the vulnerability of all of them. One of the first considerations, then, is that all liquids that can become flammable or explosive under any conditions should be stored on the site as far as possible from where numbers of people work or live. Thus ideally storage areas should be remote from offices and design departments and also well away from houses and schools and adjacent sites, whether built on or not.

Flammable Liquids

Another prime essential in the case of potentially flammable liquids is that the temperature should be kept down as low as possible. In some cases refrigeration will be necessary in order to achieve this, but otherwise this can be done in various ways. Liquids stored in tanks in the open air

Continued

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nevitably become warmed appreciably by
olar radiation, especially in hot climates.
Consequently it is advisable for such tanks
o be thermally insulated by surrounding
he tank itself by a layer of material with a
ow thermal conductivity, which, in turn, is
enclosed in sheet metal, usually an
luminium shell. In some cases the surface
of the aluminium is not painted as it is nor-
mally resistant to the weather and, being
light in colour, reflects the sun's rays
instead of absorbing them as a dark-
coloured material would do, and in so
doing would become hotter. In other cases
the surface is painted white, which ensures
the maximum reflection of the sun's rays.
This treatment can be applied to any
storage container of any of the various types
and shapes, which may be vertical
cylindrical, horizontal cylindrical with
dished or hemispherical ends or spherical.
Vertical cylindrical vessels may be fixed
or floating roofs.

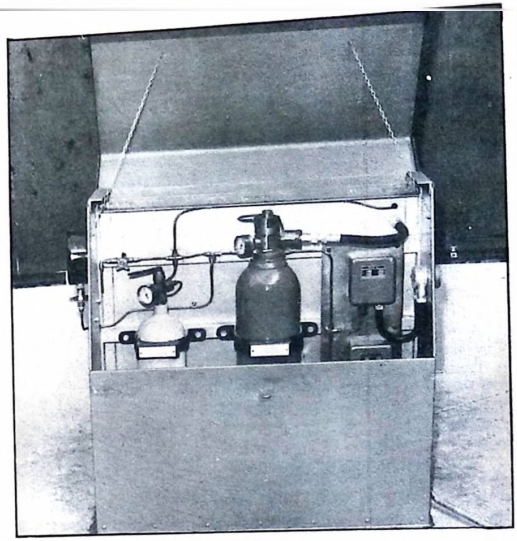
All these types of storage vessel can be
perfectly safe in every way for many
years. But true protection consists of
envisaging every type of hazard and guard-
ing against it. And one hazard that could
be very serious in its consequences is if fire
breaks out anywhere near the tank and is
likely to heat the contents to above a
dangerous level.

Cooling by water sprays

One way of keeping cool most types of storage vessels under such circumstances is virtually by drenching the outisde in a continuous and moving film of cold water. Such a film is applied by a system of nozzles, through which cold water is forced to form an extensive spray by a powerful pump. Nozzles are arranged to cover every square centimetre of surface of the roof and for the water to run down the sides of the tank, in contact with the surface. In the layout of the nozzles considerable skill and knowledge are required to ensure that all the surfaces of the top and sides will be covered by a film of water of adequate and optimum thickness using a minimum number of nozzles, a minimum of water — which may be scarce — and a pump system which is not unnecessarily large or powerful.

A wealth of information and data has been built up empirically by actual applications. Thus in some very large storage tanks each 15.6m in diameter and 21.9m high holding 22,730,000 litres of motor spirit only 94 nozzles are used to provide a continuous film of water over the surface of each tank. Similarly horizontal cylindrical tanks each 20.4m long and 3.7m in diameter containing 101.6 tonnes of liquified petroleum gas are protected by only 64 nozzles. The nozzles are supplied with water from a pump through pipes to which are attached headers, in which are fixed the nozzles.

The operation of spray systems can be made fully automatic so that if a fire occurs in the vicinity of a storage tank and the surrounding temperature is raised the



A Chubb fire protector for floating roof tanks

the pump is started up so that the protective water curtain around the tank is formed in a matter of seconds. The heat-sensitive detector frequently consists of a small glass bulb containing a vapourising liquid under pressure in an inter-connected closed system. If the temperature rises to a critical level, one or more of the bulbs will burst, reducing the pressure in the system and operating a diaphragm valve which initiates the supply of water to the spray system. The pump can be powered by compressed air or by an electric motor connected to public or works electricity supplies, if they are available; but for remote locations where there are no electricity supplies it may be necessary to install a diesel engine which will start up automatically on receiving a signal. A standby diesel engine will also be desirable in case the public electricity supplies are interrupted by the fire. The water supply can be from public mains or from a nearby pond or river or a specially-constructed lagoon. It is usual to surround the ground below and around the tanks by a low wall, known as a bund, with the surface of the ground inside concreted so that the water from the sprays does not simply soak into the ground or run away but accumulates within the bund and runs down a drain to be carried back to the source for re-cycling. This is, of course, especially desirable when water is scarce.

Foam protection

As will be known, some storage tanks are of the floating roof type — that is, the roof rises and falls within the circular shell or walls according to the quantity of the contents in the tank. Between the floating roof and the inside walls of the tank there is a seal and under certain circumstances this could be vulnerable to leaks and subsequent fire. The usual type of extinguishant for such a fire is foam which blankets the area of the fire and deprives the fire of oxygen so making further combustion impossible. The foam is discharged to the top of the seal area by a number of foam pourers mounted on the top edge of the tank. In many cases the most practical means of applying foam to such tanks is by

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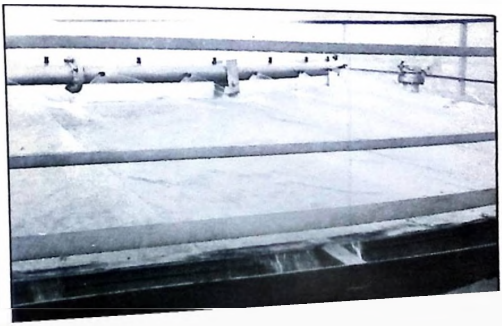

A water spray system at a BP oil terminal. A splash plate extends round the roof edge of each tank and is angled to deflect water down the sides.

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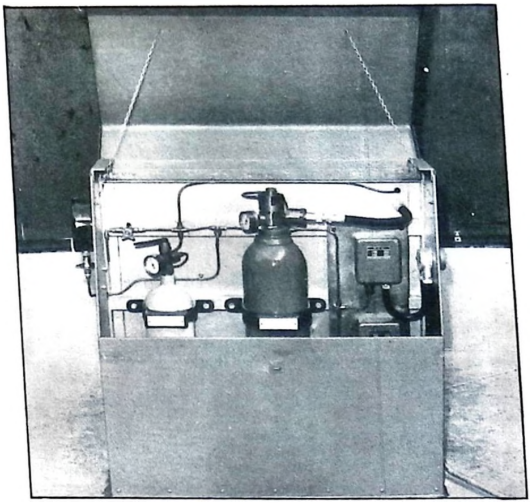

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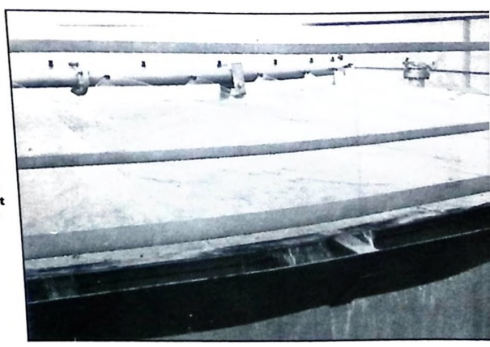


A water spray system at a BP oil terminal. A splash plate extends round the roof edge of each tank and is angled to deflect water down the sides.

Continued

foam tenders, the output hoses of which are coupled up to risers fitted to the side of the tank, up which the foam is raised by a pump on the tender. In the case of fixed roof tanks also it is sometimes preferred to use foam, but this is used when the liquid is already burning on the surface inside the tank. In order that the foam may be directed gently on to the surface of the burning liquid it is necessary to fit foam pourers to the inside of the tank.

Protection by BCF

An alternative extinguishant for floating roof tanks is BCF — bromochlorodifluoromethane — which is a vapourising liquid producing a heavy vapour which persists for a considerable time over the area of the seat of the fire and so prevents further combustion by excluding atmospheric oxygen. The system incorporates automatic fire detection along the entire length of the seal, so that even a small fire at any part of the seal will cause automatic discharge of the BCF into the whole of the sector in which the fire occurs. This is achieved by the use of a small-diameter nylon tube, protecting equal lengths of the seal. Each tube is connected to a steel cylinder containing nitrogen or air under considerable pressure and the cylinder is connected also to the discharge valve of the cylinder containing the BCF under pressure, the pressure of the nitrogen in the system holding the valve in the closed position. Should a fire break out in the neighbourhood of the seal, the nylon tube will become heated and will soften and then burst due to the pressure within. Nitrogen under pressure in the tube will be released and the loss of pressure will cause the discharge valve of the BCF cylinder to open. Liquid BCF is then released and discharges at a high rate along the stainless steel manifold which runs the whole length of the seal segment and has discharge outlets every 0.609m. Pressure switches and full instrumentation provide local and remote indicat[illegible]hat a fire has and that the sy[illegible] has operated shows the press[illegible]within the cylinde

An alternative extinguishant for roof tanks using BCF.

Steam curtain vapour barrier Hazard reductions

It will be realised that any flu fluid which is stored, handled or pr under pressure will become a

Co

ntinued
mospheric pressure and give rise to a oud of heavy, flammable and explosive apour as a result of accidental release. he cloud can travel a considerable istance from the point of escape in flamm- ble concentration and can be ignited by a ource of ignition many metres away, iving rise to fire or explosion with possibly isasterous consequences. Such an ccurrence happened at the Rhone-Alpes efinery at Feyzin, when a cloud of ropane vapour was ignited by a passing notor car at a distance of 160 metres from he point of escape. The hazard is ever present in the petroleum refining and petro- chemical industries and — as in the case of other hazards — the first and foremost measure of protection is good engineering design, construction and maintenance and unfailingly correct procedures aimed at minimising accidental release of process materials. But in practice it is impossible to eliminate leakage and spillage entirely and at all times. The hazard of fire or explosion will be considerably reduced if the plant has been sited away from an area where there is likely to be ignition or flame — accidental or otherwise — and that there is sufficient distance for released vapour to be sufficiently dispersed or diluted by natural air movement so that it is no longer dangerous.

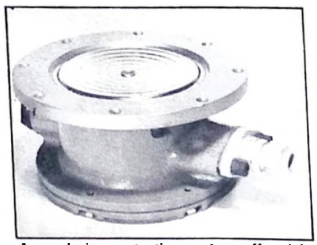
Hazard reductions

But to reduce further the hazard and to assist further in the dispersal of a vapour a simple yet highly effective system has been devised by Imperial Chemical Industries Ltd., (ICI) of Britain. The system consists of a vapour barrier incorporating a lightly-constructed wall or bund about 1.5m high, near the top of which is mounted a horizontal steam pipe with a row of small holes in its upper surface. The wall provides a check to the cloud spreading along the ground, but at the same time causes no significant interference with the dispersal by natural air movement of vapour that emanates from small escapes. The holes in the steam pipe are spaced closely enough to ensure that individual jets combine to form a planar jet or curtain of steam. The curtain of steam entrains the approaching vapour together with the very much larger volume of air required to dilute it to its lower limit of flammability. The steam pipe is divided into sections so that only those parts covering the area downwind of the escape are brought into operation. The system can be brought into rapid action automatically by the use of an arrangement of sensitive quick-response gas-detectors installed near the possible point of vapour escape. Upon sensing the presence of a vapour, a detector will give an appropriate visual and/or audible signal at a display panel which carries also the initiating controls for the remotely-operated steam valves.

This system was developed by ICI in the first instance for use in connection with their ethylene plant, but has since become used by themselves and other firms, the aim in all cases to reduce vapour contration to lower flammability limits.

Explosion suppression

Another system of protection against fires and explosions has been evolved following extensive and detailed studies of the procedures leading up to an explosion. In brief, for example, an explosion of a mixture of a hydocarbon vapour and oxygen — whether atmospheric oxygen or not — is not a completely instantaneous occurrence but though rapid, requires a definite and calculable time from the instant of ignition to the development of maximum pressure before the explosion actually occurs. The speed of travel of the pressure waves is, in fact, appreciably faster than the speed of travel of the flame front which emanates outwards in all directions from the point of ignition. If, therefore, during this time the rise in pressure can be sensed or detected, instruments and mechanisms can be brought into operation extremely rapidly to prevent further travel of the flame front. The usual means of achieving this is by a suppressor or device operated electrically as a result of the detector sensing a rise in pressure.



An explosion protection system offered by Graviner requiring low maintenance and routine inspection.

The suppressor stores a rapidly-vapourising liquid under high pressure, and when the suppressor is actuated the liquid is ejected as a rapidly-expanding hemisphere of fine droplets which immediately vapourise while moving outwards at a speed of over 61m per second. This is very much faster than the speed of flame travel so in addition to extinguising the flame by chemical action and cooling, it inerts any unburnt explosive mixture. This system has wide and valuable use and is suitable not only for protection of storage tanks containing liquid or gaseous hydrocarbons but for protection against dust explosion, of which there are a variety of types which can be extremely destructive to lives and property. Dust explosions require certain definite conditions to take place and the two essential factors are a cloud of finely-divided combustible material and a source of ignition, which may be a flame, a spark or a red-hot surface. Dust explosions are especially prevalent in the food industries in which carbonaceous materials in the form of a very fine powder — such apparently harmless materials as flour, custard powder and instant coffee presenting considerable hazards — are widely used. In that connection, windmill explosions — probably the earliest types of industrial explosions — took place in the 17th century and still typify the basic nature of such explosions. Thus when the wind was blowing strongly and the miller was taking advantage of the situation to grind as much flour as he could in the shortest possible time, the wind might also sweep through the nooks and crannies of the windmill and swirl some of the flour inside into the air to form a thick cloud. Then a spark from one of the rapidly-revolving millstones could ignite particles of flour close at hand, which would set fire to other particles near them, thus setting in train a chain of combustion which might develop into an explosion blowing the the windmill in half. In these days the source of ignition can be a glowing cigarette, hot surface, open flame or electric fire or an electrical fault giving rise to sparks. Flour mill and similar explosions in which combustible dusts are involved still take place today, in various parts of the world, and it is possible that practically all of them could be prevented by the suppressor system.

It will be realised that only a few of the more widely used methods of fire protection of plant in which are stored large quantities of flammable liquids can be described here, but many additional precautions can be taken.

Safety audits

A practice that is being used more and more by manufacturers storing or producing hazardous materials is safety auditing. The word 'audit' has traditionally been associated with financial accounting procedures, but a safety audit means that instead of an accountant examining books and documents relating to the finances of the Company, teams of experts such as safety officers and chemical engineers will be empowered to proceed everywhere on the manufacturers premises and examine every detail of the plant from the safety point of view and to make a report.

Finally, though many firms who store or manufacture hazardous materials appoint a safety officer to recommend and to put into operation suitable measures and ensure that all safety regulations are complied with, it is becoming more and more stressed that accidents involving valuable plant — like all accidents, for that matter — cannot be considered to be the responsibility either directly or indirectly of one or a few persons — it is the responsibility of senior management or the board of directors, each member of which must be held inescapably responsible ultimately. Consequently it is essential for them to maintain a close and active interest in all safety measures at all times. Though such efforts may appear tedious and non-productive, it is obvious that by identifying risks and eliminating them before incidents occur, the efforts are amply justified by the prevention of loss of life, injury, damage to plant and materials and interruption of production □

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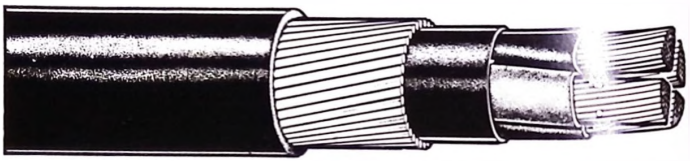

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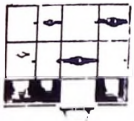

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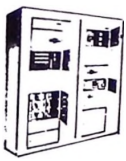

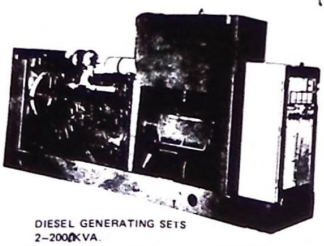

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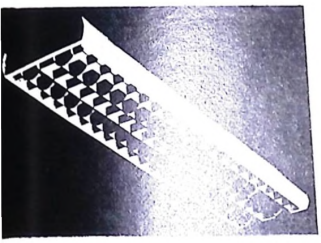

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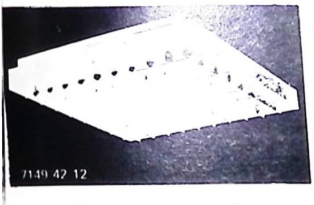

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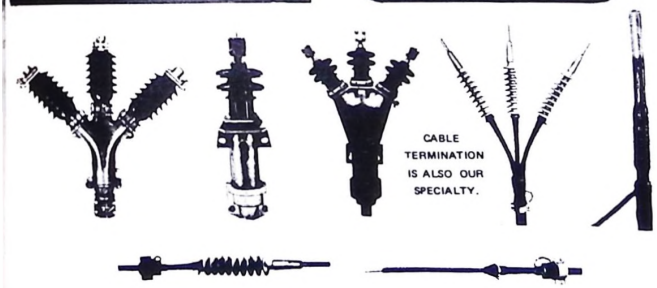

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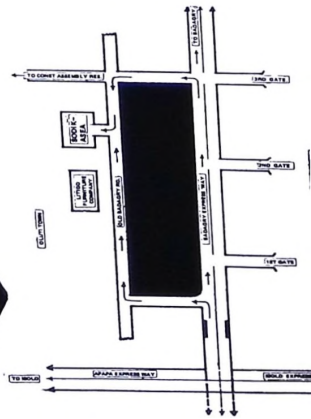

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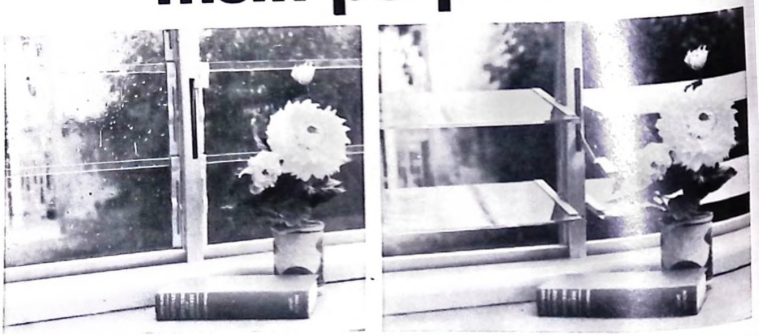

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You only fit windows once, so fit the best.

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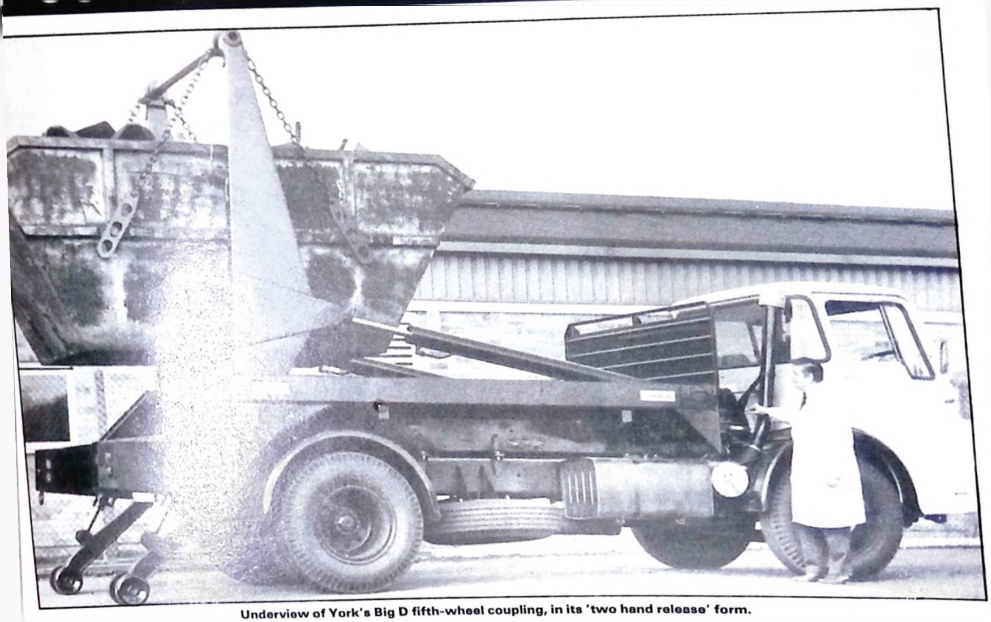
COMMERCIAL VEHICLE — YORK



Underview of York's Big D fifth-wheel coupling, in its 'two hand release' form.

Though a trailer for hauling general cargoes is a fairly simple piece of engineering, the rigours of modern transport - heavier loads, at higher speeds, over longer distances — have increased the operational demands on trailers. The York Trailer Company is endeavouring to meet such requirements in West Africa, as Alan Bunting reports.

SALES OF York trailers and ancillary equipment into West Africa have now reached approximately N1.2m annually. The figure does not include sales from York's two newest subsidiaries, Anthony Carrimore and Scammel Trailers.

West Africa was the first export market, outside Europe to which York turned its attention, and the first visits were made in 1960 to Nigeria and Ghana by Henry Hahn (still with York and now sales manager, Far East).

York supplies relatively few fully assembled trailers to West Africa — the majority of equipment being supplied in the form of completely or semi-knocked down trailer kits for local assembly, and trailer components — axles, suspensions, landing gear, braking, lighting kits, and so on — to local trailer/tanker manufacturers.

Since the full range of York trailer components (axles, suspensions, landing gear, etc) are manufactured within the group, mainly by York Technical Services, York can offer as much or as little of a trailer as local supply or import tariffs dictate. The duty varies typically between 15 and 30 per cent, for part-built through to fully-assembled trailers.

Typical of the trailer equipment shipped to West Africa by York is the company's Dreadnought suspension for tandem-axle bogies. With its classical high-articulation two-spring layout, the Dreadnought is well-suited to running on unmade roads. Three different ratings are listed: 26, 30 and 40 tonne, intended for off-road bogie ratings of 20, 25 and 30 tonne respectively. Axle spread varies from 1245 mm on the lightest version to 1524 mm on the heaviest-duty unit. The attachment of the springs to the axles is by rubber-encased "hoods" designed to minimise torsional shock loads. Lips incorporated in the two bottom leaves provide positive axle location.

Wheel alignment is accomplished by adjuster bolts below the springs. The main pivot bushes of the bogie — on which the springs articulate vertically — are impregnated with dry lubricant, although the 40 tonne DNS8 Dreadnought suspension uses large taper roller bearings. For low-loader

Continued

Pole carrier suitable for hauling timber of almost any length.

Continued

applications or where ground clearance considerations are not critical, the suspension is offered in underslung form — that is with the springs below the axles and bogie pivots.

Good suspension

The York Dreadnought suspension is already well proved over many years of successful operation throughout Africa and the Middle East, and the 800-series range of axles, introduced two years ago and developed specifically for operation under arduous road conditions, are already being accepted by operators and trailer builders alike.

Axles are supplied by York for incorporation into other manufacturers' running gear as well as being fitted as standard in York's own trailers and bogies. The 800-series range includes axles to suit single or twin wheels of 20 and 24 in nominal size. The axle beams are tubular and fitted as standard with 420 mm diameter S-cam brakes. Hubs are either grease or oil lubricated, to order. Stub axles and drop-centre designs with the same hubs are available for plant-carrying and special application trailers.

Beam diameter is 127 mm on 800-series axles rated at up to 15 tonne. Heavier models employ a 152 mm diameter beam tube. Effective brake width varies from 178 to 219 mm, depending on axle rating. Brake details include self-lubricating phosphor-bronze pin bushes.

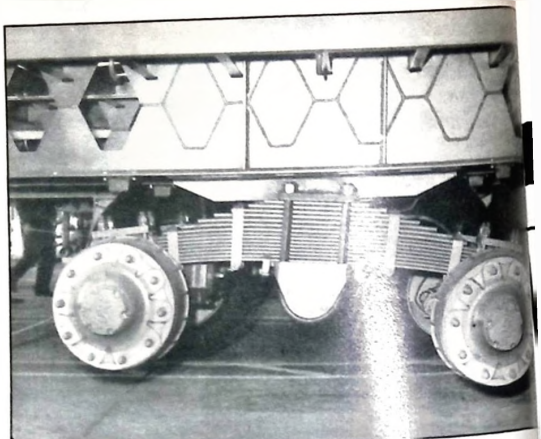
Tapered roller bearings are fitted for both inner and outer hub races, the two being spaced generously for optimum strength under cornering loads. Standard wheel track width is 1.85 m for twin tyres and 1.98 m for singles, both intended to suit heavy trailers up to 2.5 m wide.

Among the users of York running gears are Nigerwest (for liquid and powder tanks) and Morgan Enginnering of Ibadan. Other items of trailer equipment exported from the UK to West Africa by York include semi-trailer landing gears, fifth-wheel couplings and bogie sub-frames.

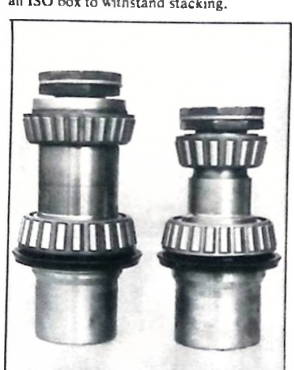
Assembly at Isolo

Complete York platform trailers are assembled at Isolo by the Nigerian Technical Co. Ltd. (Niteco), based in Apapa, but selling through branches in all parts of the country. The main I-beam longitudinals and chassis crossmembers are shipped from the UK; Niteco adds the decking and any other body structure — typically stake or dropsides. Other superstructures, designed to carry agricultural produce, freight containers and bulk liquids can also be supplied on York trailer frames, as well as tippers and car transporters.

York's export director Graham Brant reports a discernible trend to enclosed van trailers in West Africa. In some cases Niteco builds simple van bodywork on to York general-purpose frames. But in recent months, interest has developed in so-called frameless trailer vans. The York Freightmaster is market leader in Britain and the company is now promoting it actively in developing countries like those of West Africa. The Freightmaster is essentially a rigid box like an ISO freight container but without the hefty corner pillars needed in an ISO box to withstand stacking.



York's heavy-duty Dreadnought suspension articulates over [illegible] angles, to negotiate [illegible] surfaces.



Wider-spaced bearings are employed on the hubs of the latest 800-series York axles, seen (left) alongside the older 160 series hub.

Instead of employing a traditional chassis frame underneath the body, York makes the sides of the Freightmaster strong enough in their own right to withstand bending loads. Because there is less metal in such a trailer van its cost is below that of an equivalent underframed van trailer — for lengths above about 10 m, at any rate. Freightmasters are shipped in sub-assembled panels — sides, front and doors — with floor structures built up locally.

For security reasons and also to give full weather protection, enclosed van trailers with ISO container-style rear doors, are finding favour increasingly. As sales of consumer durables grow in countries like Nigeria, the risk of pilferage from and sheeted vehicles inevitably [illegible] Transport of food at controlled temperatures has also meant a swing to insulated van trailers.

Both aluminium and steel panelled versions of the Freightmaster are offered by York in West Africa. Although heavier steel vans are easier to repair.

Growing markets

Ghana and Cameroon are two growing markets for York. Both countries take pole-carrier trailers for sawn timber haulage up country. Trading restrictions imposed on imported goods entering Ghana have meant that nearly all York's business has been in componenets.

York was present in Ghana, as early as 1963, when the Ghana State Trading Corporation purchased its original fleet from York. Most of the platform trailers and Freightmaster vans supplied then are still in operation. York supplies trailer components to a number of Ghanaian equipment manufacturers, including Leyland Motors, Metal Construction Ghana Metal Engineering (all based in Accra) and to A. S. Halaby Engineering in Kumasi.

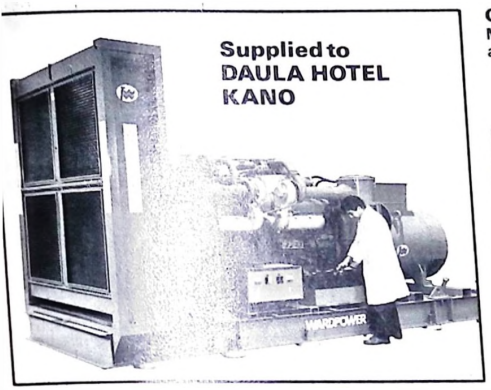
Shipments to Ghana during November/December 1977 included a total of 100 sets of trailer components to Leyland Motors.

Mr Brant says the next York product likely to be marketed in West Africa is the Skipmaster — a rival to the Meiller skip lifter — which is being produced in Ghana form for local assembly.

Since 1960, York has supplied over 200 trailers to Nigeria. A recent shipment to Niteco included 83 trailer kits and three DN5 running gears, valued in all at more than £250,000, sterling.

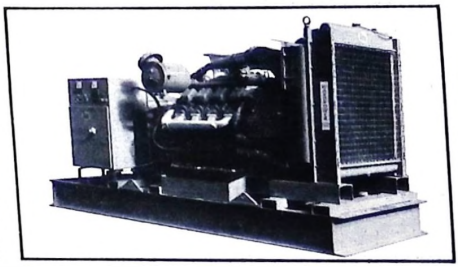
A limited amount of business is being done by York in Senegal, Cameroon and the Ivory Coast. It is mainly ckd equipment and items like fifth-wheel couplings.□

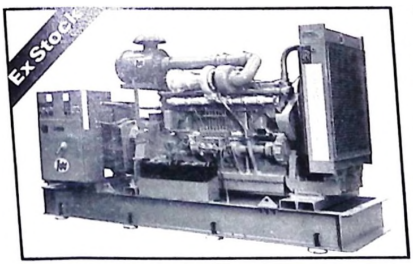
NAMCO supplies NIGERIA with WARDPOWER!



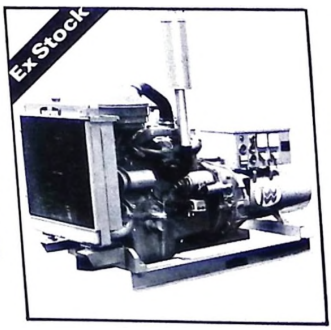
G.M. DETROIT 1000 kVA
Models from 140-1000 kVA available

DORMAN 250 kVA
Models up to 720 kVA available





ROLLS ROYCE 250 kVA
Models from 106-312 kVA ex stock, other Sets up to 625 kVA available



FORD 25 kVA
Models from 25-70 kVA ex stock

Generators for Base Load, Auto Mains Failure and Stand-by Power - many ex-stock

WARDPOWER Generating Sets with GM, Dorman and Perkins engines also available

WARDPOWER GENERATING SETS FROM:-

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Dantata House, Murtala Mohammed Way,
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Ward Centenary 1878-1978

Wardpower Generating Sets manufactured in England by
Thos. W. Ward Ltd, Machinery (Wardpower) Division

M154

Low noise generating sets

A range of simple push-button diesel powered generating sets offering low noise levels at competitive cost has been introduced by **Dawson-Keith Ltd.**

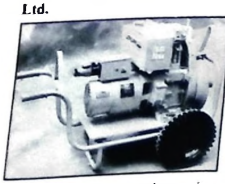
The LN generators offer outputs of 16kVA, 20kVA, 35kVA, 50kVA, 55kVA and 70kVA. Each is fitted with a sound attenuating canopy which, the company claims, provides the best available balance between noise reduction and reasonable cost. The 35kVA unit, for instance, offers sound attenuation at one metre distance in the 15-20dB range.

Internal insulation of the canopy consists of a 25 mm. thick sound absorbent foam lining sealed by a polyester membrane with an aluminium facing. Dougle access doors are fitted, one incorporating a large glass inspection panel. A silencer is fixed above the canopy, and air inlet and outlet attenuation louvres are fitted at each end.

The sets have been designed and styled for domestic applications to satisfy a demand for reasonably priced, reliable and relatively simple push-button start sets which will run quietly. However, the manufacturer believes that the range will find applications in all markets where noise is a problem and cost is an important factor. For further information contact **Afrotec Technical Services Ltd.**, Oshodi.

Generator for traffic lights

A portable generating set with close-coupled Lister engine, designed specifically for temporary traffic lights applications, has been introduced by **Jonlaw Engineering Company Ltd.**



By direct coupling the engine to the alternator, Jonlaw have eliminated the danger of belt slip or wear, with a resultant increase in reliability and improved voltage regulation. Users of belt-driven types have met the introduction of this new model with enthusiasm.

Designed to supply constant power to temporary traffic lights, the model LT.01 Generator has a large fuel tank for 24 hours continuous running and is fitted on to a robust two-wheeled trolley with anti-vibration mountings. Large, 14 in. diameter, solid rubber tyred wheels and a balacned design assist its manoeuvrability over rough terrain.

Small sump pump

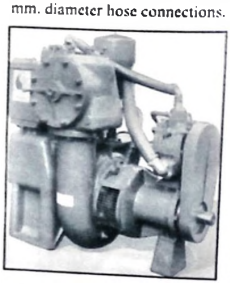
Pullen Pumps Ltd., are marketing a new submersible drainage pump designed for small sump (450 x 450 x 500 mm. deep minimum) applications on building sites and in cellars etc. Designated the 'Minor', the new pump incorporates a thermal cut-out and float switch for automatic control and has a maximum capacity of 9.5 m^3/h. and a maximum head of 7.6 m.

The Pullen 'Minor' pump can lower the water level to fractions of a centimeter and can continue running in a dry condition for sometime without sistaining damage. Maintenance is negligible as the pump has no bearings or stuffing boxes. Construction is based around a stainless steel shaft with a mechanical seal of carbon/ceramic material and a glass reinforced Noryl impeller. The pump body is of aluminium. Operation is via a 220/240v. single phase 50Hz power supply with capacitor permanently connected. For further information contact **Addis Engineering Ltd.**, Lagos.

Pumps in bare shaft versions

To meet the requirements of users wishing to fit their own prime movers, two pumps from the Univac range manufactured by **Sykes Pumps Limited**, are being made available in bare shaft versions.

The pumps are the models YVC4 and UVC6. Both are of the solids handling, fully automatic vacuun priming centrifugal type, the former being equipped with 100 mm. diameter and the latter with 150 mm. diameter hose connections.



The Sykes range of Univac centrifugal pumps is designed for a wide range of duties including pumping water containing a high proportion of abrasive solids, crude sewage, thick slurries and trade effluents. Equipped with an integral vacuun pump they are capable of rapid priming and re-priming at suction lifts down to 9.14 m. Their ability to operate efficiently and without supervision makes them especially suitable for sewer over-pumping, wellpoint dewatering, or in other applications where intermittent flows cause the inlet to be continually exposed to air. For further information contact **Leventis Technical Ltd.**, Lagos.

Portable fire pump

A portable fire pump weighing only 180 kg., yet with a capacity of 2,100 litre/min. at 7 bar, has been introduced by **Angus Fire Armour Ltd.**

Incorporating a stainless steel frame, fuel tank, exhaust and priming system for ease of maintenance and durability, the pump, which can be stowed in a vehicle or trailer, is claimed to be ideal for use in high risk areas.

A 12V electric st... with a 38 amp/hr. b... alternator are fitted as ... Emergency back-up ... provided by a 12V b... hand crank starter.

The pump is powe... 00cc four-stroke ... oled engine developi... .5 bhp) at 5200 rev. ... or priming, a stain... ust gas ejector gi... bility of more th... perature, pump ... compound gaug... ded and optional ... ation includes an ... eter. For further ... ontact **Guthrie** (... Ltd., Lagos.

Diesel engine protection system

Engine damage to ex... automotive, agricultura... marine engines is preven... an automatic diesel ... protection system which ... gradual shut-down in the ... of water or oil loss.

Eliminating compl... wiring, lights or buzzers ... can develop problems ... long-term use, the Lo... system is claimed by ... manufacturer **Interlube Sys... Ltd.**, to be completely rel... and foolproof. It does ... depend on the drive... awareness to take preven... action.

Its basis is a fuel cut-off v... which is held open by eng... lubricating oil pressure w... the engine is running normal... If oil pressure falls, or eng... temperature exceed... approximately 93 degrees ... the valve closes progressive... until it cuts off the fuel supply ... the injection pump some 45 ... seconds later.

More information may be obtained for any item by using the form facing page 196.

Hand tool Digest

Eclipse saw sharpener

The Eclipse Saw Sharpener manufactured by **James Neill (Sheffield) Ltd.**, is packed in a full colour pictorial box, whichcan be adapted either for pegboard display or as a free standing unit. Inside is a multi-lingual instruction leaflet showing the method of operation for each particular type of saw.

The saw sharpener is designed to sharpen rip, cross-cut, tenon and fleam cut saws having 4½ to 15 points per 25 mm *(except hard point saws)*. It is capable of consistently producing the recommended tooth face angle for each type of saw and for initial shaping and final sharpening of saw teeth.

The sharpener enables the handyman and tradesman to restore their handsaws to the condition when purchased, without resorting to professional service. This tool is simple to use, promotes consistency and reduces the requirements for time honoured skills and practice. For further information contact **E. Osborne (Nigeria) Ltd.**, Lagos & Enugu and **Allen & Elliott (Ghana) Ltd.**, Accra.

High speed orbital sander

Skil, power tool specialists, announce a new model 661H orbital sander. The high speed and the possibility to collect the dust deserve special attention.

The no-load speed rating is 10.000 rpm. which means in fact 20.000 sanding movements per minute. This high speed enables the operator to work very fast and to achieve a beautiful finish without scratch marks. It goes without saying that this is very important for the quality of the final appearance of the work piece, no matter if it is varnished lacquered or painted.

The dust pick-up accessory that purchased separately consists of a sturdy plastic which surrounds the sides of the sander entirely and a flexible hose can be attached to any vacuum cleaner. Practically all dust disappears in the workroom so therefore, the operator can freely sand in areas where painting jobs are done at the same time: there is no danger of dust adhering to the paint. And in homes painting jobs at home the wife will also be pleased this can be done without dust all around. Last but not least, the hygienic aspect is very important for the operator's health. For more information contact **Lagos Co. (Nigeria) Ltd.**, Lagos.

New terminal assemblies

Among the new items manufactured by **Electricals Ltd.**, are the developments, a enclosure for terminal assemblies; a "heelclam" of termination; and screw terminals.

A transparent shroud cover and two mounting rails are now available for use with the TS 32 and TS 35 terminal assemblies. For increased safety, while allowing visual inspection terminals themselves, mounting plates clip on to DIN rails to provide a arrangement.

Contractors will be interested in the Stripex wire stripper introduced recently, which accepts cables from 0.5 mm² and contains a built-in cable cutter covering the same range.

PRODUCT DIGEST

Multi-tier storage system

A free standing, multi-tier storage system from **SSI Fix Equipment Ltd.** can be erected up to 6m high without needing supporting steelwork. A wide variety of interlocking modular components offers flexibility of storage space with great strength and rigidity.

Parts of the Regal 2000 system are easily fitted without the use of nuts or bolts, making installation or alteration simple. Each module is 2m high — made up of two 1m units — so that the system can be easily transported in kit form. A typical shelf unit consists of a base with uprights and locating plugs, intermediate shelf with locating plugs, uprights of top unit and top cover with locating plugs.

Modules can be stacked on top of each other up to three tiers high; for additional flexibility, a half unit 500m high is also available. Components include shelving, cupboards, partitions, lockable and folding doors, tool drawers, bin dividers, containers, floors, stairs, gangways, rails and louvred panels. Individual shelf units may be altered without dismantling by the addition of side and back panels, doors and drawers. For further information contact **Leventis Stores Ltd.**, Lagos.

Multi-functional gymnasium

A multi-functional gymnasium system developed by **J. F. Engineering Ltd.**, is claimed to meet modern physical education requirements for maximum flexibility to enable students to develop their creative potential through "free" gymnastics.

Known as Unit 7, the equipment is offered as a comprehensive training system and is suitable for students of both sexes between the ages of six and 18. It consists of vertical anodised aluminium alloy poles and ropes suspended from, and running along, steel tracks fixed to the gymnasium's roof structure, together with a range of ancillary equipment which can be built up to meet different training requirements — from basic school gymnastics to pre-Olympic activities. Individual poles and ropes slide out from the wall and can be quickly set up and completely cleared away after use by the pupils themselves, leaving the gymnasium floor space clear for other activities.

'Factory on wheels'

A US manufacturer, **Field Form Inc.**, has condensed a metal roofing factory and put it on wheels so that builders can make their own walls, roofs or floors right on the job site for a fraction of the factory cost.

The manufacturers say builders can manufacture walls of any length, unlike pre-set built walls. The factory-on-wheels also saves freight charges and damage in transportation. It can be used at remote sites and for everything from apartment houses to submarine bases.

Telatronic Alignment system

Wheel-alignment equipment that automatically compensates misalignment on all four wheels so that correct centred steering wheel position is ensured is one of several advanced features on the **Blackhawk** Telatronic wheel alignment system.

It is believed to be the only commercially-available system that checks the wheel geometry by taking into account the alignment of the rear wheels. To deal with the complicated mathematics of compensating on all four wheels at one, the Telatronic has its own "brain". This is the Computrac Memory system which memorises the four basic angular values, then computes and applies correction factors to each of the settings. Front tow is set after taking the complete vehicle system into consideration. There are no calculations that have to be made by the operator.

Before starting a test the manufacturer's specification details (including tolerances) are fed into the equipment. All operations are controlled at the front wheels; it is here that the adjustments are made as the equipment is orientated to vehicle operation. Furthermore, there is no need to line up against screens or charts.

Merryweather's new fire engine

Nigerian authorities have ordered eight of the new Type 'B' Water Tende... **Merryweather**, ... engineers.

Called the 'Marque... the new fire engine ... designed for the ma... tender market. It ... supplied to suit local ... — there are some 40 ... on the standard mode... competitively priced. ... plies with the JCCD... specifications.

The Type 'B' is based ... internationally acc... chassis which has a 1... wheel base. The laden w... between 9 and 9.5 tons.

Pressure cooker generates own superheat

A completely automat... pressure cooker oven, ... generates its own sup... steam in a stainless ... cooking compartment, ... produced by **GFE Bur... Son Ltd.** Designed ... restaurants, hospitals ... industrial catering depart... the Dart is independent ... separate steam supply. ... pressure system enables ... vegetables, fish and poul... be cooked on a high setting ... puddings or a whole ham ... low.

Running costs are low ... oven is ready for immedi... after an initial 30 minutes ... up period. Everything is c... as required, so food wastag... minimised and quality ... maintained. Prepared food ... be reheated in a few minute...

roduct Digest

elemetry cuts neasurement osts

Vith the pace of developments the aerospace and defence elds over the last 15 years here has been an enormous emand for extremely sensitive, emote measurement and control equipment to operate in he most inaccessible and nostile of environments. Now many of the results of this demand are available to hard more mundane, but equally exacting, problems in the industrial sector. One company whose equipment has even this manner is **Tesdata Inmet**, Florida based company.

Tesdata Inmet are now to offer an inexpensive, modular approach to telemetry problems of all kinds. Typical applications for Tesdata Inmet equipment have ranged from the measurement of vibration and aero-dynamic loadings on gas turbine fan blades by NASA, in an effort to reduce commercial jet engine noise, to the study of the behaviour of potatoes as they pass through a harvesting and sorting machine, for an agricultural machine manufacturer.

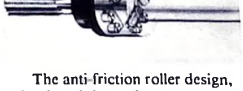
Marine applications have included in-running measurements on marine diesel engines for the development of improved combustion chamber shapes, by a leading European manufacturer. Transmitters and batteries were mounted on and around the pistons and the resulting measurements led to a new design which dramatically uprated the horsepower for a given engine size.

In the conveyor belt field a system was designed for the measurement of strain and tension in applications including metallic belts, chains, and underground cables, where radio cannot be used to transmit directly the information, to continuously monitor joints against breakage due to overstrain. It was originally developed for a belt 30,000 m. long, 13 m. wide and 26 mm. thick. Made of neoprene embedded with 58 steel wires each 12 mm. in diameter, the total weight was 3000T and it cost £4.5 million. Manufactured in 400 m. lengths, these were vulcanised together by staggering butt joints and the cost of the telemetry system to monitor these critical areas would be just £100,000. Four strain gauges were to be vulcanised into each joint together with transmitters and batteries.

Floating tool holder

An anti-friction floating holder for reaming and tapping tools incorporates rollers to overcome the loss of machining accuracy that can occur with traditional types using ball bearings.

Correction of misalignment between machine spindle and tool guiding bush by ball bearings to provide a parallel floating movement to the cutting tool causes fretting after some time. The balls ultimately become embedded and the free movement, essential for floating, ceases.



The anti-friction roller design, developed by **Bristol Erickson** specialising in machine tool equipment, provides full line — instead of point — contact to eliminate fretting and maintain constant float. The 12 rollers in the floating holder are true, full rolling units and cannot slide. They provide a full 0.75 mm. movement in all directions to give a total float of 1.5 mm.

An automatic self-centring mechanism, set for normal use by the manufacturer, is incorporated. For high spindle speeds or heavy cutting tools, this mechanism can be adjusted by a hexagonal key to counterbalance the increased centrifugal force.

Heat-sensing cable for fire alarms

A special cable to act as a continuous linear heat sensor for use with fire alarms has been developed by **Pathfinder Safety Systems Ltd.** It resembles normal twin core cable and can, in fact, be used to wire up the alarm system as well as providing a warning of rising temperatures.

Secret of the heat-sensing cable is its specially formulated thermoplastic insulant which melts at either 68°C or 105°C depending on the type selected. The former is distinguished by a braided red polypropylene casing and the latter by a black PVC sheath which is weatherproof and enables the cable to be used out of doors.

As the temperature rises to the melting point of the thermoplastic insulant, the latter breaks down and short-circuits the conductors which thus trip audible or visual alarms or activate a sprinkler system. Cable joints can easily be made with standard connecting strip so that, after a fire, affected lengths can quickly be stripped out and replaced.

The cable can be run around shelving in a warehouse or along an oil pipeline to give warning of rising temperatures that either indicate a fire or warn of explosion risks.

Precipitated plasticiser can be re-used

An electrostatic precipitator developed by **Spooner Edmeston Engineering Ltd.**, for the pvc-coating industry, removes plasticiser and other contaminants from the processing oven's exhaust in a single operation so that the plasticiser can be re-used in certain applications.

Previously, much larger units had to be employed to cope with the amount of air needed to cool fumes sufficiently for ionisation to occur; an alternative method was removal of the plasticiser, suspended in water, in a second operation.

The latest machine solves these problems. It water-cools the oven exhaust gases by means of heat exchangers so that no water is introduced into the exhaust nor is its volume increased as in normal air-cooling methods. All condensable fractions, including plasticisers, are removed leaving clean, non-toxic exhaust to be vented to atmosphere while precipitate is recovered for further use if required. Two separate, infinitely variable, outputs are provided by the equipment's power pack to drive the ioniser and separator individually.

In operation, contaminated gases are fed through cooling, ionising and separating sections to emerge clean for venting. Precipitate is drained into a receptacle to prevent sewer contamination. A bypass duct enables the equipment to be cleaned without a complete plant shut-down.

Coming shortly . . .

WEST AFRICAN TEXTILES

ANOTHER MAGAZINE IN THIS MAGAZINE

Commencing July and every other month W.A.T.R. will contain a special section specifically written for those interested in textiles. Relevant articles for the industry written by experts will make this the only textile publication for this area.

If you are in the industry ensure that you will receive the magazine by completing the Subscription Form opposite page 198.

If you sell machinery or materials then call our nearest Sales Office for more details about advertising.

Audio-visual product digest

Studer in Nigeria

Willi Studer based in Switzerland are manufacturers of equipment for operation in broadcast, television, film and recording studios in addition to hifi products for the ambitious and advanced amateur. Language laboratories and audio-visual products are also included.

The world-wide distribution of Studer products is carried out by Studer International AG. The range of products sold comprises complete systems of professional equipment. It includes

— Studio Tape Machines
— Studio Mixing Consoles
— Complete Studio Equipment.

Studer Tape Machines and Mixing Consoles are available in various executions, to meet almost any possible requirement.

The group of systems includes among others complete mono or mono/stereo broadcasting studios, various versions of OB-Vans, and a sophisticated system for audio-audio, video-audio and film-audio synchronization.

Among other big projects overseas, Studer have equipped eight complete Mono Studios at BCNN Kaduna, Nigeria, representing a value of Sfr. 780.800. — . These studios are in operation in various states of Nigeria. The operation of such studios requires a thorough training of technical personnel for which purpose Studer initiated technical training courses for NBC Lagos, NBC Ibadan, BCNN Kaduna. 80 participants from various broadcasting stations in Nigeria have profited from these courses.

Tape slide teaching

Students in universities and technical colleges throughout the world can now ma... tape/slide teaching pro... in electronics and ... munications. The prog... — manufactured by Te... ment Ltd. teaching com... supplement a range of ... designed teaching equi... The programmes e... students to use TeeQ... experiments without ... supervision by technical ...

There are eight dif... tape/slide programmes co... electronics and eleve... telecommunications.

Each kit contains 24 ... already loaded into an Ed... Edit-Mate tray, the Ed... language commentary ... compact cassette record... international AV standard... a commentary book w... covers all the programm... the series. For further info... tion contact Dekton Engi... ing Services Lagos and M... (Equipment) Agencies Acc...

Radio attachmen... to teach deaf pupils

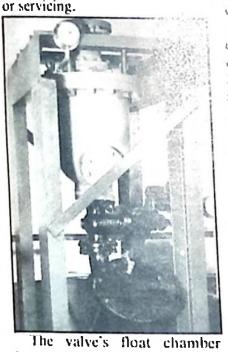
A radio attachment devel... by A. Peters & Son... enables deaf pupils and ... teachers to move freely ab... classroom unhampered by ... connecting them to a ... hearing system. It is ... equally suitable for us... special schools or for ... pupils attending normal sch... and colleges of higher ed... tion.

The teacher's compact ... transmitter measures 115m... 45mm x 20mm and weighs o... 30g. The pupil's radio rece... is similar in size and wei... Signals transmitted are pic... up in the receiver and used ... drive an induction coil wh... conveys them by electroma... netic induction to the pupil... personal hearing aid. The fa... that there is no wiring betwe... transmitter and hearing ... helps to increase a pupil's con... fidence, particularly if he ... attends a normal school ... college. For further information ... contact Showerow... Laboratories Ltd., Lagos.

imple relief
alve for
ewage mains

twin-orifice air/gas relief
alve for automatically exhaust
g and ventilating sewage and
ffluent mains incorporates a
ingle vertical spindle instead of
he usual complex of rods and
nkages.

Because of this mechanical
implicity, say the
manufacturers, **Adams
Hydraulics Ltd.**, the 80mm
diameter Adams Figure
valve is far less prone to
by solid matter than
ventional valves and can
expected to operate reliab
long periods without at
or servicing.



The valve's float chamber has a hemi-spherical base to prevent the retention of solid matter. The float and the two orifice valves are mounted in line on the vertical spindle, which moves in a brush that needs no lubrication.

The larger orifice valve has an open centre with a seating on the underside in which the smaller orifice valve locates. When there is no flow, the float rests on a bottom stop and the larger orifice valve is open, ready to allow the rapid expulsion of air/gas from the system when flow starts. Liquid entering valve's chamber lifts the float and spindle, thus closing the valve.

Desludging process solves disposal problems

Considerable time and cost savings in the cleaning of crude oil storage tanks are claimed for a chemical desludging process introduced by **Timeguard Engineering Ltd.** In addition the process recovers a high proportion of hydrocarbons and thus eliminates the problem of disposal.

Compared with the manual methods, which can involve 100 men for 3-12 months, in cleaning tanks 30-110m in diameter, the tankflush process takes a team of five men an average of 10 days, says the firm, and recovers 75-85% of hydrocarbons in the form of crude oil which can then be refined in the normal way. The operation is said to cost in labour and value of recovered oil alone about 50% of manual methods, without including downtime.

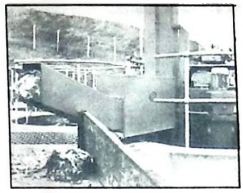
The process uses a high efficiency high flash water dispersible cleaning product known as SC-1, which was specially developed by ICI for the removal of heavy water deposits and the desludging of crude oil storage tanks.

After calculating the volume of sludge, the SC-1 is added at a volume of 3-10% and mixed by pumping equipment. Salt or fresh water equal in volume to the sludge is added and the contents of the tank mixed continuously for five to ten days. Crude oil can then be drawn off for reprocessing and the residual emulsion fed into water courses without danger to marine life.

Machine screens and de-waters sewage

A machine that screens non-bio-degradable particles from sewage and automatically de-waters them to an easily disposable form has been introduced by **Jones & Attwood Ltd.** The plant, known as the Screezer (a combination of the word screening and squeezing), is particularly suitable for dealing with waste man-made fibres which often stick together to form obstructions.

There are two basic versions of the equipment capable of handling 1000 litres/sec and 450 litres/sec of effluent. The larger version is suitable for towns of average size and the other for smaller towns and rural areas. Several machines



can be installed together to cope with any conditions, and ancillary plant can be supplied to a customer's specifications.

The machine utilizes a sectional vertical cast-iron screening drum with 6mm slots, which rotates in the direction of the sewage flow. Liquid sewage gravitates through the slots, down through the open bottom of the drum and through an inverted syphon into the downstream channel.

Lids collect on the outside of the drum and are removed by scraper bars attached to a vertical channel, the back of which forms a screen which can be raised or lowered hydraulically attached to the bottom of this is a lifting foot which carries the screenings collected on the drum to a de-watering chamber.

Small chlorinator

A new, direct-cylinder gas chlorinator has been introduced by **Portacel Ltd.**, named the Cloretta, this instrument is small and lightweight and can be used with either chlorine gas or sulphur dioxide. It is designed to meter a constant quantity of gas continuously whilst in operation with a maximum continuous gas with-

drawal rate of 1.35kg/hr from a 71kg cylinder or 0.50kg/hr from a 35kg cylinder.

It is suitable also for intermittent stop/start control and, should there be a failure in the water supply or a breakage in the vacuum control system, an instant, positive shut-off in the gas supply will occur to minimise the risk of gas escape.

The Cloretta can be equipped to give a variety of operational alternatives. The basic direct cylinder mounted version is manually controlled and supplied with a single meter tube which can be selected from a range to give outputs of 0.15kg/hr to 4.00kg/hr each with a turn down ratio of 20:1. The basic unit can also be supplied with additional equipment for use on wall mounting, using an isolating line valve as mounting bracket, or drum mounting with all the necessary fittings to locate the instrument on to a one tonne gas container.

A remote vacuum regulation version is also available which enables the regulator to be mounted directly to a cylinder or drum in place of the chlorinator, and the gas is then fed under vacuum. In addition, each of these versions is available with twin meter tubes to enable the two injection points to be dosed.

C-400 universal circulator

Techne has introduced an advanced closed circuit water circulator. Designated the C-400 this exceptional unit will deliver water at any flow rate between 0 and 15 l/min at a precisely controlled temperature.

The temperature operating limits are from —15°C (with the ancillary M-1000 cooler unit) to +80°C, the stability being +0.02°C at the outlet. The C-400 is fully protected against both overheat and dry running conditions, thus guarding against either a failure of the primary temperature control circuit or a leak in any external pipework system. It is therefore ideal for use in continuously running experiments operating with minimal supervision.

The C-400 has been constructed to give long, trouble-free life and exceptional ease of service. All the wetted parts, except the pump, are stainless steel. The pump has an all plastic impeller and housing for corrosion resistance. It is also glandless utilising a magnetic drive coupling to the motor. For further information contact **Nigerian Laboratory Co. Ltd.**, Lagos.

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 75.00, Cedes 135.00, Leone 100.00, $125.00, or equivalent per listing. For entry form see page 200.

CLASSIFIED INDEX

Full addresses listed alphabetically on following pages.

Abrasives
Bisiolu Enterprises Ltd., Apapa.
Landmark Industrial Supplies Limited.

A. C. Motor Starting Capacitors
Daly (Condensers) Ltd., Dorset, UK.

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

Adhesives
Bostik Ltd., Leicester, UK.

Agricultural and Electrical Appliances
W. A. Dizengoff (Nigeria) Ltd., Aappa.
Makin Ltd., Ilupeju.

Agricultural Equipment
Afrotec Technical Services (Nigeria) Ltd., Isolo.
J. Allen & Co. Ltd., Apapa.
Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Briscoe (Nigeria) Ltd., Agricultural Equipment Dept., Iganmu.
W. A. Dizengoff (Nigeria) Ltd., Apapa.
Hallan Graders, Leicester, UK.
Leventis Motors Ltd., Apapa.
Makin Ltd., Ilupeju.
Morpol Industrial Corp. Ltd., Apapa.
NITECO, Apapa.
Phoenix Motors Ltd., EB, Lagos.
Bewac Limited, Apapa.
Leventis Motors Ltd., Lagos.
Nigerian Motors, Apapa.
UTC Technical Division, Apapa.
Waateco Ltd., Technical Division, Lagos.

Air Cargo Services
IML Airchartering (Nigeria) Ltd., Lagos and Kano.

Air Courier Services
IML Airchartering (Nigeria) Ltd., Lagos and Kano.

Air Compressors & Pneumatic Plant
Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Guthrie (Nigeria) Ltd., Lagos.
Rutam Limited, Lagos.
R. T. Briscoe (Nigeria) Ltd., Apapa.
Holman Brothers (Nigeria), Apapa.
Phoenix Motors Ltd., Lagos.
Waateco Ltd., Technical Division, Lagos.

Air Conditioning & Refrigeration
Adeoye Adejobi T. S. Ltd., Ibadan.
Drake & Scull (Nig.) Ltd., Lagos.
Equip Iard (a Division of Scoa (Nigeria) Limited), Lagos.
Haden Nigeria Ltd., Yaba.
Haven Nigerian Computer Co., Lagos.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
Mandilas Limited, Apapa.
Nigerian Engineering Works Ltd., Port Harcourt.
Norman Industries Ltd., Ikeja.
Morpol Industry Corp. Ltd., Apapa.
Patterson Zochonis & Co. Ltd., Lagos.
R. & A. Services (Division of UAC Ltd.), Lagos.
VYB (Nigeria) Ltd., Apapa.
Waateco Ltd., Technical Division, Lagos.

Aluminium Doors & Windows
Crittal Hope Nigeria Limited.
Flag Aluminium Products.

Aluminium Roofing & Cladding
Flag Aluminium Products.

Arc Welding Equipment Aluminium Doors & Windows
Alumaco Aluminium Manufacturing Company of Nigeria Limited, Apapa.
Nigerian Hardware Industries Limited, Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department.
Industrial Gases Ltd., Apapa.
Matori — Osodi.
UTC Technical Division, Apapa.

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

Audio Visual Equipment
Controls and Automation, Apapa.

Automotive Parts
J. Allen & Co. Ltd., Apapa.
Leventix Motors Ltd., Apapa.
NITECO, Apapa.

Bearing Metals
Makeri Smelting Co. Ltd., Jos.

Biscuit Ovens & Equipment
Makin Ltd., Ilupeju.

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

Block Making Machinery
Afrotec Technical Services (Nigeria) Ltd., Isolo.
M. & E. (a Division of UAC of Nigeria) Ltd.

Boilers
VYB (Nigeria) Ltd., Apapa.

Bottling Machinery
Makin Ltd., Ilupeju.

Building & Civil Engineering Contractors
Alakija & Alakija Contracting Services Ltd., Lagos.
Costain (West Africa) Ltd., Lagos.
Cubitts Nigeria Limited, Lagos.
George Wimpey & Co. (Nigeria) Ltd., Lagos.
Alhaji M. R. Shittu & Sons Ltd., Lagos.
Structec, Apapa.
Taylor Woodrow of Nigeria Limited, Lagos.

Building Materials
Bewac Limited, Apapa.
Bisiolu Enterprises Ltd., Apapa.
Cheeseman's Building Materials Department, Apapa.
W. A. Dizengoff (Nigeria) Ltd., Apapa.
Dunlop Nigerian Industries Ltd., Ikeja.
Fibreglass Reinforced Plastics Co. Ltd., Abeokuta.
Leventis Stores, Lagos.
Nigerian Commercial & Industrial Enterprises Limited, Lagos.
Nigerian Foundries Limited.
Henry Stephens Builders' Merchants, Apapa.
C. Zard & Co. Ltd., Lagos.
Minister Technical Services (Nigeria) Ltd., Kano.

Business Services Recruitment Business Travel Agents
Air Marketing International Group of Co's, Crawley, UK.
All Counties Business Agency, UK.

Catering Equipment
Leventis Technical Ltd., Lagos.
Nirexim GmbH, Vienna.
Plantech Food Service Equipment Ltd., London.
F. Steiner & Co. Ltd., Lagos.
VYB (Nigeria) Ltd., Apapa.
C. Zard & Co. Ltd., Lagos.

Cement Manufacturers
Calabar Cement Co. Ltd., Calabar.

Chemical Engineering
Heplac Nigeria Ltd., Lagos.

Civil, Electrical & Mechanical Engineers & Constructors
Haden Nigeria Ltd., Yaba.
James Kilpatrick (Nig.) Ltd., Lagos.

Compactors
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Leventis Motors Ltd., Apapa.
Morpol Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
NITECO, Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Scoatrac, Ikeja.

Computers & Related Services
GBO BEAM (a Division of UAC of Nigeria Ltd.), Lagos.
Haven Nigerian Computer Co.
Leventis Technical Ltd., Lagos.

Concrete Machinery
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Holman Brothers (Nigeria) Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd.
Morpol Industrial Corp. Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Structec Technique.

Concrete Reinforcement
Nigerian Wire Industries Ltd.

Containers & Tanks
Fibreglass Reinforced Plastics Co. Ltd., Abeokuta.

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

Corrugated Boxes
Polythene Enterprises (Nigeria) Ltd., Ikeja.

Cranes, Ropes & Hydraulic Excavators
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.
Conveyancer (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Holt Engineering (a Division of J. Allen & Co. Ltd.), Apapa.
Leventis Motors Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
Stronghold (Nigeria) Ltd., Engineering Services Division, Ikeja.
Waateco Ltd., Technical Division, Lagos.

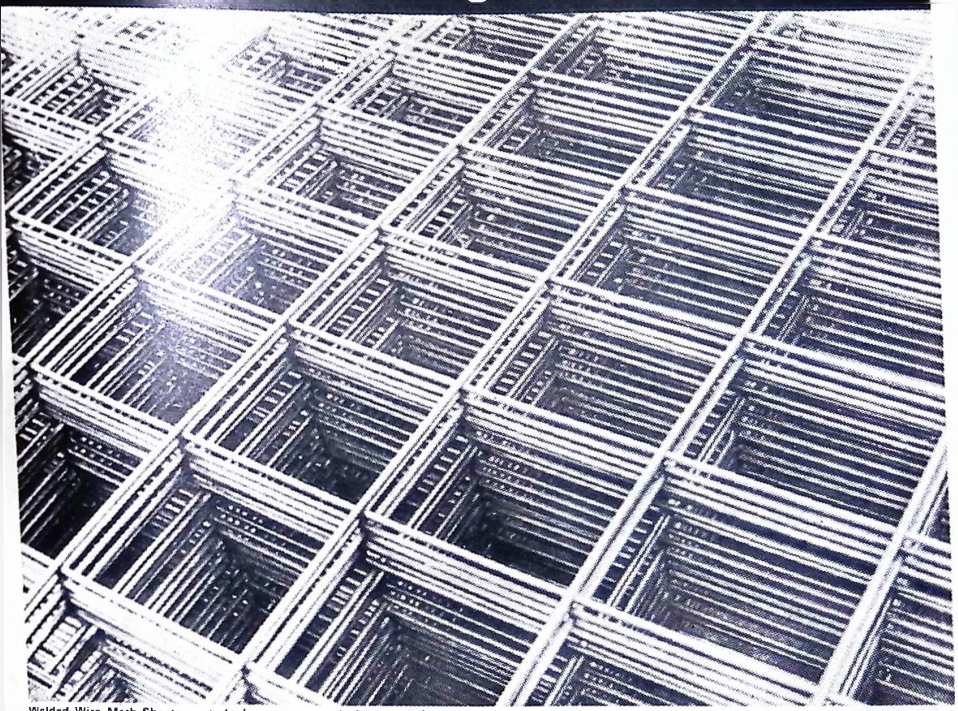
Cutting & Bending Machines
Afrotec Technical Services (Nigeria) Ltd., Isolo.

Dewatering Wellpoint Equipment & Services
Morpol Industrial Corp. Ltd., Apapa.

Diesel Generating Plant
Adeoye Adejobe Trading Stores Ltd., Ibadan.
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Diesel Sales and Service Division, Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Hold Engineering Ltd.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria) Ltd.
Minister Technical Services (Nigeria) Ltd., Kano.
Nigerian Motors Industries Ltd., Apapa.
NITECO, Apapa.
Phoenix Motors Ltd., EB, Lagos.
Powermaker Generators (Technical Division Tarpaulin Inc. (WA) Ltd.), Apapa.

Welded Wire mesh sheets*

There's no messing about at Niwil.



Welded Wire Mesh Sheets are today's most economical steel reinforcement for concrete structures, floor slabs, pre–fabricated elements NIWIL Welded Wire Mesh offers you savings on materials, ease of operation, cutting down of man hours, highest specifications, and a very wide choice of sizes. So before you get into a mess ask NIWIL

PRICES:

WELDED WIRE MESH	UNIT PRICE PER ROLL	PER SHEET
S–5/150mmx150mm/46mx2.1m/229kgs	₦ 140.00	₦ 14.50
S–6/150mmx150mm/46mx2.1m/187kgs	120.00	₦ 13.25
GALVANISED WELDED MESH		
EM10/50mmx50mm/3.6mx2.1m/19.96kgs		₦ 19.00
EM8/50mmx50mm/3.6mx2.1m/30.84kgs		28.00

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Structor Technique, VYB (Nigeria) Ltd., Apapa.
Waateco Ltd., Technical Division, Lagos.
C. Zard & Co. Ltd., Lagos.

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Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Apapa.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria) Ltd.
Nigerian Motors Industries Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Stockvis Nigeria Limited.
UTC Technical Division, Apapa.

Doors & Windows

Aluminium Manufacturing Company of Nigeria Limited (Alumaco), Apapa.
Bisiolu Enterprises Ltd., Apapa.
Crittall Hope Nigeria Limited.

Dredging & Reclamation Contractors

Nigerian Dredging & General Works Ltd., Apapa.
Westminster Dredging (Nig.) Ltd., Lagos.

Dumpers

Afrotec Technical Services (Nigeria) Ltd., Isolo.
Conveyancer (Nig.) 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.
Scoatrac, Ikeja.
Structor Technique.
Tarpaulin Industries (WA) Ltd., Apapa.

Earthmoving Equipment

Afrotec Technical Services (Nigeria) Ltd., Isolo.
Bewac Ltd., Apapa.
Blackwood Hodge (Nigeria Ltd., Apapa.
Greenham Plant Hire (a Division of UAC of Nigeria Ltd.), Ikeja.
Holt Engineering Ltd., Apapa.
Tractor & Equipment (a Division of UAC of Nigeria Ltd.), Lagos.
Conveyancer (Nigeria) Ltd., Apapa.
Hallam Graders, Leicester, UK.
Holman Brothers (Nigeria) Ltd., Apapa.
Leventis Motors Ltd., Lagos.
Nigerian Motors Industries Co. Ltd., Apapa.
Scoatrac, Isolo.
Stronghold (Nigeria) Ltd., Engineering Services Division, Ikeja.

Electrical Contracting Materials

Cutler Hammer Nigeria Ltd., Yaba.
Holt Engineering Ltd., Apapa.
Pan Electric, Apapa.

Electrical/Electronic Equipment

Adeoye Adejobi T. S. Ltd., Ibadan.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Cutler Hammer Nigeria Ltd., Yaba.
Dizengoff W. A. (Nigeria) Ltd., Apapa.
EMS (a Division of UAC of Nigeria Ltd.), Apapa.
Fado Engineering Co. Ltd., Ebute Metta.
Haven Nigerian Computer Co., Lagos.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
Mofat Engineering Co. Ltd., Lagos.
Nigerian Computer Co., Lagos.
NITECO, Apapa.
G. N. Okosala Electric Company.
VYB (Nigeria) Ltd., Apapa.

Electrical Engineering Contractors

Adeoye Adejobe Trading Stores Ltd., Ibadan.
Aluminium Wire & Cable Co. Ltd.
Electric Cable & Overhead Conductor.
Bennet Babs Electrical Co., Ikeja.
Drake & Scull (Nig.) Ltd., Lagos.
A. D. Green & Co. Ltd., Ibadan.
Heplac Nigeria Ltd., Lagos.
Marryat Daniel (Nigeria) Ltd., Lagos.
Minister Technical Services (Nigeria) Ltd., Kano.
Mofat Engineering Co. Ltd., Lagos.
Technical Constructions (Nigeria) Ltd., Lagos.

Electric Fans

Nigeria Engineering Works Ltd., Port Harcourt.

Electrical Projects

Afrotec Technical Services (Nigeria) Ltd., Isolo.

Electrolytic Capacitors

Daly (Condensers) Ltd., Dorset, UK.

Engineering Services

Cutler Hammer Nigeria Ltd., Ikeja.
Drake & Scull (Nigeria) Ltd., Lagos.

Fencing

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Fibreglass Stockists

Pilkington Glass (Nigeria) Ltd., Apapa.

Fire Fighting Equipment & Vehicles

Guthrie (Nigeria) Ltd., Lagos.
Leventis Motors Ltd., Lagos.
SIDES.
Stronghold (Nigeria Ltd., Security & Safety Services Division, Ikeja.

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Reiss & Co. (Nigeria) Ltd., Lagos.

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Henry Stephens Engineering Co. Ltd., Apapa.
Makin Ltd., Ilupeju.
Plantech Food Service Equipment Ltd., London.

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Afrotec Technical Services (Nigeria) Ltd., Isolo.
Bewac Limited, Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Apapa.
Conveyancer (Nig.) Ltd., Apapa.
Leventis Motors Ltd., Lagos.
Nigerian Motors Industries Ltd., Apapa.
NITECO, Apapa.
Tractor & Equipment (a Division of UAC of Nigeria Ltd.), Lagos.
Engineering Services Division, Ikeja.
Henry Stephens Engineering Co. Ltd., Apapa.
Waateco Ltd., Iganmu.

French Windows and Doors

Crittall Hope Nigeria Ltd.
Steel Works Ltd., Ibadan.

Full and Split Charter Operations

Air Marketing International Group of Co's, Crawley, UK.

Garage Equipment

Stockvis Nigeria Limited.
VYB (Nigeria) Ltd., Apapa.
C. Zard & Co. Ltd., Lagos.

Glasshouses

Makin Ltd., Ilupeju.

Glass/Mirrors Processors

Pilkington Glass (Nigeria) Ltd., Apapa.

Graders

Blackwood Hodge (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Morpol Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.

Graphic Arts Requisites

A. M. Faltas (West Africa) Ltd., Lagos.

Hand & Power Tools

Landmark Industrial Supplies Limited.

Hospital and Hotel Equipment

A. M. Faltas (West Africa) Ltd., Lagos.
Plantech Food Service.
Nirexim GmbH, Vienna.
Equipment Ltd., London.
F. Steiner & Co. Ltd., Lagos.

Insurance Brokers & Consultants

Interbroker & Co.

Intruder Detection & Alarm Systems

Reiss & Co. (Nigeria) Ltd., Lagos.

Irrigation Equipment

Afrotech Technical Services (Nigeria) Ltd., Isolo.
Guthrie (Nigeria) Ltd., Lagos.
Leventis Technical Ltd., Lagos.
Phoenix Motors Ltd., Lagos.
Stockvis Nigeria Limited.

Labelling Machines

Makin Ltd., Ilupeju.

Laboratory Chemicals/reagents

The Twilights Nigeria Ltd.

Laboratory Furniture

Nirexim GmbH, Vienna.

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VYB (Nigeria) Ltd., Apapa.

Library Equipment

Nigeria Engineering Works Ltd., Port Harcourt.

Liquid Storage Tanks

Reiss & Co. (Nigeria) Ltd., Lagos.

Livestock Feed Mills

Makin Ltd., Ilupeju.

Machine Tools & Woodworking Machinery

Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria Ltd.), Lagos.
Nigerian Motors Industries Ltd., Apapa.
Stockvis Nigeria Limited.
Stokvis Nigerian Tool & Die Co. Ltd., Ebute Metta.
Tarpaulin Industries (WA) Ltd., Apapa.
C. Zard & Co. Ltd., Lagos.

Man Hole Covers & Gully Gratings

Bisiolu Enterprises Ltd. Ap…

Marine Engines and Accessories

Allens Marine, Port Har…
Blackwood Hodge (Nigeria…
Sales and Service Division…
R. T. Briscoe (Nigeria) Ltd…
Holman Brothers (Nigeria) L…
Nigerian Motors Industries…
Henry Stephens Engineering…
Apapa.

Mechanical and Ele… Engineering Contra…

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…co Engineering Co. Ltd. E…
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…otor Transport …ucks)

…n & Co. Ltd., Apapa.
… Briscoe (Nigeria) Ltd.
… Division, Iganmu.
… Stephens Engineering C…
A…
L… Motors Ltd., Apapa.
N… O, Apapa.
P… Motors Ltd., EB, La…
W… Ltd., Iganmu.

Off… Equipment

GBO … AM (a Division of U…
Nigeria Ltd.), Lagos.
Le… Technical Ltd., Lag…
Niger… Engineering Works L…
Port Harcourt.
F. Ste… & Co. Ltd., Lagos.

Office Metal Furnitu…

Leventis Technical Ltd., Lag…
Steel Works Ltd., Ibadan.

Oil Tank Calibrators

Caleb Brett & Sons (Nig.) Ltd.

Oxygen, Acetylene and Special Gasses

Industrial Gases Ltd., Apapa.

Packaging Machiner…

Makin Ltd., Ilupeju.

Packaging Materials

Polythene Enterprises (Nigeri… Ikeja.

Paints & Varnishes

Berger Paints (Nigeria) Ltd., I…
Bisiolu Enterprises Ltd., Apap…
Dulux, ICI Paints (Nigeria) Lt…
Makin Ltd., Ilupeju.
Nigerlux Paints, International P… (West Africa) Ltd., Ikeja.

Pipes, Building & Pre…

Bisiolu Enterprises Ltd., Apapa.
Brossette (Nigeria) Ltd., Apapa.
Dunlop Nigerian Industries Ltd.
D. L. Payne (Nigeria Ltd., Yaba.
Interplast Ltd., Accra.
Leventis Stores, Lagos.

Plant Hire

Costain (West Africa) Ltd., Lag…
Greenham Plant Hire (a Division… of Nigeria Ltd.), Ikeja.

Equipment Plastic Processing

Makin Ltd., Ilupeju.

Poultry Feed Distributio… Equipment

Makin Ltd., Ilupeju. Afrotec Tech… Services (Nigeria) Ltd., Isolo.

Printing Materials

Makeri Smelting Co. Ltd., Jos.

ijected Windows

i Works Ltd., Ibadan.

otective Coatings

ik Ltd., Leicester, UK.

imps

otec Technical Services (Nigeria)
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T. Briscoe (Nigeria) Ltd., Technical
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d.), Lagos.
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hoenix Motors Ltd., Lagos.
tockvis Nigeria Limited.
arpaulin Industries (WA) Ltd., Apapa.
TC Technical Division, Apapa.
YB (Nigeria) Ltd., Apapa.
Waateco Ltd., Technical Division,
agos.

Quarry Plant

Afrotec Technical Services (Nigeria)
Ltd., Oshodi.
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Morpol Industrial Corp. Ltd., Apapa.
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Phoenix Motors Ltd., Ilo, Lagos.
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