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NICAL REVIEW

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...ional Magazine for Industrial & Business Management

August 1978

In this issue:

...ability of Shoe Manufacture
Destination Abidjan
Mechanization in Agriculture
Pump Maintenance

West African
CONSTRUCTION

Excavators
Bricks in Architecture
Slipforming
Compaction Equipment
at EXPOMAT

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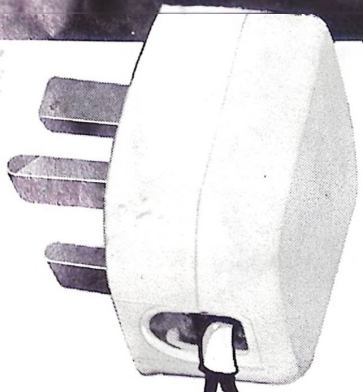

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Contents

This month's cover: A JCB 807B crawler excavator at work in Lagos. For more information on hydraulic excavators see page 81.

SKILLED HANDS

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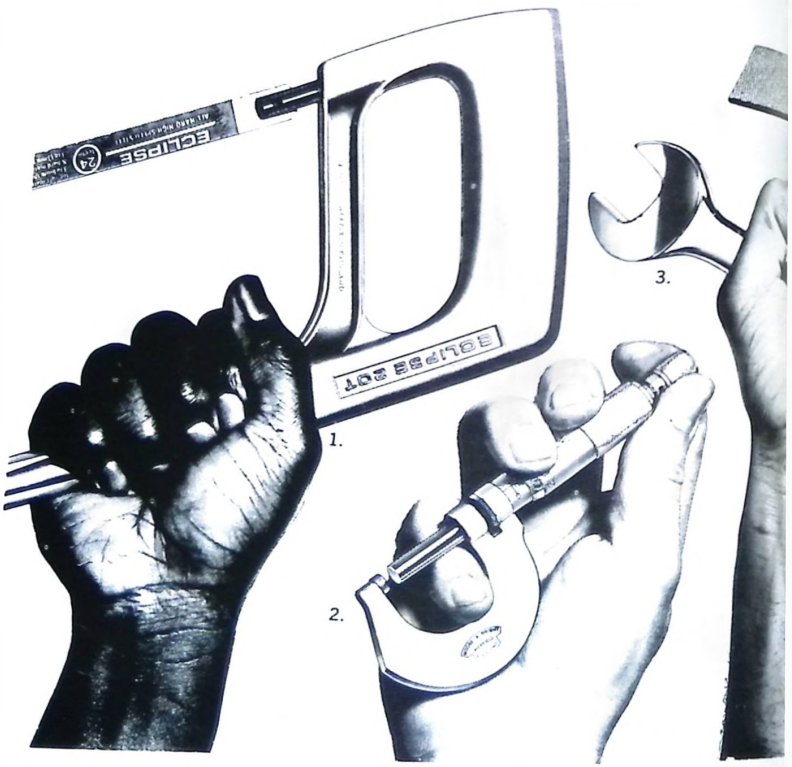

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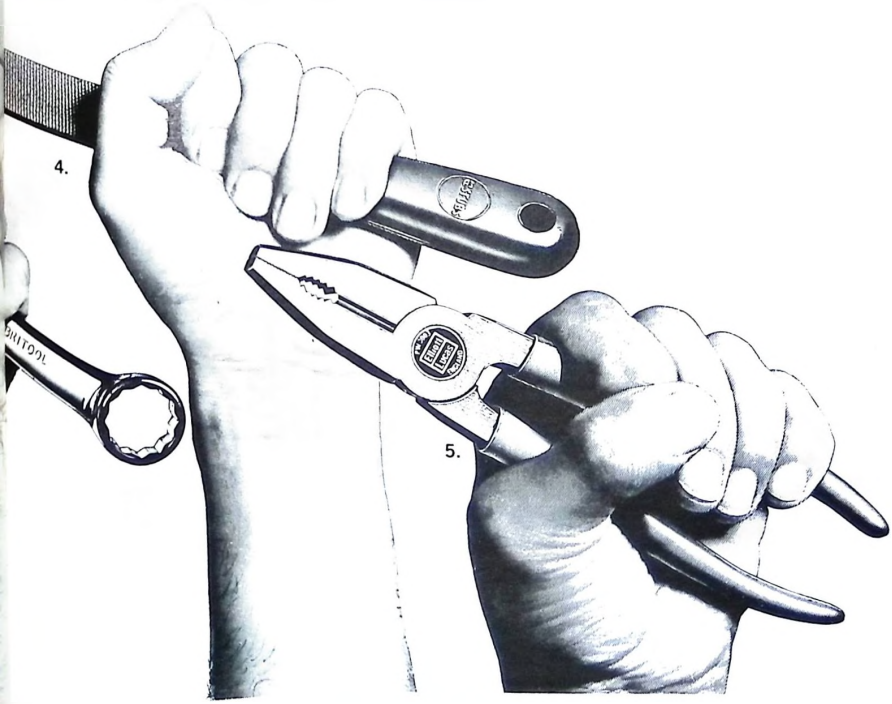

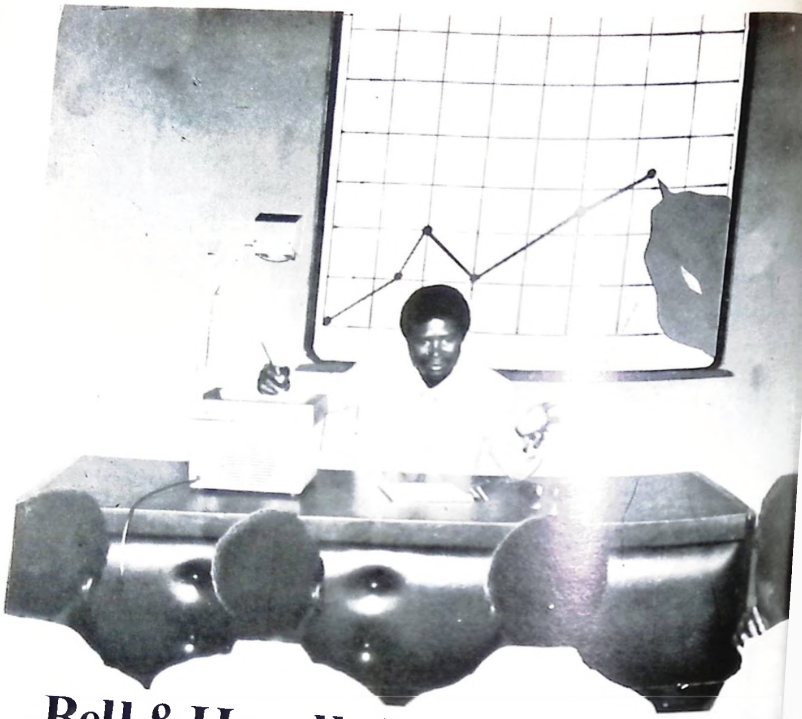

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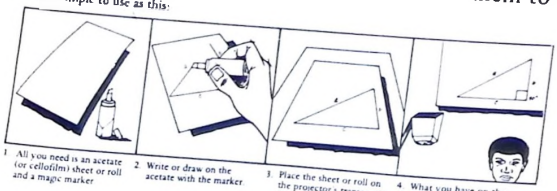

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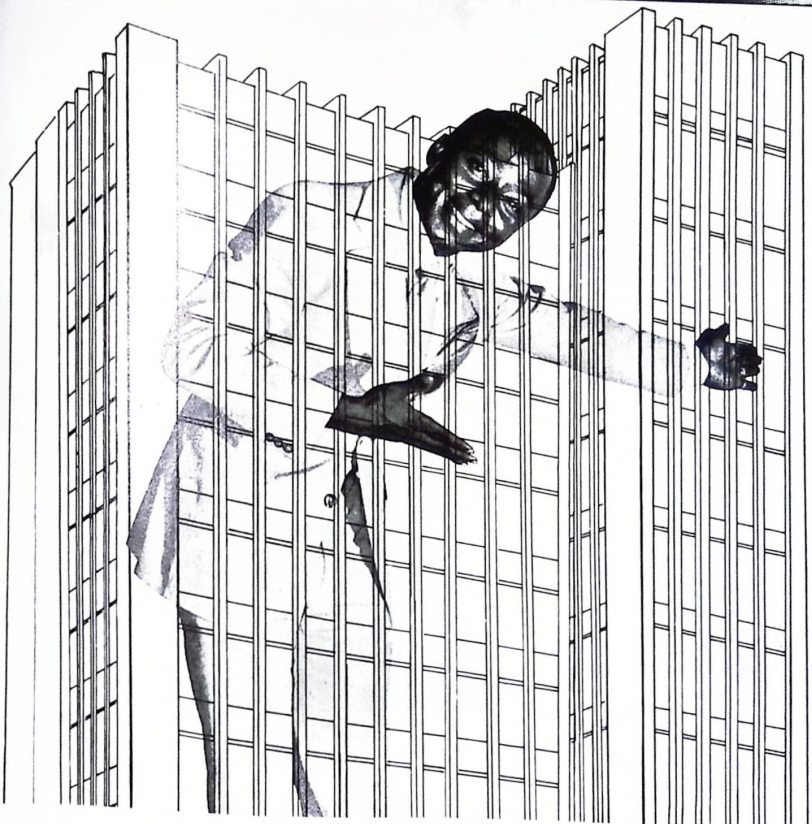

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Commercial review

Ghana to start oil production

Ghana is to start oil production on October 1 with an initial output of over 5,000 barrels per day. Agri-Petco Ghana Inc. is currently engaged in off-shore oil production at Saltpond. Presenting the final results of the company's analysis, Mr. Phillcy, President of Agri-Petco International, said that his company would dig three additional wells after oil production had started. This it is hoped will boost production in the Salt-pond area to 10,000 barrels a day. By the time of production the company will have spent [illegible] on its operations.

Joint venture for Peugeot-Citroen and Fiat

Italy's largest private enterprise Fiat, is to join forces with the French Peugeot-Citroen Group for the design and manufacture of a new [illegible] commercial vehicle in a L241bn (N402 [illegible] production facility in South Italy. The annual production targets are to provide some 80,000 units annually of a 10 and 13 cwts model which is to have an optional petrol or diesel engine. The new model Fiat used would be "an internationally competitive vehicle increasing the respective production levels for the two companies."

Shortfall of textile materials

According to the General Manager of Alprint (Nigeria) Ltd. the Nigerian market needs 1200 million metres of textile motor materials per annum.

There are 35 textile companies in the country which together produce a total of about 1050 million metres of both cotton and synthetic materials annually.

With the current favourable price which the manufacturers have continued to enjoy in recent times from the Nigerian Cotton Board it would not be difficult to make up for the temporary shortfall.

New assembly line

Yamaha the Japanese motorcycle manufacturers are to build an assembly plant in Nigeria according to an announcement from Tokyo. Initial monthly production is expected to be 5,000 small motorcycles.

Consumer Protection

A professional body to protect Nigerian consumers from harmful industrial products has been formed in Lagos. Called SPAN, the Society of Public Analysts of Nigeria the body plans to provide data on the constituents of food, drugs and cosmetics to determine the fitness of the products.

Cameroon-German discussions a success

A unique series of economic discussions between representatives of some 30 West German firms — including giants like Mercedes-Benz (automobiles and lorries) and Hoechst (chemicals) — and nearly 80 representatives of industry and commerce from Cameroon have resulted in closer economic ties between the two nations and at least ten new contracts for West German firms, with more in the offing.

The discussions, sponsored by the Cameroon embassy in Bonn and various German chambers of commerce and industry, took place in Cologne, Hamburg and Stuttgart in late May and the first two weeks in June.

West German firms are already among the leading contractors in the Cameroon's developing economy; the object of the discussions was to present that nation's requirements to as many West German firms as were interested in participating and possibly winning contracts for projects in the West African nation. The Cameroon delegation was headed by the nation's Prime Minister, Paul Biga.

"The talks were very successful from our point of view," Helri Djeenkue told West African Technical Review from Bonn, where he is the Cameroon's ambassador to the Federal Republic of Germany. "Not only were new contracts initiated for a variety of construction projects then and there, but many firms already active in our country have been engaged to increase their participation in the Cameroon's development."

The total value of West German firms' activities in Cameroon runs into several thousand million Deutschmarks.

For example, one of the the West German firms that participated in the discussions in Stuttgart was Richard Mayer GmbH & Co., a construction firm. Mayer's managing director, Wilhelm Sauermann, told West African Technical Review that his firm has been active in Cameroon's capital, Yaounde, and environs since 1971. "Our contracts there are worth several million marks a year," Herr Sauermann said. Among Mayer's projects have been the construction of a market enclosure in Yaounde; a factory building for a machine tool company; a research complex for agricultural machinery and implements; as well as a number of bridges and approaches up to 100 km. (62.5 miles) long. Herr Sauermann said that his company's future contracts in Cameroon had been stimulated by the discussions.

Ambassador Djeenkue said that the chief purpose of the tri-city talks was to acquaint West German firms with the lucrative prospects of assisting development of his country. "Germany is already one of the leading foreign nations active in our economy," he said, "and we have been very satisfied with their performance."

Other Wurttemberg firms participating in the talks were the automotive and tractor construction firm Gottlob Auwarter KG, Stuttgart, and machine tool manufacturers Maschinenfabrik Rau GmbH. According to Dr. Tscherning of the Chamber of Commerce and Industry in Stuttgart, food processing firms, other machine tool manufacturers, and makers of all sorts of agricultural machinery participated in the talks. "I think especially smaller German manufacturers were impressed that the obstacles to working in an African nation are not so great, and that the Cameroon and a few other African nations are very anxious to have German expertise and participation. From that point of view, the value of the talks exceeded their outcome in actual contract by far."

Herr Friedrich of the Hamburg Chamber of Commerce expressed similar views about the discussions in the north German city. "The information that was exchanged has proven, I think, invaluable to paving the way to expansion of our participation in the Cameroon," Herr Friedrich said.

While no definite schedule of similar talks in future has been set, representatives of both nations indicated that similar discussions should be held on a regular basis — and perhaps in other European nations and in the USA as well. □

West Germany to invest in Ivory Coast

West Germany's Chambers of Commerce have called on businessmen to invest more in the Ivory Coast. The Ivorian's new investment code has laid the foundations for a relationship of trust between the two countries, it said. It is regretted, however that so far the opportunities for bilateral economic co operation have been inadequately taken up. An office in Cologne is to be opened to advise West German businessmen on to the investment possibilities of the Ivory Coast.

Genset licences required

Before installing private generating plant in Nigeria a licence now has to be obtained from the Federal Ministry of Mines and Power. The ministry has warned that any organisation or member of the public operating generating plant without a licence will be liable to prosecution under Regulation 16, of LN76 of the Electricity Act of 1965. The primary objective of licences is to ensure that generators are properly installed and operated in accordance with the newly instituted electricity regulations.


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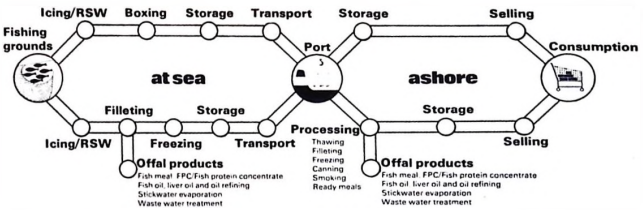
commercial review

all for higher standards

t the opening of the annual meeting of the igerian Institute of Quantity Surveyors, e acting Commissioner for Works and ousing in Kaduna State said that the stitute should be vested with sufficient uthority to deal with any recalcitrant nembers and firms that have produced ub-standard jobs. The President of the nstitute also expressed concern over the vay the federal and state governments con-loned the engineers' practice of guarding against the use of the services of rofessional quantity surveyors on civil ngineering projects.

Floating fish factories — the future for African fishing?



Fish factories today are planned already out at sea. What can be done at sea and what can be done ashore or should the fish be treated in a floating fish factory?

The illustration shows the flow chart of fresh and frozen fish, from fishing ground to consumption. Alpha-Laval can build small or large fish treatment factories including different treatments to receive a variety of fish food products. The fish factory also includes ice-making plants and waste water treatment.

The new fishing laws that have taken place in many countries with the widening of the fishing grounds will mean considerable new assets which must be carefully planned and utilised. However, without proper treatment of the raw fish, the consumption will be limited to fresh fish and thus only the fishing port population and the closest surroundings. With smoking, canning and freezing, the fish can be distributed inland and exported. The offal in the fish factories is converted to valuable fishmeal fooder and fish oil. Small units of fresh water distillers will supply fresh water for the fish treatment factory.

Refrigeration units are supplying refrigeration to ice-plant and storage rooms. The ice-plant is of vital importance for keeping fresh fish cold from the fishing ground to the fish treatment plant and during the further distribution of fresh fish.

EXECUTIVES' CALENDAR

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

AUGUST		
21-25	IFSEC Exhibition for Security & Insurance	ECO HOLIDAY INN LAGOS
SEPTEMBER		
19-23	AQUATECH — International Exhibition for the treatment, storage and use of water	AMSTERDAM
22-24	SICOB — International Exhibition of Data Processing of Communication and Office Organisation	PARIS
22-1 Oct.	International Autumn Fair	BUDAPEST
22-1 Oct.	HOVENTA — International Exhibition of Trade and Catering Industrial Equipment	BUDAPEST
23-25	QUOJEM — Hardware Trade Show	PARIS
23-27	AUTOMECHANICA — International Trade Fair for Equipment for Motor Car Workshop and Service Station	FRANKFURT
25-29	FURNACES 78	BIRMINGHAM
25-29	International Broadcasting Convention	LONDON
25-1 Oct.	FIEPAG International Packaging & Printing Exhibition	SAO PAULO
26-30	Office Equipment Trade Exhibition	STUTTGART
26-30	International Ship Machinery & Marine Technology Exhibition	HAMBURG
27-30	ISO Cold-Heat-Sound International Congress & Trade Fair	DUSSELDORF
27-1 Oct.	ILMAC — International Exhibition of Laboratory, Chemical Engineering, Measurement & Automation Techniques in Chemistry	BASLE
27-1 Oct.	GLAS '78 International Fair for Application Machinery for Industry, Trade & Handicraft	DUSSELDORF
27-4 Oct.	K '78 International Office Equipment Exhibition	COPENHAGEN
28-30	BURO-KID International Trade Exhibition of Publicity, Printing, Graphic Arts, Design & Data Processing	SALZBURG
OCTOBER		
1-15	International Fair Baghdad	BAGHDAD IRAQ
2-6	MIDEST International Market of Sub-Contracting	TOULOUSE FRANCE
3-7	NUCLEX '78 International Nuclear Industrial Fair	BASLE
3-8	SKOMESA '78 19th International Tobacco & Tobacco Machinery Fair	SKOPJE YUGOSLAVIA
4-8	IKM International Kitchen Exhibition	UTRECHT
4-8	World Dairy Expo — International Trade Show for Dairymen	MADISON USA
7-11	International Exhibition of Public Works Equipment & Technology	SINGAPORE
11-14	IGB '78 International Trade Fair for Industrial Cleaning & Factory Hygiene	DUSSELDORF

Seminar on business management

The World Bank and eleven other multinational companies drawn from the United States, Europe, the Far East and Africa, including the Ashamu Group of Companies, participated in a high-powered 4-day seminar on Case Study, Business Management, in Washington in June.

The Ashamu Group of Companies consisting of ten major companies specialising in a wide variety of activities ranging from large-scale farming, food processing, manufacturing, mining, shipping and transportation was the only company invited from Africa to participate in the seminar.

Boost for Nigerian Tourism

The Plateau Tourism and Transport Company Ltd, (PTTCL) has recently been formed by the State Government. The company has an ititial share capital of ₦5m and is made up of the Plateau Hotels Board, the Plateau Bus Service and a section of the State Ministry of Trade Industries and Co-operatives. It is hoped that this new company will organise package tours of the States and use its financial resources to promote tourism generally.

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102P77

ommercial review

₦8.4m profit for Blackwood Hodge

Blackwood Hodge (Nigeria) Ltd. has recently announced another year of record turnover and profit. The chairman of the board of Directors of the company Alhaji, Chief S. L. Edu announced a record pre-tax profit of ₦8,424,568 at the Annual General Meeting of the company held at the Independence Hall of the Federal Palace Hotel.

The pre-tax profit showed an increase of ₦1,919,285 or 29.5 per cent compared with 1976. The sales turnover for the company for 1977 was ₦[illegible]6,087 against ₦32,759,672 in 1976 showing an increase of 23.4 per cent. A net dividend of 6.7 kobo per 50 kobo share was recommended by the directors during the meeting shareholders were told that plans are under consideration for the construction of new premises.

NBL record a pro[illegible]

Nigerian Breweries Limited [illegible] a net profit of ₦5.25m in 1977 [illegible] with ₦7.9m in 1976. The reason [illegible] lower profit margin was attributed [illegible] reduction in sales volume, resulting from erratic electricity supplies, industrial problems and production difficulties, and severe increases in costs. The chairman of the Board of Directors was optimistic for 1978 following the completion of the Aba and Kaduna expansion projects.

Profits dip for BEWAC

A disappointing year has been recorded by BEWAC Nigeria Ltd. with an increase of only 2.1 per in turnover. A substantial drop was recorded in the profit margin from the level of ₦11.8m in 1976 to ₦3.6m, a fall of 69.5%. After tax and other deductions the real profits stood at ₦1.5m.

Two principal reasons were given for the fall in profits. Firstly the shortfall in expected deliveries on items such as the Land Rovers and Range Rovers, resulting in a substantial fall in sales and revenue. Secondly the company chairman took the Price Control Board to task for failure to review the prices of vehicles upward in time to take account of the imported inflation. This drop in sales affected the Motor Division more than any of the other areas of activity in which BEWAC operates.

More beer for Ibadan

Investments and Credit Corporation of Oyo State are promoting the ₦3m Africana Breweries Ltd to be built at Ibadan. The brewery will produce 500,000 hectolitres of beer and 200,000 hectolitres of soft drinks initially, growing to 1m hectolitres of beer and 400,000 hectolitres of soft drinks. The project is to be financed by the Nigerian Industrial Development Bank and Messrs Socafrica.

Nigerian oil agreement

Nigeria has asked Yugoslav and South Korean shipyards to take crude oil in payment for 19 ships ordered last year for a total of ₦176, according to the weekly Business Times. The Yugoslav yard has agreed to this arrangement but Hyundai shipbuilding and Heavy Industries of South Korea have offered a credit arrangement which has been rejected by Nigeria.

Oil contract finalised

Six of Wormald International's specialists in the field of on-shore off-shore fire protection for the oil industry left for Nigeria in January to supervise the installation of the final stage of the ₦1.2 million Mobil Nigeria contract.

Wormald International was commissioned to survey production and well platforms off the Nigerian coast and to recommend protection and safety devices. The contract which followed consisted of providing the safety devices for the protection of six off-shore platforms, the power plant and in-shore facilities.

The site of the in-shore activities presented tremendous problems in communicating with Wormald personnel and the transport of both men and materials. The site is 400 miles East of Lagos and is surrounded by thick Nigerian jungle. After flying into Lagos there are further flights on small crafts landing on isolated strips, a trip down river and finally a bus ride to the site. All these arrangements were made by Mobil Producing of Nigeria. The contract has now just been completed.

Training facilities expand

The Peugeot Automobile Company of Nigeria Ltd. (PAN) in Kaduna in complying with Nigerianisation policy has created training centres and introduced training programmes. The company has voted ₦4.5m for the building and procurement of equipment for the centre. A four year agreement has also been concluded with the Organisation for Rehabilitation through training (ORT) Geneva, for the training of 1,000 workers each year.

Photo-scan secures success in West Africa

Photo-Scan Ltd. have long been involved in the expanding overseas market, and particularly in the development of Nigeria. Negotiations with a number of companies started as long ago as 1972, now Photo-Scan can boast orders being placed in Nigeria valued in excess of one million pounds.

Photo-Scan's first customer was the Nigerian Security Printing and Minting Company where a complex multi-camera system was installed, covering all security risk areas inside and outside their premises.

The experience gained in this first installation was invaluable, not only because of the greater technical ability required in installing so complex a system, but also in the knowledge gained of local conditions.

These systems were so successful that the Company agreed to act as agents in Nigeria for Photo-Scan, and this liaison has proved to be a very worthwhile venture for both Companies.

This experience facilitated Photo-Scan's progress in other fields and systems are now installed in the Customs and Excise Department, the Airport Authority, Central Bank of Nigeria, Barclays Bank, Rocky Pools, retail establishments such as Leventis Stores and Kingsway Stores, and many others.

Currently Photo-Scan are supplying equipment for the Murtala Muhammed Airport, Lagos, in readiness for the opening later this year.

Now an order has just been received for systems to be installed in eight branches of the Central Bank and in due course this will be extended to all the nineteen branches.

Each installation requires custom made consoles to be built to suit individual requirements and the majority of these now include video tape recording facilities.

As for back-up service, Photo-Scan's expertise comes to the fore. A fully equipped Workshop is maintained, carrying a comprehensive range of spares, and supported by a team of experienced engineers and installation staff.

Implications for American Business

Despite the short-term deflationary outlook, Nigeria's economy remains the largest in Africa and potential for growth remains strong. In only six years, Nigeria has moved from fifty-second to fifth place among American overseas suppliers. Knowledgeable Nigerians see the US as a leading and, in some specialities, the only source of technology, managerial expertise and food supplies. In the first half of 1977, the US share of the market gained two points to over 11%. If last year's Lagos International Trade Fair is an indicator, trade should be good. 35 firms in the US Department of Commerce pavilion reported direct sales of $41 million and projected sales in the next year a whopping $360 million.

Motor vehicle spare parts continue in high demand. In 1977, Nigeria imported $466 million worth. Though some spare parts will be imported for a long time, one can expect the market for imported parts to shrink as the government takes steps to protect local manufacturers. Attracted by the possibility of a closed market, firms are moving in to establish factories for radiators, disc brakes, windshields, etc. A clause in the contract of local vehicle assemblers requires that 30% of a vehicle's value be procured locally within ten years of start-up.

Electric power equipment offers major opportunities. In 1977, Nigeria imported $306 million worth of electric power machinery and switch-gear, the US share being $20 million. Demand for power is outstripping supply by a wide margin and so new generating equipment is sought. One US company had sold three new generators and another has rebuilt old units. The power shortfall also ensures a good market for home and industrial standby generators. A recent act of the Constituent Assembly has given state governments the power to legislate on generation and sale of electricity once the new constitution comes into effect in late 1979. This enables states to open their own power companies with a consequent widened demand for equipment and expertise.

Production equipment for items banned by the new import regulations is in demand. Examples include machinery for making furniture, clothing and footwear as well as equipment for poultry raising.

Two promising fields for the US are agriculture, including wheat and rice, and communications equipment. The US supplied 40% of Nigeria's $206 million in wheat imports and 30% of the $286 million in rice imports. This was almost matched by the $149 million worth of telecommunications equipment and systems sent to Nigeria last year. This last figure could be duplicated this year since the FMG has a capital budget for posts and telecommunications of $470 million. Agricultural equipment is sought and no trade restrictions apply.

Americans will find t eased by several recent time, the FMG announc to assure more attractive ment and encourage f domestic productive ca dividends have been ma per cent to 20 per cent United States Export B Nigeria have been cleare will again make loans an worthwhile projects. FMC OPIC are being streamlin

In regard to specific manufacture of building promise. The construct slump this year but it has potential, and competitive high priced imported mat needs investment to produce and timber. Another avenue ment capital here is in the iron and steel rods, sheet Imports of the latter in 197 $223 million. The new announced in April 197 domestic manufacture for m The completion of the A complex will open the wa machine tools industry, ex existent.

American companies are the possibility of assembling f in Nigeria. The FMG origi each of four commercial vehicl the option to assemble tractors of the assemblers, Fiat and Se to do so, with projected annual of 5,000 tractors by 1980. Wit emphasis on agriculture, the I thinks this will not be enough.

As Nigerian economic planni to emphasize domestic produc opportunities will exist for the p of basic commodities. In the p there have been shortages in vit sugar and beer, items that the Nigerian refuses to do without major projects valued at several million dollars each, promise wor skilled international contract technical partner has been select nitrogenous fertilizer plant, nor construction contract been a Separate design and construction must be awarded for a petroc complex and a liquified natural gas Another opportunity is in the civi for the Ajaokuta Steel Mill.

A recommendation increasingly by leading Nigerians and backed Embassy is that business visitors beyond Lagos. Interest, innovation great determination to develop chan a number of states. Some states expressed interest in selling off subs amounts of state equity in ex government-owned factories. Retu partial private ownership is seen as to attract able management as w needed finance.

1977 Breakdown of scheduled services for Nigeria, Ghana and Cameroon

Total Scheduled Services	Nigerian Airways			Ghana Airways			Cameroon Airlines		
	International	Domestic	All Services	International	Domestic	All Services	International	Domestic	All Services
Kilometres flown	4,941	12,682	17,623	2,845	678	3,523	4,542	1,677	6,219
Aircraft Departures	4,080	25,524	29,604	7,893	4,774	12,667	2,064	5,090	7,154
Hours flown	6,785	25,553	32,338	4,378	1,615	5,993	5,361	5,065	10,426
Passengers Carried	119,527	924,079	1,043,606	121,065	127,707	248,772	103,519	243,176	346,695
Freight Tonnes Carried	1,500	468	1,968	1,240	199	1,439	1,642	2,912	4,554
Passenger Kilometres flown	456,487	395,271	851,758	198,709	35,199	233,908	237,824	76,589	314,413
Available seat -kilometres	729,726	567,361	1,297,087	309,463	51,340	360,803	412,739	145,034	557,773
Passenger Load Factor	62·6%	69·7%	65·7%	64·2%	68·6%	64·8%	57·6%	52·8%	56·4%
Tonne - kilometres performed									
Passenger (incl. baggage)	44,743	42,518	87,261	17,083	2,766	19,849	21,404	6,893	28,297
Freight (incl. express)	3,723	345	4,068	2,649	70	2,719	4,454	1,326	5,780
Mail	1,110	544	1,654	810	28	838	1,229	335	1,564
Total	49,576	43,407	92,983	20,542	2,864	23,406	27,087	8,554	35,641
Available Tonne - kilometres	85,000	54,583	139,583	41,293	5,206	46,499	82,280	22,755	105,035
Weight load factor	58·3%	79·5%	66·6%	49·7%	55·0%	50·3%	32·9%	37·6%	33·9%
Length of scheduled route network (km)	29,534	7,805	37,339	7,233	1,511	8,744	——	——	——

Airport developments gets underway

In the 1975-80 Development Plan ₦735 million was allocated to rehabilitate 16 standard airports.

Of the 16 airfields, five are to be international ones capable of serving the large international aircraft. Murtala Muhammed Airport has had to be redesigned to accommodate supersonic aircraft. Construction work on the 3,900 metre long runway is expected to be completed next month, and construction work on the airport pavements and terminal buildings are almost complete. Meanwhile contract work for some of the ancillary buildings, power supply and water supply have been awarded. The new control tower is hoped to be fully operational and replace the existing one which will be demolished to make way for a taxi-way.

Kano airport is designed to take Boeing 747 aircraft, and its runways have been lengthened and strengthened, and now the terminal area is being reconstructed to provide more parking space and improve the existing internal road system.

At Port Harcourt, the runway construction which started in 1975 is virtually completed to take 747's and the terminal building project has had its contract revised to include facilities for international passenger needs.

Kaduna Airport is being expanded to accommodate the B747 type of aircraft. Its new terminal and ancillary buildings are being designed to handle international flights and a separate cargo building is being provided.

Sokoto airport's 3,000 metre runway, which can accommodate 747's is also nearing completion, and a new terminal building is being built.

The other two airports catering for 747's are Maiduguri, whose 3,000 metre runway and terminal are with provision for extending the apron to accommodate heavy traffic, and Ilorin are both near completion. The latter is being built as an alternative to Murtala Muhammed and its terminal building has been designed to full international standard.

Yola, Benin, Calabar and Ibadan all have runways under construction and due for completion soon, as does Jos, whose work has also started on the airfield lighting installation, and Enugu which has ancillary buildings such as fire rescue, power house, and a maintenance bay as well.

By the time all these airports have been completed, the inter-state connections as well as movement to connect international flights would have been considerably improved to a level that can cope with future demands.

Steady growth for West African Airlines

A breakdown of the individual West African IATA (International Air Transport Association) member airlines statistics for 1977 indicate a steady growth for all airlines in terms of passenger traffic, the greatest expansion taking place within Air Liberia. The following table gives a breakdown of West Africa's scheduled international and domestic services combined, and staff numbers. When comparing the individual airline employee figures, the reader should bear in mind the differences in airline organizations and practices for example with regard to sub-contracted work such as maintenance and catering.

Airline	Passengers		Ton-Kms Performed		Load Factors		Pilots & co-Pilots	Maintenance & overhaul Personnel	Total Personnel
	000's	change	Millions	change	Passenger	Weight			
Air Afrique	471	5·8%	274	-0·5%	58·0%	56·8%	147	473	4,313
Air Liberia	30	92·2%	1	12·3%	50·0%	59·6%	13	28	141
Air Zaire	484	6·3%	102	-10·1%	52·2%	47·4%	112	1,542	5,790
Cameroon	347	16·8%	36	15·6%	56·4%	33·8%	36	192	1,493
Ghana Airways	249	41·8%	23	9·2%	64·6%	50·3%	30	269	1,861
Nigerian Airways	1,044	59·5%	83	41·1%	65·7%	66·6%	175	1,268	5,948

New links for Ivory Coast and Belgium

Ivory Coast has agreed that direct telecommunications links by telephone, telegraph and telex will be set up with **Belgium.** The new links were decided during a visit to Brussels by the Ivorian Minister for Posts and Telecommunications M. Kone Bangali. His Belgian counterpart also agreed to the request for scholarships for Ivorian technicians to study in Belgium.

A Government delegation led by Mr. P. E. Paintsil, Senior Principal secretary of the Ministry of Transport and Communications flew to California, US to finalise arrangements for the delivery of a new DC9 aircraft for Ghana Airways.

Thirteen steel vats, some over 10ft. high with capacities of 5,000 litres, made up the main part of a consignment from UK to Nigeria that needed a unique aircraft to handle such bulk.

Heathrow-based air charter agents, Mercury Aviation Services Ltd, chose the Guppy — a specially converted CL44 swing-tail freighter with a "swollen" fuselage which gives an interior and loading door height of 345cm. No other civil aircraft is capable of taking such bulky cargo except certain types of jumbo jets which are 4 times bigger.

Mercury chartered the Guppy from TAC, who call it the "Skymonster", for the flight from Stanstead airport direct to Lagos.

Two hundred cases of pharmaceuticals, bringing the total load to 24 tons, were also carried on the flight which was arranged for The Wellcome Foundation Ltd. The plant is for extension of their Lagos factory which will make their Nigerian production virtually self-dependent.

commercial review

New cargo airline

Pelican Air Transport — the first airline to be based at Manchester International Airport — has officially started operations. The initial flight was to Ndola, Zambia carrying general cargo with a return flight calling at Cyprus to bring grapes into Manchester. The first flight to Lagos took place on July 24, with a mixed cargo.

Apart from being Manchester's first resident airline, it will at last provide a much needed facility for north and midlands based exporters who until now, had no alternative but to use southern airfields.

Pelican's first aircraft is a Boeing 707 freighter — appropriately christened 'Manchester Lass.' It will take fully palletised loads up to 42 tonnes capacity — more than any other Boeing 707 on the British register.

"After two years of planning, we are now a reality", said Terry Oldham, joint chief executive. "The response we have already received from industry in the north has been fantastic and I can confirm that we will be operating a second 707 by the end of September."

Efforts to improve intra-Africa schedule

African airlines are to pull out all [illegible] in a concerted effort to improve intra-[illegible] schedules particularly in the East [illegible] band, to develop common specifications of wide-bodied aircraft and to co-ordinate the development of overlapping [illegible] the creation of a joint cost-sharing scheme.

This emerged from the assembly of the African [illegible] tion held in Khartoum which has highlighted [illegible] among member airlines tion by the association schedule services in the [illegible]

Also discussed was the [illegible] menting a standardised [illegible] for pilots, technicians and [illegible] and the development of [illegible] and certification [illegible] ordination with the African Commission.

The Secretary General [illegible] considerable difficulties [illegible] come if improvements [illegible] services within continental [illegible] be achieved.

Evolution of air traffic at some of the French [illegible] West African countries

	1970				1975				1976			
	Passengers		Freight(2) (arrival & departure)	Post (2) (total)	Passengers		Freight (arrival & departure)	Post (2) (total)	Passengers		Freight	
	Total (1)	Transit			Total (1)	Transit			Total (1)	Transit		
BENIN	57,219	20,732	1,628	160	77,565	32,452	3,254	213	92,688	43,539	3,470	
CAMEROON							18,010				20,328	
IVORY COAST	228,537	14,227	10,231	583	484,681	90,975	14,755	818	546,727	84,726	16,385	
GABON							21,465				22,873	
SENEGAL	323,053	134,315	5,877	783	625,766	218,154	11,772	942	636,542	195,469	13,183	
TOGO	37,631	11,410	738	118	115,552	42,433	3,128	157	122,213	44,045	4,675	

cial review

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nts Signed

greements have been signed
a and Chad. The agreement
wice-weekly air service between
djamena. An agreement has
ed between Nigeria and South
st by South Korea and an Affri-
A third agreement is shortly to
Nigeria and Barbados.

n operating profits
rld's airlines

l's airlines recorded a consider-
ovement in profitability last year.
them they achieved an operating
more than $3bn, their best result
early 1970's.
mprovement has been attributed to
y revival of world air passenger
after the oil crisis and subsequent
mic depression in 1973-74.
senger traffic grew by 10 per cent
ar and is expected to rise by a
r 8 per cent this year. Preliminary
s issued by the International Civil
tion Organisation, the aviation
ical agency of the UN, show that all
es (scheduled and non-scheduled,
ding charter airlines) in its 141
ber-countries earned total revenues of
n last year. However against this had to be set operating expenses of $46bn for items such as fuel, oil, wages, landing fees leaving an operating surplus of $3 bn. The organisation pointed out that this was only an operating surplus and did not take into account such non-operating items as interest on capital and taxes in various countries. Net profits for the world's airlines, therefore are likely to be well below the $3bn operating surplus.

The organisation stressed that while some airlines earned surpluses many others incurred operating losses. In 1976 about a quarter of all airlines incurred losses.

British-Nigerian air services agreements

Nigeria and Britain have signed an air services agreement to formalise existing air links, and to provide a formal framework within which both countries can develop their air services. A total of 16 scheduled weekly return passenger flights are now being operated by the airlines of the two countries.

Kuwait trade mission to Cameroon

A Kuwait trade Mission recently visited Cameroon, and in receiving the delegation, the Minister of Economy and Planning, Mr. Youssoufa Daouda said that the private sector was closely associated their policy for development.

The Minister used the opportunity to emphasize the great importance that Cameroon attaches to its policy of planned liberalism which is reflected in:

- an open door policy to private investors;
- an elaborate and generous investment code;
- permanent structures for dialogue between the Government and the private sector at all levels;
- the 4th Five-Year Economic, Social and Cultural Development Plan (1976-81) of which 27% of the investments is to be financed by the private sector while 33% would be financed by semi-public enterprises;
- the State's participation in the private investment is not obligatory and the State only participates in strategic projects with industrial and social character which can only be undertaken by several private investors.

The Minister also emphasized the policy of individual decentralization by which private investors are encouraged to establish themselves outside Douala and Yaounde.

B. Cal.—Sierra Leone link strengthened

The 24-year-old link between the Sierra Leone Government and British Caledonian is expected to be further strengthened later this year through major service improvements.

In the autumn two BAC 1-11 flights between London and Freetown will be replaced by a Boeing 707, so there will be five services a week all on Boeing 707s.

ommercial review -

aw shipping decree

ew decree has been introduced banning ign ships over 15 years old from enter- Nigeria's waters from August 1st. The v decree provides a fine of ₦20,000 as t of the plan to tackle the problem of gestion at both Apapa and Tin Can nd Ports.

ontainer perations worsen

e standard of container operations in gena is beginning to deteriorate and if situation is not urgently resolved, erything will come to a standstill.

At present, the average monthly loading ands at over 6,500 — an additional con- ner berthing facility has recently been leased for use at the New Terminal Apapa harf Extension. A further facility is soon be released.

Since the new directive that containers be thoroughly examined as to minimise their use for smuggling purposes, e container terminal company has been orried, fearing that the container opera- on may grind to a halt.

Problems have been growing, thus preventing any serious improvement. The TC lack basic equipment to handle the containers and they also lack the space for handling the landed containers. However here are ways of improving the situation, for instance making greater use of the provision for direct delivery of containers to receivers premises where they are to be examined. It would also help to enlist the co operation of customs authorities in major exporting countries to examine and sealed containers at the loading end to minimise the need for further detailed examination on landing.

Seafreight service commences

Blue Line Export Services (Shipping) Ltd. have recently introduced a UK/West African seafreight service for bulk, general and wheeled cargoes. There are monthly sailings from Shoreham in the UK to Banjul in the Gambia and to other West African ports by inducement.

Anchor Global expands

Anchor Global Transport of Felixstowe, UK has added a further ten trailers to its fleet to cater for more expansion in its door to door groupage and full load ro-ro trailer services to Nigeria. Warehousing facilities at Felixstowe have also recently been extended.

After two and a half years of operation, the Anchor service is now the longest established trailer route to Nigeria, and the company claims to be market leader in terms of number of trailers shipped.

Whilst the market in general has been fairly static, in the first six months of 1978 Anchor's traffic was three times that of a similar period a year ago.

Anchor decided to build up its own trailer fleet earlier this year. Twenty 10M trailers were purchased in April and the further ten are also 10M units.

Managing Director of Anchor Global, Simon Gearing, believes 10M trailers are better than 12M for long distance ro-ro because the 25 ton limit can usually be loaded on 10M but a sixth of shipping space, and therefore cost, is saved.

Ro-ro lines merge

The two major Ro Ro shipping lines serving Nigeria — BFI Line and TFL Afrik — have merged to form a joint company, BFI West Africa Lines Ltd. Both companies have long standing interests in the West Africa trade and the merger is a natural extension of these. Currently they are providing sailings every 14 days. The new joint service, which started on July 1, will have sailings every 10 days from Felixstowe and Sheerness, UK.

A wide range of equipment is available including 20ft containers, 40ft box vans, 12 metre flats and low loaders.

Brewery expands

Nigerian Breweries Ltd. (NBL) Kaduna is being expanded at a cost of ₦9m. The programme includes provision of new silos with storage capacity for 40,000 tonnes of malt costing ₦1.5m with another ₦40,000 for painting. On Nigerianisation the General Manager said all expatriate engineers positions would be handed over to Nigerian engineers at the end of 1978.

Developments in treatment of bilharzia

A new medicine for the treatment of intestinal bilharzia has been developed by Pfizer, an international company dealing with research, development and manufacture of medicines. The new medicine called VANSIL has undergone extensive tests throughout West Africa, especially in Nigeria, where the disease is prevalent.

Trade mission launches investment appeal

Nigerian business representatives appealed to American owners of small and medium-size businesses in Atlanta, USA to invest in their nation.

The Nigerian delegation of 27 business men and women were in Atlanta on part of a 21-day tour of the United States. The group made a special call in Atlanta for investments in the area of agriculture-related businesses and in housing.

The emphasis of this trade mission is on small and medium-size business.

Several government subsidies are available as incentives to the finding of investors in Nigeria in such agricultural fields as animal husbandry, grain production, food processing and dairy production.

Book Reviews...

Electro Buyers' Guide

A new pocket book has recently been published "ZVEI — Electro Buyers' Guide — New Edition 1978" available in English, French, Spanish and German.

This book comes out once a year on the occasion of the Hanover Fair and consists of a goods classification section; a register of products; and list of goods and their manufacturers and an index of firm. It also contains authentic references concerning sectors of the electronics and electrotechnics — from the complete "power station" to the "miniature component."

Equipment for rural workshops

Intermediate Technology Publications Ltd. have recently published "Equipment for Rural Workshops" by J.E.L. Boyd. Agriculture Units, Intermediate Technology Development Group.

The aim of this booklet is to assist the man in the field who is required to set up a training workshop, a workshop for his own use, or attempting to assist local people in the purchase of equipment.

Only well-known and reliable equipment is listed, and the tools recommended are those which would be suitable for general purpose wood working and metal working enterprises, which might be called on to make or repair a very wide variety of goods.

The booklet is intended to help people choose appropriate tools and equipment — it is **not** an instructional textbook on workshop technology.

Mathematics for Technicians

McGraw Hill have recently published a new book "General Mathematics for Technicians (2nd edition)" by H. G. Davies and G. A. Hicks, a revised edition of "General Mathematics for Technical Colleges".

The book has been written and planned to meet the requirements of the mathematics Standard Unit Level. One of the Technical Education Council's programmes in Engineering and Science.

At the beginning of each chapter a list of objectives is included and at the end of the chapter there is an assessment test composed of short answers.

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commercial review

ew agricultural rvice from Minster

inster Agriculture, has introduced a new rvice which it claims can double meat duction of domestic herds.

Dr. J. T. Meadley, the company's irector, said that research carried out in tswana had shown that by making mple changes in livestock husbandry chniques, marginal land could be made to oduce twice the amount of meat.

The changes, which take into account cological, economic and social factors ffecting livestock, involve such things as ncing, water and grazing. Research has hown that these techniques can make a g reduction in the import of beef and hus save foreign exchange.

Called the Range Management Development Unit (RMDU), the special service akes into account the improvement and utilisation of pastures and natural vegetation, as well as husbandry techniques. RMDU will co-ordinate the whole spectrum of production from land capability planning to improved livestock and provision of adequate marketing systems, abattoirs and local slaughter facilities.

Call to re-appraise OFN

ONAI, the Organisation of Nigerian Agricultural Industries has called on the FMG to re-appraise OFN, saying it had not yet made any impact. At the end of its meeting in Benin, the organisation issued a communique appealing to the FMG to invest in agriculture and save the nation from spending foreign exchange on the importation of food. The organisation blamed the decline in agricultural production on the old age of farmers, lack of incentives, apathy of youths towards farming and the unilateral methods said to have been adopted by commodity boards in fixing prices without taking members of ONAI into consideration.

Value of camels' milk

The value of camels' milk as a source of food is to be investigated by a firm of agricultural development specialists, OAD (Agriculture) Ltd. of the UK, using a purpose-built camel milking parlour designed by another British company, Gascoigne Gush and Dent Ltd.

The camel is said to be a very good converter of poor quality food and water into good quality milk and meat. The production and value of camels milk will be examined in a herd of 40.

The specially-designed milking parlour is capable of handling 8 animals at a time. It is a "walk-through" type in which the camels will enter at one end, stand nose to tail for milking, and leave at the opposite end — an arrangement which speeds milking time. To encourage the fullest possible yield, facilities are provided for feeding concetrated food to the camels during milking.

Ghana's timber exports drop

Ghana's exports to the UK last year, 808,000 cubic metres woth £103 m were the lowest for thirty years. Statistics have shown that Ghana has dropped from third to tenth among countries supplying sawn lumber sending 62% less of this and 45% less in volume of logs. This has been attributed to severe balance of payments problems and the inability to replace sawmill and forest extraction machinery, thus reducing supplies.

In brief...

Sierra Leone has signed an agreement with the **West Africa Rice Development Association** (WARDA) for the promotion of rice production within West Africa. The agreement provides for an increase in quality and quantum of production and use of varieties suitable to the climate. It also aims at promoting more effective storage, processing and marketing.

The World Bank has granted the **Ivory Coast** $20m to develop rubber (hevea) plantations in Grand-Bereby of between 7,000 and 13,500 hectares.

The project includes a factory for the treatment of the raw material, social infrastucture including a school, dispensary and residences and access roads. The project will provide employment for 2,200 people.

The Chairman of the National Grains Production Company Ltd. recently told the **New Nigerian** that the FMG had agreed that the company should establish a 4,000 ha mechanised farm in each of the 19 states. The company has already constructed storage depots with a capacity of 13,000 tonnes in Kaduna, Kano and Gusau. Storage facilities with a capacity of 6,000 tonnes each have also been built at Badeggi, Ilorin, Oyo, Benin, Potiskum and Enugu. Each farm will be constituted into a company.

The newsprint mill being built by the Nigerian newsprint manufacturing company beside the Cross River at Oku Iboku will be ventilated and have its waste heat recovered by equipment from **Carrier Ross Engineering** of the UK. Carrier-Ross engineers have been in close touch with the consulting engineers from the planning stage of the mill.

French and West African telecommunications have taken a big step forward with the inauguration of a new submarine cable which extends an existing line between France, Morocco and Senegal. Now stretched a further 2,500 kilometres the new line links with the Ivory Coast too.

Two US companies are negotiating with the **Ghanaian Government** to undertake the rehabilitation of Ghana's telecommunications system. This was announced at the West African Regional Seminar jointly organised by Postal Telegraph and Telephone International and the Friedrich Ebert Foundation. One of the US companies has been named as **Global Communications.** One company is to provide a small satellite earth station, while the other will provide external finances to rehabilitate the telephone system.

Scientists and engineers attending the international conference on Appropriate Technology at Fourah Bay College, Sierra Leone have been urged to find methods of adopting modern technology to rural needs, taking into account culture, level of literacy, national resources and general environment.

BP Nigeria Ltd. has announced the promotion of Mr. N. O. Farinde to the post of Deputy General Manager and will be the first Nigerian to hold the post.

The newly-formed Nigerian Marketing Association has been urged to help the Federal Government realise its economic objectives. The Federal Commissioner for Trade told the Association that it had a crucial role to play ensuring the success of government economic policies, such as the recent budgetary measures.

An agricultural survey has commenced in selected areas of Ondo State, conducted by the Federal Office of Statistics as part of a nationwide exercise to determine the contribution of agriculture to the nations gross domestic product. The survey will include the size of farming households, yield estimates of crops and market prices for some commodities and a livestock count and physical measurement of areas under cultivation.

The Technical Division of Tarpaulin Industries (W.A.) Ltd has won another agency to represent in Nigeria, **"Société Surgerienne de Constructions Mecaniques" (SSCM),** manufacturers of "Poyand" diesel engines. The Technical Division of Tarpulin Industries formed within the last two years has successfully launched Powermaker Generators, Line Forklift Trucks and Marina-Mobile Landhomes.

In June the **Ivory Coast Minister of Finance, Economy and Planning** opened an interministerial meeting for the preparation of the 1981-5 Ivorian Plan for solid, social, cultural and economic development.

The programme was an analysis of the present situation, definition of objectives and policies and a study of various choices.

The French company, **INTER G** is to construct a **ground nut oil mill in Senegal** with a grinding capacity of 200,000 tonnes a year. This mill, will be built at Diourbel, 150 kms from Dakar for the electrical and industrial company (SEIB) of Baol, controlled by the Senegal government.

ommercial review

In brief...

: first phases of the new hydro electric tion at Shiroro, Niger State will be com- ssioned by the end of June, according to PA. The station has a capacity of 3MW I the generators have been positioned t have yet to run. The station is believed be the short term answer to the power oblems of the Minna area. 132kV nsmission lines are to be constructed m Shiroro to Minna, Minna to Bida and inna to Abiya.

onstruction is expected to start this year l a system of feeder roads to link the umdeke Plateau with the Cameroon ational highway system.

The work, in the western part of the ountry, is being booked by the **ternational Bank of Reconstruction and evelopment**, and is planned on a 'do-it- ourself" labour intensive basis. The cheme may eventually involve more than ,000 km. of roads.

adagry College, Lagos State and **Ahmadu ello University**, Zaria are to have catering nstallations from **Modern Catering ystems** UK who have already supplied the ederal Secretariat in Lagos, the Lagos ports Stadium and State Secretariat at los. The new contracts are valued at more than ₦35,400.

The Gambia has appointed a UK firm of transport consultants **RPT Economic Studies Group** to carry out a comprehensive survey of the country's road maintenance requirements as part of an improvement programme supported by the World Bank. The five-month study will be carried out by specialists from the Economic Studies Group in association with parent consulting engineers **Rendel Palmer and Tritton**, and financial advisers **Price Waterhouse Associates.**

Ghana has finalised agreements with Sierra Leone and Gabon to enable her deep sea vessels to fish in their territorial waters. Recently the country has been facing a fish shortage.

The Federal Commissioner for Establishments Mr. Dan Isokari represented the Federal Commissioner for Trade at the unveiling of a plaque to commemorate the Golden Jubilee of the Nigeria Hotels Ltd. and Ikoyi, Lagos.

Work is to commence on a new 1.5m tonnes a year oil refinery at Victoria, Cameroon, in September and should be completed before the end of 1981.

The Sokoto State Ministry of Information in conjunction with the State's Ministry of Agriculture and the Federal Ministry of Information has launched a one-month campaign on OFN with special emphasis on rice production.

Nigeria is at present importing fifty tonnes of an anti-termite wood preservative from the UK each month. The preservative is manufactured by Cuprinol who also market timber preservation and industrial wood preservatives in Nigeria.

The hydroelectric dam at Taabo was completed (as far as the civil engineering work was concerned) in June, six months earlier than forecasted. Work began in 1975 by the Groupement des Enterprises Taabo with the participation of Italian and French companies including Inpregilio, Dumez, Fougerolle, Solre T.P. et Torno.

A joint venture company has been established by a Ghanaian company **Willigina Ltd.** and **Nam-Young Construction Co.** a South Korean concern, on a 51-49 basis to enter the housing and construction business in Ghana. The venture is to be capitalised at $870,000.

The Sierra Leone Ports Authority has embarked on a "container" service system to transport cargo from overseas. The system aims at reducing pilfering one of the main problems of the Ports Authority.

The ₦88m Calabar Port Complex officially opened during the first week in August. The contracting from **Royal Netherlands Harbour Works** is currently dredging the deep channel.

The executive secretary of the Federal Capital Development Authority has opened an air-strip for the proposed federal capital near Abuja to offer quick temporary communication between the area and other parts of the country.

A Hotels Management and Tourism Board has been established in Sokoto State, with Alhaji Ismaila Gusau as Chairman.

Ghana has signed a $20m (¢27m) agreement with an Italian shipbuilding company **Societa Esecizio Cantieri** for the construction of two tuna vessels. The first vessel is expected to arrive in September and the order supplements an earlier one for the construction of four fishing trawlers.

Barclays Bank International opened a new branch in Abidjan last week.

NEPA has commissioned 25 distributor transformer substations between January and June this year in Kwara State alone. 15 of them are in the State Capital Ilorin and the rest at Offa and Jebba.

The glass manufacturing division of the **Ghana Industrial Holding Corporation** (G. I. HOC) at Aboso is to increase production from 4,000 tons to 16,000 tons. The increase is expected to meet Ghana's beer and spirits bottling requirements.

An **American firm** from Michigan, Ohio, is to **assemble helicopters in Ghana** for export to African and European countries. The plant is expected to start operating after the establishment of the Free Zone at Tema.

Telecommunications Internationales de la Cote d'Ivoire (Intelci) is launching an international invitation to tender for construction of a "Standard A Intelsat" aerial at the Akakro Land Station.

The Nigerian South American Line (NSAL) owned by Henry Stephens Shipping Co. Ltd. has been admitted a member of the Brazil/Nigeria Freight Conference.

New appointments

● **The Nigerian High Commissioner** in Sierra Leone Mr. J. G. O. Olaitan has been reassigned as Ambassador to Moscow and will be succeeded by Mr. Olufemi Ani.

● **The next General Manager of Palm Line Agencies (Nigeria),** Division of UAC Nigeria Ltd., is to be Mr. Ayo Afolabi, a Nigerian, currently Area Manager of the Division.

●**Mr. Gamaliel O. Onosode** has been appointed Chairman of Cadbury Nigeria Ltd. Mr Onosode is at present the Chairman and Chief Executive of Nigerian Acceptances Ltd., Merchant Bankers, and Chairman of Nigerian Stockbrokers Ltd., Lagos Development Co., and a director in 20 other major companies.

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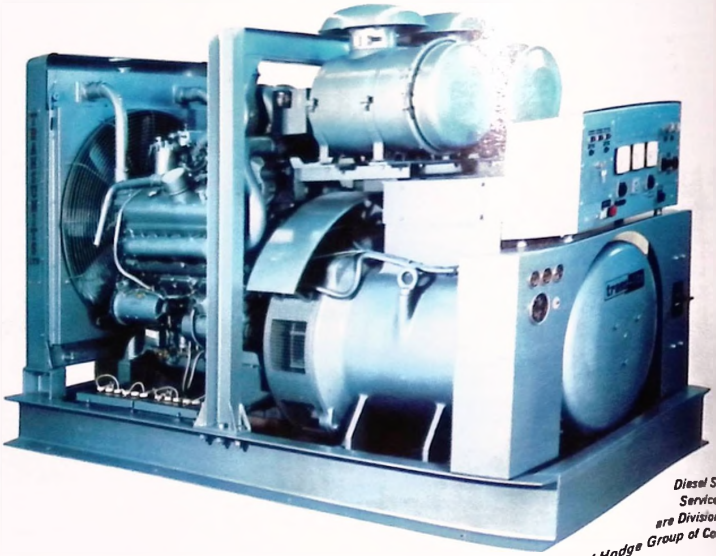

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Sierra Leone: Kissy Works, Kissy Dockyard, P.O. Box 1456, Freetown.
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ompanies & contracts

order worth about ₦26,650,000 for ckfish has been placed with **Iceland, eenland** and **Norway** by the **Nigerian tional Supply Company Ltd.** The order ounts to 205,000 bales out of which rway is to supply 75,000 bales, Iceland 0,000 and Greenland 10,000. Nigeria s able to secure a 30 per cent reduction price due to her position as the biggest gle market for Stockfish. Nigeria buys -60 per cent of Stockfish produced by e three countries.

ne largest air-freight contract on record as been signed by **Peugeot N** with e French Airline **UTA** an Nigeria irways. The contract is for the airlift of KD parts for 162,000 cars f rance Nigeria in the next 4 year year 2,000 cars are to be airlifted Nigeria his number will increase to 0 in 981.

Hunting Geology and Geoph Limited, have recently been awarded a ct by a unit of **Coastal States Gas Co** ation of Houston, Texas, to und take a programme of airborne spect meter surveying to explore for uraniu deposits in Liberia. Hunting are responsible for the supply of geophysical equipment and personnel for two helicopters operated by **Western Helicopters Inc.,** California.

Hunting electronics technicians supervised the installation of the geophysical and ancillary equipment into two Alouette Lama helicopters specially modified for airborne geophysics, and are operating and maintaining these instruments during the course of the survey. The instrumentation being used in each helicopter includes a 4-channel spectrometer, a 1,000 cubic inch sodium iodide crystal assembly.

At the survey bases in Liberia, Hunting positioned senior data compilers to plot the helicopters' flight paths in the different survey areas onto aerial photographs and mosaics and a geophysicist is analysing the data and producing provisional interpretation maps. The first stage of the digital data processing will be performed by Hunting in UK. Flying operations are expected to continue for four months.

Final shipments have been made of equipment supplied by **Kent Instruments** for a major order from Nigeria for instrumentation for a water distribution network to be undertaken by the **Anambra State Water Board.** Instrumentation for the scheme was ordered by **John Holt & Co. (Liverpool) Ltd,** the value of the order has been placed at £350,000 (₦413,000).

Nigeria has recently signed a contract worth ₦2,054,021 for the construction of a new town for 300,000 inhabitants north of Murtala Muhammed Airport.

A paper sack manufacturing line has been sold to Senegal by **Oy W. Rosenlew Ab,** who have become a minority shareholder of the Senegalese company **Rufsac.** The line has a capacity of 10-12 million sacks a year. It is expected to supply the annual requirement of paper sacks in Senegal.

Nigerian Railways are to receive wheel sets from the **British Steel Corporation** which use 2,760 British-made rolling stock wheel bearings.

The Timken AP (all-purpose) bearing is ready to use and specifically designed for railway rolling stock. More than six million have been sold throughout the world.

Nigerian Railways have ordered 208 freight cars (for the transport of merchandise and cattle) from three construction companies: **Mechanoexport Import** in Roumania; **Mitsui** in Japan and **Projects & Equipments Corp.** in India.

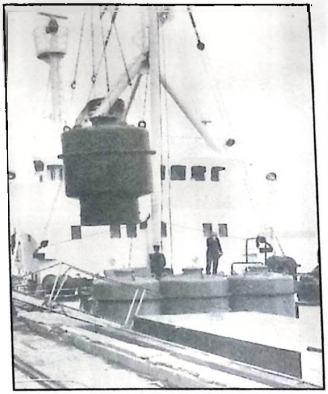
Whessoe Systems and Control of the UK have negotiated a contract valued in the region of £200,000 to supply their Whessmatic 500 telemetering system and tank level gauging on a number of oil storage tanks at the Kaduna Refinery of the **Nigerian National Petroeum Corporation.**

Carrier-Ross has been awarded a major contract to provide machine hoods, heat recovery plant and complete mill ventilation equipment for the **Nigerian Newsprint Manufacturing Company.** The new mill complex, situated at Oku Iboku will house two paper making machines to produce standard grade newsprint using a high percentage of locally grown tropical hardwood.

The Danish company, **Corekem,** part of the Emborg Group, is involved in various stages of building five breweries in different parts of Nigeria. The latest is a 450,000 barrel operation near Port Harcourt for **Inikio Breweries.** It is expected to start producing in two years time.

Langville Transport has won a contract for forwarding all equipment and fittings for a complete three-floor department store to Nigeria, which has been successfully completed in less than five weeks.

All interior fitting of the 6500 m² Nigerian department store is being carried out by **Eurolink Merchandising Systems Ltd.,** part of Baxter Fell Northfleet Ltd. Equipment needed was supplied by Eurolink. In all, 129 cases were packed, with a total volume of 630 m².



Part of the AGA consignment which includes 22 of the above steel light buoys.

AGA Navigation Aids Ltd. have won an order worth £200,000 (₦236,000) to supply marker buoys, moorings and lights to the **Royal Netherlands Harbour Works Company,** Contractors for the Calabar Port Development, Nigeria.

The ₦70m petrol pumping station under construction at Arigbabu, Shagamu is to be completed this October. The contract was awarded three years ago to a Russian company **TSMPE.** When completed it will be possible to pump all types of petroleum products from the oil refinery at Warri to Murtala Mohammed Airport, Apapa, Ibadan and Ilorin.

A US company **Western Electric International** has submitted a ₦167m proposal to the FMG for the implementation of the second phase of the national telephone and telegraph transmission system. The company would undertake the project in partnership with an indigenous telecommunication company — **the Nigerian Far East Co.**

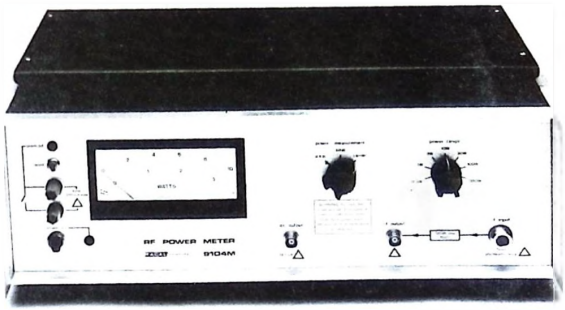
Airflow Developments Ltd. have received an order for 50 portable ventilation units for use in Nigeria. The units are to be used for manhole ventilation during the installation of a new multi-million pound telephone system, and will help engineers to complete their work underground quickly in very hot and humid conditions. At present engineers can stay down underground inspection chambers for only about an hour, after which they have to come up and rest for about two hours. The ventilation units will enable this ratio to be considerably improved.

Dakar's largest hospital, Le Dantec, is about to award contracts for medical equipment.

The Ministry of Cocoa Affairs, Ghana has placed an order worth £35m with West Germany for insecticides.

Instrumentation of Communications

The demand for radio and ground communications today is soaring, and as a result there is overcrowding causing interference. L. Painter from Racal looks at the developments made in precision measurements that can help prevent such interference.



The 9104 measures total power, carrier power and P.E.P. Results are displayed directly in r.m.s. value on a meter with a linear scale.

WITHIN THE electromagnetic spectrum the regions devoted to radio and data communications, radar, navigation aids, telemetry and satellite communications are vital to the development of modern civilization, and the communications engineer of today is faced with an unprecedented demand for radio and ground links. This has led to a multiplicity of signals in the available frequency bands accompanied by a reduction of the frequency spacing between individual channels.

The potential dangers that could result from interference due to overcrowding are becoming more significant daily. It is not difficult, for example, to visualize the disastrous effect that major interference would have on the control of aircraft flying in crowded air-traffic lanes or the hazard of lost or garbled transmissions in data networks and tactical radio systems. Prevention is always better than cure and to this end modern transmission and receiving equipment is designed to meet very stringent requirements in terms of signal purity, frequency accuracy and stability. But failure to comply with these requirements can cause more than interference in adjacent channels, for the transmission of distorted or impure signals will result in unnecessary power dissipation coupled with loss of efficiency and range. It is therefore essential that both the transmitter and the receiver should be carefully checked at regular intervals. For whether we are considering high-power permanent station installations, the low powered hand portable transceivers favoured by police forces, emergency services and airport personnel, or high speed data transmission it is only by regular monitoring and calibration that performance can be maintained within the limits now being set by communications authorities.

The Racal-Dana wideband millivoltmeter model 9301 for the accurate true r.m.s. measurement of r.f., sinusoidal, pulse and noise waveforms.

Sampling technology

One of the most significant steps forward in the field of precision measurement is in the exploitation of electronic sampling techniques. In a typical sampling circuit, a local oscillator signal is processed in a pulse generator to produce a train of narrow pulses of frequency Fs. The frequency spectrum of this pulse train is a comb of harmonically related sampling frequencies extending from Fs to a higher frequency determined by the width of the fundamental sampling pulse. When an external frequency, Fx, is applied to the sampling mixer it beats with a harmonic of Fs to produce a low or intermediate frequency signal. If Fx is an exact harmonic of Fs, then the output will be a constant dc but in all other cases the output frequency will be the difference

Continued

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the nearest harmonic of
ple has been developed
range of test instruments
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hniques are widely estab-
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d offer overall accuracies of
order. Above 1GHz, how-
oblems involved in areas such
eed gating and prescaling or
conversion are best overcome
plication of sampling techni-
hen becomes possible to pro-
gital frequency meter having a
g capability extending from
the higher GHz band without
circuits or add-on units.
ling circuits adopted for fre-
measuring instruments perform
nctions equivalent to prescaling or
nic conversion and internal
ment of this type, two sampling circuits
each driven by its own VCO are
yed with the input signal in parallel. The VCO controlling the first
generator is swept between pre-
mined frequency limits until a har-
e of the sampling frequency Fs coin-
with the input signal frequency Fx.
is point the dc level at the gate out-

The 9058 is a fully portable selective analyser that can perform all the functions of narrow band spectrum analysis usually associated with far more expensive instruments.

put stops the sweep and holds the loop in lock. After division by a factor M, the pulse frequency F1/M is applied to one input of a phase comparator. A second sampling loop operates within the same gating frequency range at a rate F2 generated by its own VCO. The signal F2 is divided by M1 and then compared in phase and frequency with the signal F1/M to produce a signal which will lock the second VCO. Sampling oscillators F1 and F2 are restricted in range to ensure that the harmonic of F2 which [illegible] Fx in the second sampling network will have the same harmonic number as used in F1 and is therefore offset from Fx by 1/M and a difference frequency produced equal to Fx/M. This output signal is applied to the digital counting stages for readout in a manner similar to the lower frequency direct gating stages.

Typical of the instruments now available is a digital frequency meter with a sensitivity of 50mV which employs sampling techniques to measure up to 3GHz. The only restriction on the upper frequency is the width of the pulse applied to the sampling gate but further advances in semiconductor technology will enable the circuit designer to produce the extremely narrow sampling pulses needed to extend the frequency range above present limits.

Transmitter and receiver calibration

Close channel spacing can be maintained only when transmitters are operated at the correct frequency and modulation levels and when receivers are available with good sensitivity, good selectivity and high stability. A particular application of sampling techniques led to the introduction of a VHF/UHF calibrator to provide a rapid and economical means of checking and resetting these parameters. Carrier frequencies are allocated in

Continued

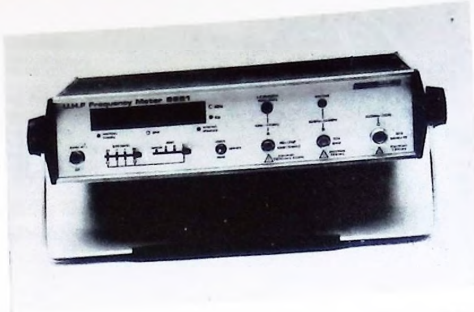
—with inter channel spac- by the PTT authority. In example, bands up to —n use with channels sepa- 12.5, 25 or 50 kHz. Since channels are normally fre- —ch are an exact multiple of —nel spacing, it is possible to —beat comparison method in —gnal under test is sampled at separation rate controlled by n-up oven-controlled crystal Any necessary retuning of the —illator is achieved simply by or zero beat on the calibrator this application, a direct read- quency is not provided nor ary. Additional features of this nstrument include a precision nidband working, a ... MHz for receiver checks, ... and ing facilities and a battery pack applications.

...ation checkin...

...bining search and ... techni- ... the basic sampling circuits, ...omatic modulation ... are ...able for measurement of both FM with carrier frequencies ...e range 1.5 to 2000 MHz. ...ic tuning and adjustment of input has revolutionized the ...ment of modulation which can performed accurately with the ... of training. Size has been considerably compared with ...-tuned counterparts and this ...nt is therefore ideal, particularly ...ry operated form, for test and ...ment on mobile equipments in ...n remote locations.

...l analysis

...ther variation on the basic sampl- ...ciple is used in an HF Selective ...er designed principally for check- ...le-sideband transmissions in addi- ... measuring intermodulation pro- ...nd carrier suppression. Essential- ...is an extremely linear selective ...r operating on the heterodyne ...le and incorporates a narrow-band ...ccurate attenuators, and an output meter. It has a bandwidth of 200Hz, a dynamic measuring range of 70dB, and a measurement accuracy of ±1.5dB. This small, easily tuned, stable, low noise instrument with excellent linearity has been made possible only through the use of its unique sampling circuit for frequency changing. Tuning over the complete operating range is achieved in only three switched bands with a crystal controlled LO.



Fully programmable the 9921 3GHz Frequency Meter has automatic levelling on all input channels.

RF voltage

So far, we have considered applications of sampling circuits in which, the sample frequencies are generated either from a precision crystal-controlled oscillator or a VCO dependent upon the input signal frequency. The versatility of sampling techniques however, is such that they can be used to great effect in a true rms millivoltmeter designed to exhibit high accuracy over extremes of level, bandwidth, and input waveform.

It can be proved mathematically that if an alternating repetitive signal is randomly sampled and held, and a sufficient number of samples is taken, the rms value of the signal is preserved at the output. In the latest addition to the company's range of high-performance test instruments, a dual sampling process followed by rms conversion is the heart of the circuit which gives accurate true rms readings of any voltage from 100μV to 300V over the frequency range of 10kHz to 1.5GHz.

The sampling system employed, gives a frequency response independent of voltage range and which is virtually unaffected by temperature variations between 0° and +55°C. Furthermore, its true rms reading capability gives consistently high accuracy throughout its dynamic range even on non-sinusoidal waveforms without recourse to the use of graphs or correction curves so familiar with conventional milli-voltmeters. Additionally, a unique noise cancelling circuit reduces residual noise to less than 20μV — a figure at least one order better than previously attainable in wide-band volmeters.

Signal generation

Sampling techniques in conjunction with state-of-the-art solid state electronics have opened up new avenues for instrument development. But there have been radical advances in other areas also. The r.f. signal generator, for example, has recently been revolutionized by the introduction of a fully synthesized instrument which is tuned by a single spin wheel control rather than by the more usual array of decade switches. With special features for radio communications users, this signal generator represents the most significant advance in its field since the advent of synthesis techniques. It includes a unique channelised mode in which the operator can tune the output frequency in discrete channel-related steps; a continuous mode of general purpose use; a built-in frequency meter that continuously monitors the output signal and full a.m., f.m., and p.m. facilities.

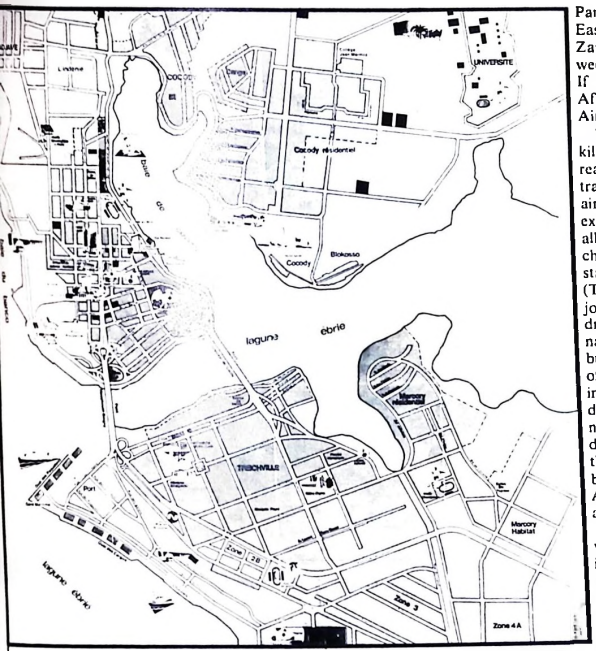
This modulation meter makes fully automatic measurements of a.m. and f.m. signals with carrier frequencies up to 2GHz.

Power

A major disadvantage of traditional power meters has always been their susceptibility to damage by overloading. This is no longer the case following the release of a new high power, absorption wattmeter. This is capable of true rms power measurements from less than 100mW right up to 300W over a range of frequences from 1 to 1000 MHz. It is virtually impossible to damage the meter even with the continuous application of well over 300W to the most sensitive ranges. The fact that power measurements of CW, AM, FM and PM signals in addition to Total Power and Peak Envelope of Power of all types of AM signals can be made is an indication of its versatility. Accuracy is completely independent of the modulating waveform. □

DESTINATION ABIDJAN

Hints for a businessman's first trip to Abidjan



A street plan of Abidjan

THE SITE of Abidjan was originally chosen by French officers in 1898 as the junction for two railway lines — one running along the Atlantic coast, the other penetrating the interior towards the Niger River. Nevertheless it took some 30 years for Abidjan to outgrow Grand Bassam, the former capital.

With a population now in excess of 500,000 Abidjan, with its modern high-rise buildings in a delightful setting of bougainvillea and hibiscus and a sophisticated linking road system, consists of clearly defined districts or 'quarters' all grouped around the Ebrie Lagoon and Cocody Bay.

The Plateau, with its shining skyscrapers and bright lights, forms the city's commercial centre. On its western edge stands the Presidency surrounded by elaborate gardens and facing across the Baie du Banco with a superb view over the timber 'years, then the forests and lagoons as far as Grand Lahou. Further out still, past Banco National Park, is the new town of Youpougon.

Southwards towards the ocean is the industrial zone and port, and the suburbs of Marcory and Koumassi, the latter a teeming new town. However the true heart of the city lies in Treichville. Here, around the central market and its many restaurants and nightclubs, there are bright lights, spicy food and exciting African music day and night.

East of the Plateau, across another arm of the lagoon, lies the largely residential suburb of Cocody, dominated by the Hotel Ivoire complex. Beyond the new embassy quarter, the African Riviera project is being built — a new garden city and tourist development with villas, apartment blocks, hotels and leisure facilities.

How to get there

UTA and Air Afrique fly daily from Paris to Abidjan, the latter via Geneva and Rome, and there are regular services by Pan Am, KLM, Swissair, Sabena, Middle East Airlines, Alitalia, Egypt Air and Air Zaire. British Caledonian also operate on a weekly service from London via Monrovia. If travelling from other parts of West Africa there is Ghana Airways, Nigeria Airways and Air Mali.

The airport of Port Bouet lies about 16 kilometres from Abidjan but taxis are readily available. Some hotels provide free transport for their guests to and from the airport. Taxis in Abidjan are plentiful except at lunchtime and are also cheap. For all journeys, however, it is essential to check that the meter is switched on at the start of the journey and that Tariff 1 is used (Tariff 2 is used after midnight and for journeys outside the town limits). Taxi drivers on the whole do not know the names of streets and visitors are advised to buy a street map on arrival, obtain details of the locations of the companies they intend visiting and be prepared to direct the driver. As an alternative, especially if a number of calls are to be made (as taxis are difficult to pick up away from main thoroughfares) a chauffeur-driven car can be hired. The main car hire firms are Hertz, Air Service Ivorien, Locauto, Auto Ivoire and Abidjan Location Auto.

The only road journey that a business visitor would normally consider undertaking to reach Abidjan would be that from Accra via Kumasi. The distance can be covered in a full day of hard driving on surfaces that are good most of the way, but bad on a stretch each side of the frontier. However, a new coast road is projected.

For travel within the country, there are regular air services with Air Ivoire between Abidjan and the principal towns of Sassandra, Tabou, Gagnoa, Daloa, Man, Bouake, Korhogo and San Pedro. There are also air taxi services. Alternatively all the main towns in the Ivory coast are accessible by road, mainly laterite although some are tarred.

Continued

A caterpillar grader at work improving the roads

ntinued

here to stay

Hotel accommodation is excellent in Abidjan, and thus they are almost always fully booked, so be sure to make reservations well in advance. From a businessman's point of view, the Hotel du Parc and the Hotel Tiama are amongst the best and right in the centre of town. However, the Hotel Ivoire Intercontinental fully lives up to the modern conception of virtually a hotel city, with swimming pools, a boating lake, a supermarket, tennis courts, a bowling alley, five restaurants, a casino and even an ice skating rink. The Ivoire also includes excellent conference facilities. The Convention Centre auditorium seats up to 2,100 and is complete with simultaneous translation system, audio-visual equipment, four smaller meeting rooms, concierge facilities, cocktail lounges, theatre, two cinemas and a press room.

A view of the Forum Golf Hotel with their attractively designed swimming pool in the foreground

Other good hotels include the Grand Hotel in the Plateau, the Hotel des Relais in Cocody, the Hotel Internationale which is very close to the airport, and the Hibiscus in Marcory. Close to the Industrial Zone, but agreeably situated on the coast, are the Hotel Palm Beach and the Hotel Akwaba. Not quite so convenient for businessmen but in the beautiful setting of the Riviera is another Intercontinental — the Hotel Forum Golf. This is ideal for those who

Continued

1978 Flight Schedules between Abidjan/London and Abidjan/New York

Abidjan London

Airline	Dep. Abidjan	Aircraft	Flight		Arrive	Dep.	Aircraft & Flight No.	Arrive London	Airport (Heathrow-H) (Gatwick-G)
Monday									
British Caledonian	07 45	707	BR [illegible]					17 25	G
Air Afrique	00 50	DC10	RK [illegible]		11 10	12 30	AB3 AF812	12 30	H
Air Afrique	21 15	DC10	RK [illegible]		08 20	10 00	AB3 AF800	10 00	H
Tuesday									
Air Afrique	09 00	DC10	RK [illegible]	Paris	17 15	18 30	AB3 AF818	18 30	H
Ariana	10 20	DC10	AZ [illegible]	Rome	16 50	18 50	TRD BE507	20 10	H
UTA	19 15	DC8	UT832	Paris	07 35	09 00	L10 BE303	09 00	H
Wednesday									
UTA	08 15	DC8	UT814	Paris	16 40	18 00	B11 BR883	17 55	G
British Caledonian	15 20	727	WT704	Accra	16 10	19 45	D10 BR384	05 10	G
UTA	19 25	DC10	UT822	Paris	07 25	09 00	L10 BE303	09 00	H
Thursday									
Lufthansa	00 40	707	LH RK563	Frankfurt	08 15	09 05	TRD BE323	10 30	H
UTA	08 15	DC10	UT824	Paris	17 55	19 30	B11 BR693	19 25	G
Swissair	10 15	DC10	SR259	Geneva	17 00	17 55	D9S SR812	19 25	H
	21 45	DC8	UT812	Paris	07 50	09 00	L10 BE303	09 00	H
Friday									
Air Afrique	07 25	DC10	RK30	Paris	20 05	21 30	B11 BR897	21 25	G
British Caledonian	20 20	707	LN542	Accra	21 25	22 30	707 BR308	06 00	G
Sabena	22 40	707	SN422	Brussels	01 15	08 05	707 SN601	08 00	H
Air Afrique	23 00	DC10	RK32	Paris	08 30	10 00	AB3 AF802	10 00	H
Saturday									
Alitalia	00 20	DC10	AZ631	Rome	07 50	09 35	D9S A2282	10 55	H
Lufthansa	00 40	707	LH563	Frankfurt	08 15	09 05	707 BE723	10 30	H
Air Afrique	09 15	DC10	RK22	Paris	19 05	20 30	AB3 AF820	20 30	H
UTA	19 15	DC8	UT828	Paris	07 20	09 00	L10 BE303	09 00	H
Air Afrique	20 20	DC10	RK18	Paris	07 15	09 00	L10 BE303	09 00	H
Sunday									
UTA	09 00	DC10	UT802	Paris	17 15	18 30	AB3 AF818	18 30	H
Swissair	10 15	DC10	SR2[illegible]	Geneva	17 00	17 55	D9S SR812	19 25	H
	21 10	DC10	UT858	Paris	07 02	09 00	L10 BE303	09 00	H

Abidjan/New York

Airline	Dep Abidjan	Aircraft	Flight No.	Via	Arrive	Dep.	Aircraft & Flight No.	Arrive New York
Monday								
Pan American	20 50	707	PA185					08 00
Air Afrique	00 50	DC10	RK42	Paris	11 00	13 00	747/AF077	14 45
Air Afrique	21 15	DC10	RK48	Paris	08 20	11 00	Concorde/AF001	08 45
						13 00	747/AF077	14 45
Tuesday								
UTA	18 15	DC10	UT832	Paris	07 35	11 00	Concorde/AF001	08 45
UTA	19 15	DC10	UT832	Paris	07 35	13 00	747/AF077	14 45
Wednesday								
Pan American	10 00	707	PA187					19 15
UTA	08 15	DC8	UT814	Paris	16 40	17 45	747/AF017	18 30
UTA	19 25	DC10	UT822	Paris	07 25	11 00	Concorde/AF001	08 45
Thursday								
Lufthansa	00 40	707	LH/583	Frankfurt	08 15	10 00	D10/LH482	13 30
UTA	21 45	DC8	UT812	Paris	07 50	11 00	Concorde/AF001	08 45
Friday								
Air Afrique	20 45	DC8	RK48					06 00
Air Afrique	23 00	DC10	RK32	Paris	08 30	11 00	Concorde/AF001	08 45
Saturday								
Lufthansa	00 40	707	LH583	Frankfurt	08 15	10 00	707/LH400	13 45
Pan American	19 50	DC10	SR254	Robertsfield	21 05	00 30	707/PA185	08 00
Sunday								
Pan American	07 45	Caravelle	RK509	Dakar	10 40	15 10	707/PA199	19 15
UTA	21 30	DC10	UT858	Paris	07 20	11 00	Concorde/AF001	08 45

London Abidjan

Airline	Dep. London	Airport (Heathrow-H) (Gatwick-G)	Aircraft	Flight No.	Via	Arrive	Dep.	Aircraft & Flight No.	Arrive Abidjan
Monday									
Air Afrique	09 00	H	A300B	AF809	Paris	11 00	12 15	D10/RK25	19 45
Sabena	10 00	H	Trident	BE376	Brussels	11 55	12 55	707/SN421	20 10
Air Afrique	16 30	H	Lockheed L1011	BE326	Paris	20 30	22 00	D10/RK47	05 30
Ariana	19 45	H	DC9	AZ776	Rome	23 00	00 15	D10/A2836	04 55
Tuesday									
UTA	20 30	H	Lockheed L1011	BE332	Paris	22 30	23 59	D8S/UT811	04 30
British Caledonian	23 05	G	707	BR353	Robertsfield	07 50	11 30	737/UY705	12 50
Wednesday									
Swissair	11 10	H	DC9	SR811	Geneva	12 35	13 55	D10/SR258	19 00
UTA	19 45	H	Caravelle	AF1825	Lyon	22 20	00 15	D10/UT823	04 05
Thursday									
UTA	20 30	H	Lockheed L1011	BE332	Paris	22 30	23 59	D8S/UT811	06 30
Friday									
Air Afrique	08 00	H	Trident	BE308	Paris	10 00	11 45	D10/RK31	17 30
Ariana	08 45	H	727	AZ317	Rome	13 10	15 05	D10/A2830	18 45
British Caledonian	10 00	G	707	BR 151	Robertsfield	16 50	20 20	707/SN422	21 40
	20 30	H	Lockheed L1011	BE322	Paris	22 30	23 55	D10/RK21	04 15
Saturday									
UTA	08 00	H	Trident	BE304	Paris	10 00	11 15	D8S/UT825	17 35
Air Afrique	08 00	H	Trident	BE104	Paris	10 00	11 45	D10/RK37	16 55
Swissair	11 10	H	D9S	SR811	Geneva	12 35	13 55	D10/SR254	19 00
UTA	20 30	H	Lockheed L1011	BE322	Paris	22 30	23 59	D10/UT801	04 20
Sunday									
British Caledonian	22 [illegible]	G	707	BR355					08 10
UTA	08 45	H	727	AF317	Rome	13 10	13 55	D10/RK41	17 35
UTA	19 00	G	B11	BR814	Paris	20 15	22 15	D10/UT867	06 40

New York/Abidjan

Airline	Dep New York	Aircraft	Flight No.	Via	Arrive	Dep.	Aircraft & Flight No.	Arrive Abidjan
Monday								
Pan American	17 45	707	PA186					10 55
Air France	18 00	747	AF070	Paris	07 55	09 00	D10/UT831	17 50
Tuesday								
Air France	13 00	Concorde	AF002	Paris	22 45	23 59	D8S/UT813	04 30
Pan American	17 45	707	PA180	Dakar	05 35	08 00	CRV/GN124	11 05
Air France	18 00	747	AF070	Paris	07 55	11 15	D10 UT871	18 00
Lufthansa	19 45	747	LH401	Frankfurt	08 10	13 50	707/LH562	18 45
Wednesday								
Pan American	16 30	707	PA186	Robertsfield	05 30	08 05	D10/SR259	09 25
Air France	18 00	747	AF070	Paris	07 55	09 00	D8S/UT827	19 20
Thursday								
Air France	13 00	Concorde	AF002	Paris	22 45	23 59	D8S/UT811	06 30
Pan American	17 45	707	PA184	Dakar	05 25	08 45	D8S/RK108	11 25
Air France	18 00	747	AF070	Paris	07 55	11 15	D10/RK31	17 30
Ariana	19 30	747	A2603	Rome	11 20	15 05	D10/A2830	18 45
Alitalia	21 20	747	A2643	Rome	11 25	15 05	D10/A2830	18 45
Lufthansa	22 40	707	LH407	Frankfurt	11 15	13 50	707/LH562	19 45
Friday								
Pan American	16 30	707	PA188					08 15
Air France	13 00	Concorde	AF002	Paris	22 45	23 55	D10/RK21	04 15
Air France	18 00	747	AF070	Paris	07 55	11 15	D8S/UT825	17 35
Saturday								
Air Afrique	20 30	DC8	RK10					15 00
Air France	13 00	Concorde	AF002	Paris	22 45	23 55	D10/RK21	04 15
Pan American	16 30	707	PA198	Robertsfield	05 30	08 05	D10/SR2165	09 25
Air France	18 00	747	AF070	Paris	07 55	11 00	D10/RK41	17 35
Air France	22 00	747	AF022	Paris	10 55	13 00	D10/UT867	19 45
Sunday								
Sabena	21 45	747	SN548	Brussels	10 45	12 55	707/SN421	20 10
Air France	22 00	747	AF022	Paris	10 55	12 15	D10/RK25	19 45

tinued

Grand Hotel, and the Ivoire night club.
For other means of entertainment, there several air-conditioned cinemas — the is, Rex, Studio, Sphinx, all on the teau; Ivoire at the Hotel Ivoire. There is o the French Cultural Centre which is ll worth a visit and it often presents films d plays and the Goethe Institute ganises periodic concerts and has regular m shows. There is also a theatre in the iversity complex at Cocody and an cellent museum which is well worth a sit.

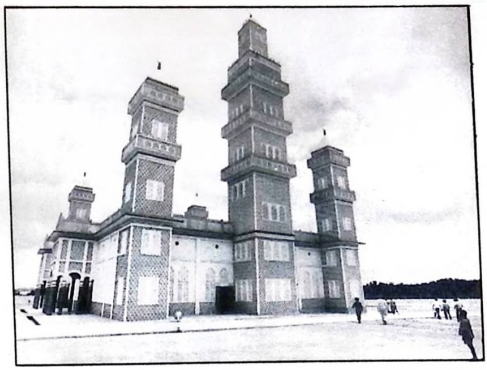
Where to shop and what to buy

There are the shopping ar... The Treichville market is highly d...nised, abundant and fun. Wood c...ings of statues and masks, carved wo... doors, bronze and gold jewellery, ... and masks, pottery, cloth and dra... can all be found here, and after ... hard bargainings it is possible to ge... down to very reasonable levels. At A... there is also a large food and cloth m... at less in the way of artifacts. The b... ket for these is on the Plateau, oppo... Hotel du Parc, and there is also ... food market further into the Platea...

A large selection of fish is available at this market

Besides the markets, there is a vast choice of almost every kind of merchandise throughout Abidjan, particularly in the Plateau, where elegant shops and boutiques as well as modern air-conditioned supermarkets abound.

Dress in Abidjan is fairly formal and businessmen are usually expected to wear a jacket and tie, or, when visiting top executives, a suit should be worn. There is no standard practice for dress in the evening (only one restaurant — le Toit at the Ivoire insists on men wearing jackets). Business hours for commerce and government are from 8 am to 12 pm and 2.30 to 5 pm on Monday to Friday and 8 am to 12 pm on Saturdays. Banking hours are from 8 to 11.30 am and 2.30 to 4.30 pm Monday to Friday. Most shops are open from 8 am to 12 pm and 4 to 7 pm every day except Sundays.



The impressive mosque in Yamoussoukro built by the President

Essential to know French

One of the most important things of all to remember is that French is used exclusively for official and commercial purposes and little English is spoken, although the use is spreading. It is essential, therefore, that business visitors have sufficient command of French to be able to conduct business in that language. Normal French forms of address should be used.

Yamoussoukro worth a visit . . .

Should one have some time to spare, the visitor must not miss the opportunity of visiting Yamoussoukro, the President's birthplace, which has grown rapidly over the past years and is often spoken of as the place where 'all roads meet all roads'. Wide boulevards separate impressive new buildings. The vast mosque in the city was built at the President's own expense for the people and is the religious expression of his policies. The President's residence is set behind a lake filled with sacred caymans (of the crocodile family) in shaded wooded grounds. But of far greater importance is his model plantation, reputed to be the largest in West Africa, upon which all the country's main crops are grown. Yamoussoukro is also the headquarters of the ruling National Democratic Party. As you approach the town from Abidjan the square Party Headquarters building can be seen high on a hill and further down the slope is the brand new and luxurious Hotel President.

. . . as is Assouinde

Another spot well worth a visit while in Abidjan and only two hours' drive from the city is Assouinde, a beach resort built on a strip of land between the lagoon and the ocean near the Club Mediterranée at Assinie. The resort is reached by boat and has been built in imitation of an African village. Thatched bungalows cluster around a central courtyard with swimming pool, sun-deck, bar, restaurant, night-club and shops. The hotel — Les Paletuviers' — has 300 bedrooms and its restaurant menu includes many African dishes. Assouinde has facilities for water-skiing, tennis, volley ball, table tennis, petanque and riding. Visitors can also join organised excursions in dugout canoes to tour neighbouring lagoon villages and see folk-dancing.□

"Les Paletuviers" Assouinde

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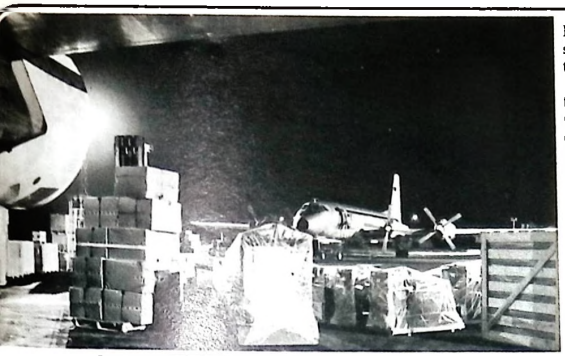


General goods [illegible] loaded on their way airfreight to Kano.

KANO
GATEWAY TO THE NORTH

Kano's central position and fully operational International Airport provides the city with a vast industrial and commercial potential. This short article outlines the opportunities that now exist for air freighters to northern Nigeria.

Skyscrapers high above four-level freeways bumper to bumper with Datsuns, Peugeots and Mercedes testify to the wealth of Nigeria's capital, Lagos.

These are the symbols of progress, founded firmly on the fact that Nigeria is second only to the Arab Emirates in its production of oil — a lucrative discovery that let loose the independant energies of human enterprise.

Vast potential for commerce

The result is a consumer-conscious Nigeria that is now spreading its wealth beyond Lagos to help district authorities provide the kind of infrastructure that has already resulted in a degree of self-sufficient industry.

Peugeot, for example, is now established in the ancient, picturesque walled city of Kano, Nigeria's third biggest city.

Kano's central position, and the fact that it has the only fully-operational international airport outside the capital, has established its undeniable place as 'Gateway to Northern Nigeria' and, therefore, its viability as a potential industrial and commercial mecca.

Some commentators even go so far as to predict its eventual elevation as commercial capital with Lagos retaining its authority as the seat of government.

The Federal Military Government would seem to go along with the idea.

Spurred on by local enthusiasm and practical steps towards industrial and commercial growth, the Government has demonstrated its support for Kano by building a new runway and aprons at the airport and by having plans ready for work to begin soon on new airport buildings.

Signs that Kano wanted to develop were first evident in 1976 when the local authority saw to it that the airport accepted commercial flights during the annual Hadj - the festival of pilgrimage that in previous years had closed the airport for three months to almost all but pilgrim flights.

European shippers who had hitherto consigned goods to Murtala Muhammed Airport, Lagos or to the Port of Apapa for overland delivery to northern destinations were relieved by this symbol of progress. It had long been known that many northern importers were becoming increasingly irritated with the long, expensive delays experienced because goods had to be brought into the country via Lagos.

One report claimed that a drilling platform ordered for use in a village near Kano had cost ₦2,360 to transport from the UK to Lagos and the equivalent of ₦23,600 to transport overland between Lagos and Kano — and in a much longer time.

Stories likes this encouraged a handful of far-sighted European forwarders to establish representation at Kano in order to assist local importers in their efforts to reduce costs and save time directly importing by airfreight.

It is these operators who have helped establish Kano by finding a rapport with the Nigerian authorities that has legitimately overcome a burden of red tape. By acknowleding the necessity for the strict rules that govern the import of goods they have gained confidence and respect.

One of the most successful air forwarders to Lagos and Kano is the IML Group. This group has invested heavily to ensure that its air cargo charter services into Nigeria from the UK, Europe and the Far East will satisfy all requirements.

This is particularly significant when one considers that in recent months there has been as much as a 300 per cent growth in the amount of air cargo arriving directly — 50 per cent of which is for the outlying towns and cities. This is despite the fact that even now only selected full charters and a relatively small number of part charters are allowed to operate into Kano.

Air freighters expand operations

In anticipation of this, IML formed a sister company soon after opening its office in Kano early in 1977. Freight Agencies (Nigeria) Limited augments IML's total service approach by providing specialised clearance and forwarding facilities and a three-times weekly trucking service between Kano and Kaduna - a door-to-door service that highlights the enormous benefits of Kano as a distribution centre.

While professional air freighters take a pride in providing good service there are others who are less competent at seeing their loads from door to door.

Faced with a build-up of unclaimed cargo at Kano Airport, the Military Government has recently announced its intention to introduce a system of pre-clearance, similar to that already enforced at Lagos/Apapa where apron and quay congestion had been considerably reduced.

Without local representation it is exceptionally difficult to arrange pre-clearance at Kano, communication being what it is! Add to this the myriad of rules, regulations and small-print legislation and it becomes evident that the only satisfactory way of dealing with pre-clearance is to do what IML recommend: to have a professional on the spot capable of dealing with every single detail speedily and efficiently. Without this kind of expertise it is impossible to operate successfully.

At this stage in Kano's development a large proportion of the cargo being imported is associated with the building of roads and other construction projects.

Gradually imports will become more and more associated with consumer products, in line with the wealth that will go hand in hand with the city's rise to prominence.

When this happens, Kano can be said to have arrived and will provide its own symbols of progress. One can only hope that the planners in Kano will have better taste than their brothers in Lagos. If they do, Kano's gateway will be open wide to the most profitable commercial exercise — tourism. It would be a pity to miss such an opportunity. □

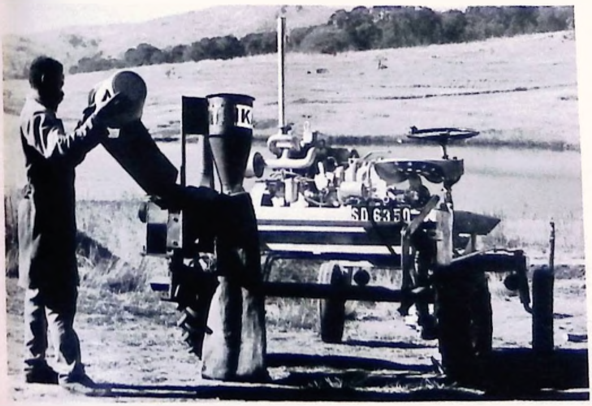
The Mechanisation Dilemma

by
Dr. J. T. Meadley
Minster Agriculture

ese three photographs illu[illegible] the rsatility of the Tinkabi tractor, a revolutionary sign developed in Africa to m[illegible] farmers' eds for cultivation, transport and stationary wer.

WEST AFRICAN FARMING

WEST AFRICA is littered with mechanical graveyards and wrecks of tractors stripped for spare parts. The cost of these now stationary piles of potential farm power — manufactured in eastern and western bloc countries out of Africa's own raw materials and now rapidly disintegrating into rust — must run into millions of dollars. Despite this sad picture of rusting metal, however, large amounts of the same agricultural machinery are still flowing into West Africa.



WEST AFRICAN FARMING

Increased agricultural production in West Africa depends upon increased productivity from the land and from those who farm it. Both could be more productive providing the land is adequately conserved (WATR., "Soil Productivity in Retreat — The West African Problem" —

Continued

inued

D. Franks, June 1978) and the rural ulation receives a much better deal in s of services and prices. There is no bt that mechanisation has a role to play ncreasing productivity providing it is of a complete farming system which ludes security of tenure, credit, seeds, ilisers, stable prices etc. Here is the mma — mechanisation is needed but sent policies are having little effect.

e limits the farmer

There can be no doubt that the small mer will remain the major producer of od and many cash crops in West Africa the foreseeable future. The maximum a which he can cultivate is often determined by the amount of labour (family) he can call on to plough, plant, eed and harvest at specific times in the ar — for timeliness of operation is key ctor in determining yield. A farmer may erefore be limited both in the area he can ultivate and his ability to carry out ecific tasks at the right time. Mechanisation can theoretically provide the power to ultivate larger areas at the right time and herefore increase productivity.

The importance of oxen

The forms of mechanisation are varied. The ox, for example, is a valuable and much neglected source of farm power in tsetse-free areas. It has many attractions — it is self-reproducing; is fuelled by renewable resources; produces a valuable fertiliser; consumes crop by-products and produces a valuable end-product — meat. There are of course distinct disadvantages to this low cost power unit. It's ability to work is strictly limited; it must be fuelled all the year round; it is frequently lacking in stamina after the dry season when maximum effort is needed; the high grazing requirement of the oxen team and its associated herd can lead to erosion. Despite these limitations oxen have a potential barely realised — particularly in areas where there is a tradition of cattle raising. Much can be done by improved feed management to increase the strength of oxen ready for the ploughing season.

Just one of many mechanical graveyards that can be seen throughout West Africa

WEST AFRICAN FARMING

Stronger oxen result in smaller teams and therefore smaller supporting herds and grazing requirements. Much valuable work is being done in Senegal and Gambia, in particular, to improve oxen performance and develop low cost and adaptable toolbars for a range of implements. Oxen justify much more attention— not least because they do not involve foreign exchange.

The limited role of the conventional tractor

There are many situations where oxen are inappropriate and the powerful and more versatile tractor has been introduced. In addition to its obvious role in cultivation its power can be used through the PTO to drive implements and stationary equipment, (e.g. irrigation pumps and generators). However the conventional tractor has many disadvantages in West Africa.

(a) It is a sophisticated unit requiring skilled operation and maintenance — particularly for hydraulics and transmission. In addition to a shortage of skilled operators, there is frequently a lack of servicing facilities and spare parts such that a tractor costing $14,000 can be kept idle for up to three months for want of a farm belt worth $5 — during which time it will have generated no revenue and depreciated in value by at least $750.

(b) Tractors are very expensive to purchase ($10,000 plus) and to maintain and are beyond the reach of most individual farmers.

WEST AFRICAN FARMING

(c) The efficiency of utilisation is normally limited by the weather. Conventional tractors cannot operate successfully in very wet or very dry conditions and the number of days a tractor can operate in the field may be very limited.

(d) The tractor itself has limited value unless accompanied by a range of costly implement.

Tractor hire units have their problems

Despite these problems the conventional tractor has a limited role to play and many

Continued

Clearing land with heavy equipment in northern Ivory Coast

Continued

small farmers aspire to owning a tractor in order to increase the area under cultivation and improve the timeliness of operations. A very few individual farmers can afford to realise their aspirations. Those who do, however, frequently have a privileged position with respect to availability of land, security or credit and detailed analysis of enterprise economics often demonstrates additional advantages such as availability of labour from the extended family at relatively low cost. In many areas tractor hire schemes have been set up to help farmers who cannot afford their own. However few have had any real success and there have been many problems with long travelling times, control over operators, timeliness of operation and invariably they are heavily subsidised. Many of the mechanical graveyards in West Africa began as tractor hire schemes and their impact to date has been limited. The potential for private sector tractor hire schemes has yet to be realised.

Large scale mechanised farming

The conventional tractor has also been the focal point of many attempts by government agencies to set up large scale mechanised farms to produce food. Although there might appear to be certain attractions to farming large tracts of land with centralised management, the real situation has been very different. Any project of this kind has very high front end costs (land clearing and development, infrastucture, purchase of equipment etc.) and high running costs — in particular the cost of management. Any realistic financial costings of the large scale mechanised farming projects will demonstrate the very high production costs and that the small farmer, with his much lower overheads and greater adaptability can produce at much lower cost. Despite this there may still be an important role for the mechanised farms if they genuinely serve as a focal point for development and provide services to the farming community — including mechanical services on a commercial basis.

WEST AFRICAN FA[illegible]NG

Mechanisation has of course b[illegible]ed successfully in large scale farmi[illegible] ra-tions in West Africa but mainly [illegible]ee crops (where cultivation requirem[illegible]re minimal) or with export commodi[illegible]es such as sugar or pineapples under [illegible]ct central management. The developm[illegible] of the pineapple industry in Ivory Coast for example, which involves extensive mechanisation, is a success story but this may reflect the exceptional and pragmatic approach of the Ivory Coast to the development of its agricultural industry. Here the production of some of the main cash crops is undertaken by companies jointly owned by government and private enterprise and m[illegible] Government keeps [illegible] management and ther[illegible] there for others to learn.

Small tractors receive little su[illegible]

There have been [illegible] produce a small tractor [illegible] the small farmer. Th[illegible] successes in this field. S[illegible] involved scaling down [illegible] tractor but this did no[illegible] problems nor bring dow[illegible] stantially. Other attempt[illegible] two-wheeled tillage [illegible] temperate or irrigated [illegible] proved ill-suited to the e[illegible] ditions in West Africa. [illegible] interesting development [illegible] tractor developed in S[illegible] originally designed to re[illegible] of overgrazing and to [illegible] the problems asso[illegible] sophisticated conventional [illegible] hydrostatic transmis[illegible] replacement parts for ea[illegible] and its cost, including a [illegible] ments, is roughly 25% [illegible] h.p. tractor without [illegible] establishment view seems [illegible] tractors cannot be [illegible] manufactured at a cost [illegible] can afford nor will meet [illegible] Fortunately not all acce[illegible]

Ferguson revolutionised
to meet the needs of
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for welding etc. Unfo
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all scale processing or
help to stimulate the ru
basic requirement for
opment.

Preparing land the hard way — at Kalangba in Sierra Leone

ethink
land clearing

here is a long tradition in West Africa
learing land by hand particularly in the
er areas under shifting cultivation. As
and larger agricultural schemes are
eloped (with all the inherent dangers
ntioned in our earlier article (WATR.,
il Productivity in Retreat — the West
ican Problem" — H. D. Franks, June
/8) the tendency is to automatically clear the land with heavy machinery which can cause considerable damage to the soil. In some instances mechanical clearing is essential, especially where regular cultivation will follow, but in many cases alternative methods may be cheaper and more effective. In Liberia, for example, the cost of mechanised clearing of land covered with medium density secondary bush is approximately $1.000 per hectare (nearer $2.500 in Nigeria) compared with only $250 per hectare for clearing by hand.

Obviously hand clearing would not be suitable for mechanised annual croppping but can be quite adequate for tree crops. The figure of $250 includes partial mechanisation with chain saws under trained management. Land clearing by hand, which is not as slow as may appear at first, not only results in very substantial savings of foreign exchange (equipment and fuel) but also recycles the cost of development back into the rural community.

A dilemma when selecting machinery

Those responsible for stimulating agricultural production in West Africa face a dilemma. They see the need for some form of mechanisation to help farmers become more productive but much of what is available is irrelevant or too expensive. They are hampered also by tradition — the wide range of traditional farming systems in West Africa, the traditional design of tractors and implements and possibly the traditional approach to mechanisation taught at college or university. However it is unlikely that a tractor designed for large intensive arable farms in temperate conditions will be directly relevant to a system of shifting cultivation, for example, designed to conserve the soil and use only hand labour. The two do not relate and manufacturers should not be required to design equipment which will simply mechanise traditional operations. Nor should agriculturalists have to design farming systems in the tropics around traditional machinery designed for temperate conditions. A complete rethink is needed, questioning both systems and machinery, relating to local needs and determining the scope for local manufacture.

The international development agencies have a major role to play here since they fund much of the agricultural development. They are well placed to fund this research into and development of farming system and relevant agricultural machinery. There is also much scope for them to fund the rehabilitation of existing machinery which is out of order before sanctioning the purchase of yet more equipment.

Whatever emerges from such a rethink, which may be co-ordinated regionally but must be developed locally, mechanisation must be seen as but one part of the rural economy. West Africa's farmers will no doubt mechanise when the equipment available meets their needs and their pockets and the prices they receive for their produce makes their efforts worthwhile.□

chanised preparation of land for rice at Sanya in the north of Sierra Leone. One of three ctors owned by a private farmer.

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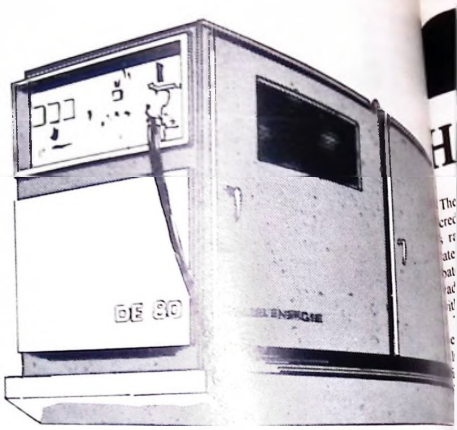

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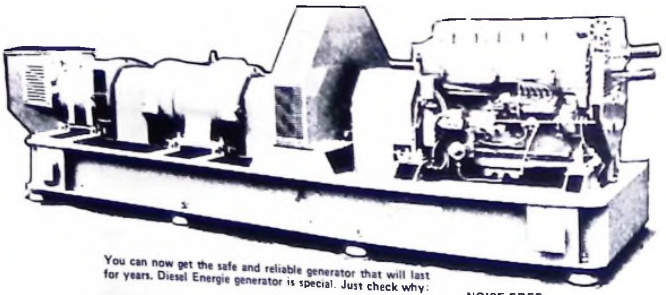

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WATER ENGINEERING

RNESSING THE SENEGAL

al river, 1,700 km in length, is
even: during the rainy season,
flow may reach 2,000 m³ of
econd (6,000 m³ when it is in
ing the dry season, one can
gh the river, and some years
en getting one's feet we
ounts to saying that nothing can
bout it. But such is not the con-
drawn by the three principal
states: Mali, Maur and
(Guinea, little concern about a
t is still minor on its ter is for
ent not participating in roject).
he help of FAO, UND World
and the European ment
they have set up an org tion for
velopment of the Sene the
nisation pour la mise ur du
e Sénégal (OMVS). The of this
cy is both to secure and to ase the
mes of inhabitants of the Senegal river
and of adjacent zones — about
fourth of the total population of the
e countries with some 3 million farmers
have everything to gain if regular
ation replaces the present caprices of
climate, destroyer of the ecosystem.

When three countries thus have a
mmon concern, the solution is obviously
t management and implementation of
jects: accordingly, they have decreed
common ownership of all the works to
built jointly, whatever their geographic
ation.

MVS project onsists of our points

The OMVS project consists of four
ints.

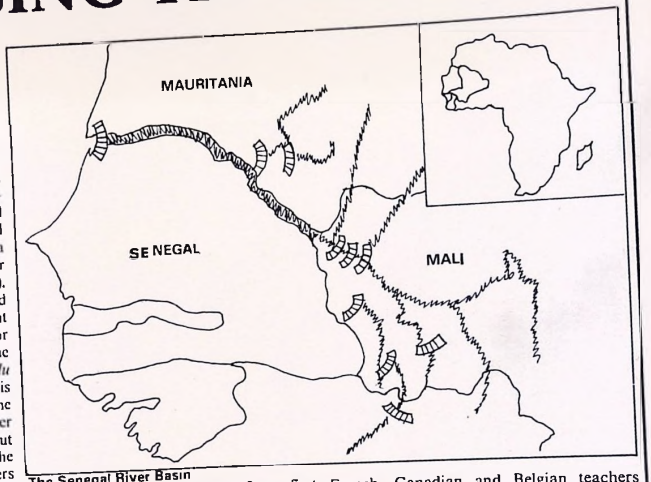
Regulating the stream flow of the
enegal river to maintain it all year round
300 m³ per second, by the construction
a series of dams.

Making a navigable canal, 930 km long,
ith twelve ports, the largest at the two
nds, one at Saint-Louis in Senegal near the
outh, and one at Kayes in Mali to give
is landlocked country access to the sea.

Producing electricity with ten hydro-
ower dams up to 4,000 million kWh per
ear.

Irrigating vast areas and bringing them
nder cultivation. The theoretical irrigable
area is 800,000 ha. But even putting
400,000 under cultivation would enable the
riparian countries to cover their food deficit
and even place them in a position to export
some cereals and vegetables.

Of several sites the experts considered
suitable for the construction of these dams,
the Council of Ministers of the partici-



The Senegal River Basin

pating states has chosen four for a first phase (others will follow). These are: Gourbassi (2,000 million m³ of water impounded) on the Falémé; Manantali (10,000 million m³) on the Bafing; Galougo (over 30,000 million m³) on the Senegal; and Diama, the "anti-salination" dam on the delta, the essential purpose of which is to stop the backing up of the sea in the river beginning in December.

The implementation of all this, estimated at $350 million in 1974, will open opportunities for investment gauged at over $3.5 thousand million in agriculture, industry and transportation, the annual product from which is expected to exceed $1 thousand million. This means that, in view of the stakes involved, seeking immediate profitability from such works in particular would not make sense.

Large scale educational effort required

The development of the Senegal river also entails a large-scale educational effort. Indeed, it is not enough to construct dams, to dig irrigation canals, to plough land, to prepare rice fields and to sow. It is also necessary to train farmers for the new situation. Whence the extreme importance of the Ecole Nationale de Formation et de Vulgarisation Agricole (National School for Training and Agricultural Extension). This school is already functioning at Kaedi in Mauritania under a United Nations assistance project with Mauritanian, French, Canadian and Belgian teachers working together.

Aside from the adaption of traditional techniques, the inertia of certain habits of the people must be overcome. One thinks in particular of the consolidation of landholdings, all the more necessary because, side by side with small holdings usually not bigger than 500 m², there exist immense latifundia.

A start has already been made

At four points of the valley, one can already note that a start has been made and well made: one sees fields of wheat at Guede, in Senegal; rice paddies being prepared in the Gorgol valley in Mauritania; rice crops being harvested in the villages of Rosso and Kaedi in Mauritania.

The OMVS High Commissioner, A. W. Mamadou of Mali, likes to recall that there are 44 river or lake basins in Africa. If all of them were developed, 100 million people would emerge from a state of backwardness.

As for the problem of the Sahel, the Chad, Niger, Volta, Senegal and Gambia river basins could make a decisive contribution to its solution. By harnessing the 100 thousand million m³ in annual stream flow from these basins, which now drain into the ocean, millions of hectares of cultivated land could be developed.

For A. W. Mamadou, there is no question but that the management of these river basins could constitute the basis of the rehabilitation strategy of the Sahel. □

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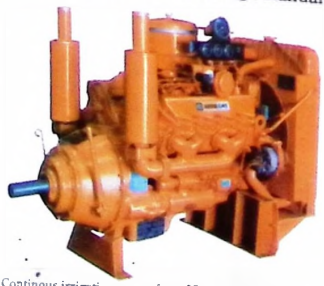

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THE NUTRITIVE VALUE OF MILK

This article by Professor P. E. Jakobsen is an account of the properties and the nutritive value of milk and other dairy products, and attempts to re-examine and evaluate the criticisms levelled against the production of milk and milk products during recent years. The criticism has especially been levelled against the content of saturated fatty acids in milk, but also to some extent againt the low coefficient of utilization of protein and energy in milk production. In the following, the word "milk" means cow's milk, unless something else is explicitly indicated.

ilk consists of two phases, a fat phase id a water phase. The fat phase is spersed as globules in the water phase. he water phase contains lactose, protein, ineral substances, and water soluble tamins, either in a molecular solution or in colloidal solution. The fat phase which rgely consists of triglycerides, but ins bosphopilids, steroids, and soluble itamins.

The fat globules also contain a little rotein as the membrane around the fat lobules consists of lipoprotein. The size f the fat globules varies quite a bit but on n average the diameter is 5.5μ. In one rop of milk there are 20-200 million of hese fat globules.

The membrane around the fat globules consists of a hydrophillic and a hydrophobic layer. The membrane is of importance to the taste and the keeping qualities of the milk. It has turned out that changes in the characteristics of the membrane cause a change in the tendency to after-taste of milk. After-taste is largely due to oxidation of milk lipids and the consequent formation of aldehydes and ketones.

The secretion from the mammary gland excreted immediately after the calving (1-2 days) is called colostrum (first milk/raw milk). The content of solids in colostrum is approximately twice as high as in the milk secreted later on. Especially the protein content is higher, but also the content of mineral substances and vitamins is higher in colostrum than in milk. In approximately 4 days the content of proteins and vitamins, etc., will be reduced to the content characteristic of the product of the dairy breed in question.

The changes in the composition of the milk which occur later on, are small compared with the changes during the first 2-3 days. The percentage of fat in cow's milk falls a little in the first part of the lactation period and rises slowly in the last part.

Milk Production as Part of the Future Livestock Production

No doubt one of the future demands to livestock production will be:

1. Not to maintain a competitive struggle between livestock and man as regards the consumption of food, and
2. To ensure a high quality of the livestock products.

As to point 1, milk production is very advantageous as it only requires a minimum consumption of foodstuffs (= concentrated foodstuffs which may be used for human consumption). As to point 2, it may be mentioned that the milk production results in a number of foodstuffs of superior quality.

Milk and the Global Supply of Proteins

Experiments with piglets have shown that milk proteins have a value approximately 25 per cent higher than proteins from barley. Besides, we know that the value of milk proteins will be increased further if it is used as a supplement to vegetable food.

Milk provides an excellent source of essential amino acids.

As it appears from Table 1, the proteins of cow's milk contain an adequate amount of the essential amino acids to meet the human requirements. 1 litre of milk in 24 hours will supply one person's total requirement of protein as well as essential amino acids. As vegetable proteins are excellently supplemented with milk proteins, it will be possible to ensure the whole world population on optimum nutrition through the consumption of vegetables + ½ litre of milk per day. With the present world population this will result in an annual consumption of approx. 1,000,000 million litres of milk, which equals the production of approx. 300 million milk cows or approx. 0.02 cow/ha of the land cultivated at present. In Denmark there is approx. 0.6 cow/ha or 30 times more. Nevertheless, the above-mentioned supply of milk proteins will result in a trebling, since the present global cattle population consists of approx. 100 million milk cows.

Table 2 shows the supply of proteins compared with the requirements. From this it appears that protein deficiency in the developing countries is largely a distribution problem. The average consumption of proteins is larger than the requirement, and

Continued

Table 1. Essential amino acids in milk and an adult's daily need of optimum protein nutrition (8).

	Content/Litre		Daily Need	
	Cow's Milk	Human Milk	Minimum	Optimum
Isoleucin	1.67	0.75	0.70	1.4
Leucin	4.90	2.28	1.10	2.2
Lysine	2.00	0.94	0.80	1.6
Methionine (+cystine)	1.10	0.29	1.10	2.2
Phenylalanine (+tyrosine)	1.77	0.77	1.10	2.2
Threonine	1.51	0.63	0.50	1.0
Tryptophan	0.47	0.31	0.25	0.5
Valine	1.71	0.66	0.80	1.6
Glutamine acid	6.8	2.3		

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...ization of the resources in ...untries could be improved ... improved development of ...ll countries is necessary to ...nt production of foodstuffs, ...use the increase of popula- ...veloping countries is very ...duction of foodstuffs never ...me a limiting factor in rela- ... increase of population. ... mentioned in the booklet ...hibition "The Daily Meat" ...ical Museum, Copenhagen), ...f presenting the problem is

...utritive ...of Milk

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...nother example of the app...ability of ...is its stabilizing (soothi...) effect on ...human organism and ou... animal ...nisms. Milk is also an optimum ...stuff for people exposed to a heavy ...ical and psychological strain. Thus ...influences the power of concentration ...tively and it produces a relaxing effect.

...lk Proteins

...he effect of milk is largely due to the ... that the milk proteins are easily ...sted and have a high biological value (a ...h content of essential amino acids). ...Also other amino acids are of great ...ritional importance, e.g. glutamic acid. ...will appear from Table 1, there is a high ...ntent of glutamic acid in milk (3 times ...gher in cow's milk than in human milk). ...experiment with human beings has ...oved that the assimilation of glutamic ...id results in a reduction of the content of ...olesterol in the blood (18). A basic diet ...th all essential amino acids + glutamic ...id. This caused a reduction of the content ... cholesterol in the blood of voluntary ...bjects from 226 mg./100 ml. to 165 ...g/100 ml. serum. A similar experiment at ...hich glycine + NH^4 — acetate were ...fused instead of glutamic acid, did not ...esult in a reduction of the content of ...holesterol in the blood. The glutamic acid ...bviously has a specific effect on the excre- ...ion of cholesterol. The effect of milk on the ...content of cholesterol is probably con- ...nected with the high content of glutamic ...acid (8).

Another cause for the favourable effect of milk is said to be its content of orotic acid (8), which is a precursor of the pyrimidines (uracil, cytosine, thymine).

The absorption of orotic acid from milk results in a saving of energy and an improvement of the capacity of the liver as a detoxication organ, as RNA is rapidly regenerated up to a maximum. These conditions are of special importance when the organism is under stress.

Although the milk protein has several positive effects, a so-called milk intolerance due to hypersensitivity to the milk proteins may occur now and then. This intolerance may be avoided by heating of the milk (15).

The proteins in the different types of cheese will have almost the same composition of amino acids as the milk protein. Several experiments have been performed on the effect of cheese on new-born children with indigestion (7). An examination of approximately 1,000 such patients at the age of 0·6 months has proved that a substitution of milk for cheese may yield surprising results by normalizing the digestive processes. This effect is ascribed to the high content of accessible proteins in cheese, and the fact that the supply of lactose has stopped.

Table 2. The global supply of proteins compared with the need (1).

	g protein+/person/day	
	Average consumption	**Average need**
Globally	65.5	38.7
U.S.A.	94.0	39.7
U.S.S.R. + others	90.5	40.0
Western Europe	86.3	40.0
Africa	58.2	41.5
North-West Africa	57.9	50.9
Central Africa	43.7	37.8
Asia	57.8	38.3

+ Standard protein

Milk Sugar (Lactose)

It is a well-known fact that a large part of the population in many countries has a low lactose activity, the result of which is that the cleavage of the lactose in the alimentary canal only takes place to a very small extent. This results in a lactic acid fermentation which may in some cases cause milk intolerance (15). The symptoms are indigestion. Another disease with new-born children who live exclusively on milk, is the deficiency of active hexose-phosphate-uridyl transferase. In this case the glactose cannot be utilized, and a galactosemia (galactosuria) with different symptoms (jaundice, vomiting, diarrhoea) arises. Human beings with a low lactase activity or a low hexose-phosphate-uridyl transferase activity ought to consume the milk proteins in the form of cheese or the like, from which the lactose has been eliminated.

Milk Fats

By and large, products from poultry and pigs can be produced with the desired composition of fatty acids. Thus it is possible to make these animals produce fat with a content of linoleic acid varying from 2 to 50 per cent of the fat. Because of the hydrogenation process in the forestomachs of the milk cows it is much more difficult to control the composition of the milk fat. Therefore, this will normally have a low content of linoleic acid. The human need of linoleic acid is not known.

The content of linoleic acid in cow's milk corresponds to 1.4 per cent of the total energy of the milk. Experience shows that children who in their first months live on cow's milk as a substitution for mother's milk, often suffer from overweight at an

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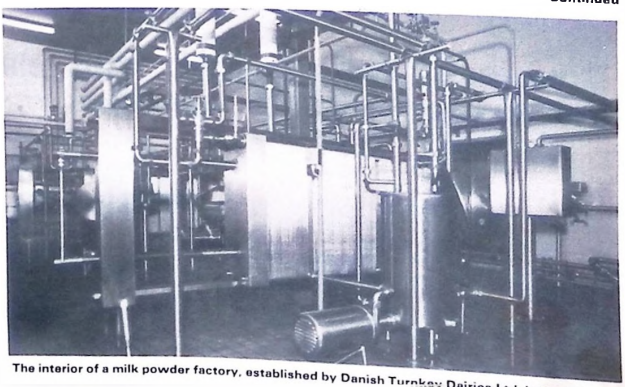

The interior of a milk powder factory, established by Danish Turnkey Dairies Ltd. in East Africa.

Table 3. Fatty acids in milk fat (g/100 g fat) (8).

	Number of Atoms C	Human Milk	Cow's Milk	Camel's Milk	Sow's Milk
Butyric acid	4	0.4	3.1	—	—
Caproic acid	6	0.1	1.0	—	—
Caprylic acid	8	0.3	1.2	0.9	—
Capric acid	10	1.7	2.6	10.8	—
Lauric acid	12	5.8	2.2	2.4	0.2
Myristic acid	14	8.6	10.5	7.5	3.1
Palmitic acid	16	22.6	26.3	29.7	28.7
Stearic acid	18	7.7	13.2	8.4	4.6
Oleic acid	18	36.4	32.2	28.5	38.6
Linolic acid	18	8.3	1.6	1.5	14.1
Arachidonic acid	20	0.8	1.0	0.1	0.5

ontinued

arly stage of their development. [illegible]ks as this tendency to overweigh[illegible]ased epositing of fat) will last th[illegible] the ears. However, the cases of [illegible]weight vith babies nourished on cow[illegible] may also be caused by the fact that [illegible]ly it was regular practice to add [illegible] the babies' milk, and thus the [illegible] acid energy is reduced to 1 per cen[illegible] total energy.

Linoleic acid

From Table 3 it appears that the milk of ruminants (cow's milk, camel's milk) has a very low content of linoleic acid compared with human milk and sow's milk. Besides, it is possible to enrich the milk fat with linoleic acid, if the fodder fat of the milk cows is protected against hydrogenation processes in the forestomach. Such an enrichment with linoleic acid will be advantageous if milk is used as the only food for new-born children. However, as regards resources it is more advantageous to add linoleic acid directly to the milk, as it is the case for the production of substitutes for mother's milk. The consumers must be told that it is inadvisable to use milk as the only — or almost only — food for new-born babies because of the low content of linoleic acid. It also ought to be mentioned that the proportion between protein and energy in cow's milk is too high for new-born children, just as the content of sodium is too high, whereas the content of iron is too low. Apart from this, milk is one of the best balanced foodstuffs we know.

The Influence of the Diet on the Frequency of Heart Disease and Vascular Disorder

The consumption of milk fat has often been pointed out as the cause of an increasing number of deaths owing to heart diseasesalthough it has never been possible to prove any correlation (2, 4, 11).

Through hardening of fats, for instance for use at the production of margarine, part of the unsaturated fatty acids are transformed into trans-fatty acids. Consequently, certain countries have decided not to produce margarine which contains trans-fatty acids. However, in this connection it ought to be mentioned that a high content of poly-unsaturated fatty acids in the diet may result in the formation of trans-fatty acids in the alimentary canal. Thus a consumed cis-fatty acid may be transformed and absorbed as a trans-fatty acid. Butter has a low content of trans-fatty acids (16).

The most important risk elements in connection with heart disease and vascular disorder are overweight, smoking, too little exercise, increased serum cholestorol and other hereditary elements (5). Nothing seems to indicate that the consumption of more poly-unsaturated fatty acids than physiologically necessary reduces the risk of heart diseases and vascular disorder in healthy people. It appears from Table 4 that the consumption of a normally balanced diet results in a plentiful supply of the two most important poly-unsaturated fatty acids (linoleic and arachidonic acids), viz. approximately 13 g./day. Besides, it is worth mentioning that some test results seem to show that large quantities of poly-unsaturated fatty acids have an aging effect, which means that the physiological age become higher than the actual age (10).

Table 4. Example of a daily ration.

	Total amount of fat/g	Oleic acid/g	Linoleic acid +arachidonic acid/g
Bread, flour, hulled grain	4	0.4	2.4
Dietetic margarine — fat	16	6.4	6.4
Butter fat and milk fat	16	4	0.8
Eggs, lunch, dinner	44	18.2	3.4
Total	80	29	13

Total energy of the daily ration	approx.	10,000 kJ
Total fat energy	approx.	3,000 kJ
Energy in linoleic and arachidonic acid	approx.	500 kJ
Fat energy percentage of the total energy	approx.	30 pct
Percentage of the linoleic and arachidonic acid energy of the total energy	approx.	5 pct

P/S = approx. 0.6 (P/S = proportion: poly-unsaturated fatty acids/saturated acids)

Summary

As mentioned above a trebling of the number of dairy cows might have the result that the whole world population had the possibility of consuming proteins and fat from ½ litre of milk per day. To a large extent such a milk production could be realized on the basis of products of low value (processed by-products, roughages), and then it would be possible to obtain: 1) an optimum nutrition of the population in all countries by means of a basically vegetable diet supplemented with milk proteins, as well as 2) an improvement of the environment and the development of resources. It will probably be possible to realize such an extension of the animal husbandry, when the one-sided propaganda against milk products stops.

Because of the low content of linoleic acid in milk it is appropriate to warn against the utilization of cow's milk as the only or almost only food for infants in their first months. The following 4 points probably constitute the most important elements in the prevention of heart diseases and vascular disorder.

1. Consumption of protein and energy in quantities sufficient to cover the requirements.
2. A balanced diet.
3. Maintenance of an adequate physical condition.
4. Moderate consumption of alcohol and tobacco.

Finally, it ought to be mentioned that the above 4 points imply that the consumers are free to decide whether they want butter or margarine on their bread.

These simplified recommendations do not apply to sick people. Diabetics have to observe one diet. Persons who are predisposed to fatness have to observe another diet. Problems in this connection have to be solved by the patients' doctors. The above theories are in dispute because some dietitians want to transfer a diet beneficial to sick people (persons who are predisposed to heart diseases and vascular disorder) to the vast majority of the population, who are not predisposed to these diseases. This is wrong as unbalanced diets may have certain side effects. □

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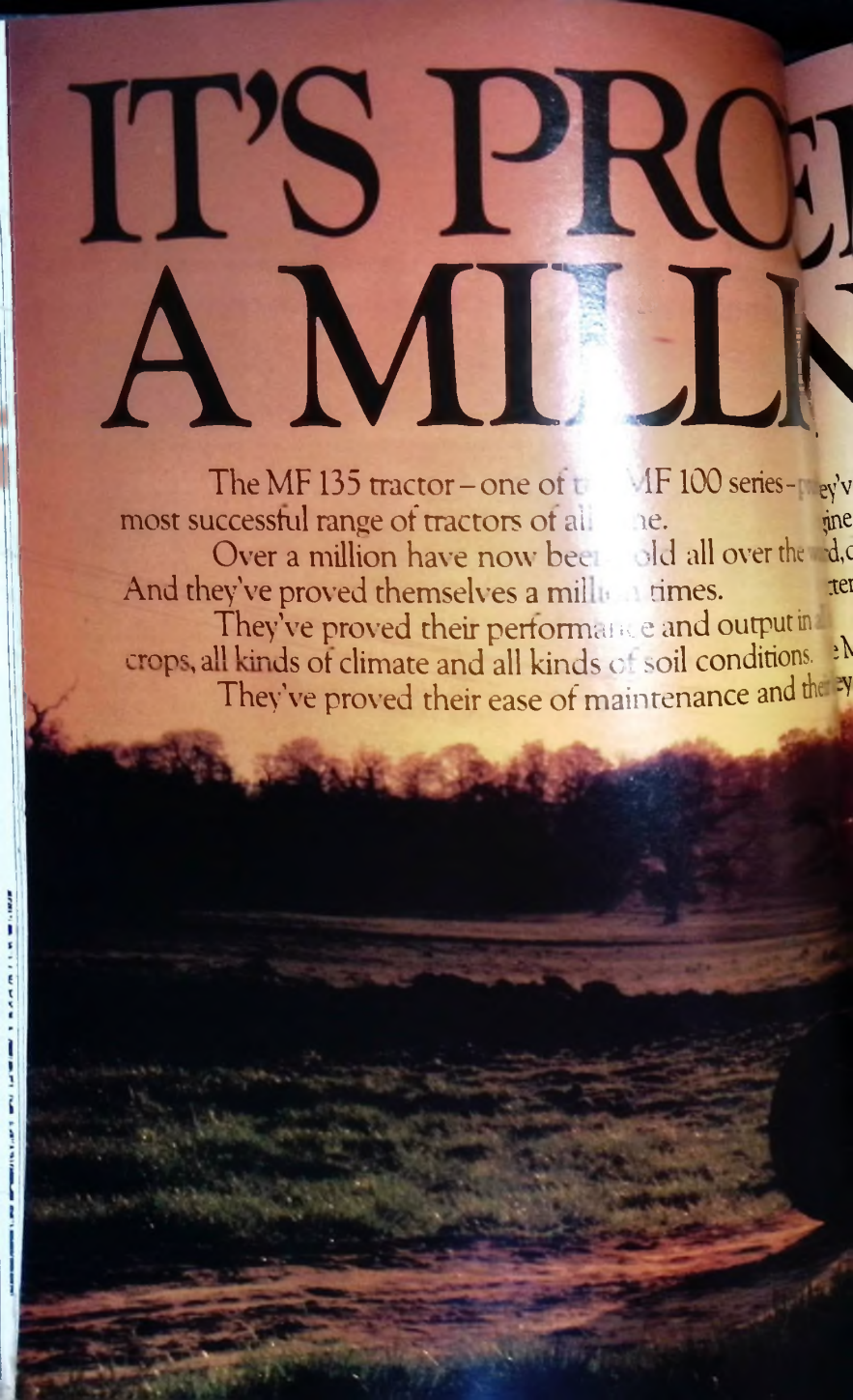
They've proved their performa e and output in
crops, all kinds of climate and all kinds of soil conditions.

They've proved their ease of maintenance and the



D ITSELF
TIMES.

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day after day, [year] after year, to help farmers everywhere produce
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Just some of the men's shoes now being made by the Standard Shoe Company of Owerri, Imo State, Nigeria. This factory is the latest to be planned and installed by USM International, the export division of the British United Shoe Machinery Co.

THE VIABILITY OF COMMERCIAL SHOE PRODUCTION

The demand for footwear is on the increase throughout West Africa, especially in Nigeria following the government ban on imported shoes. With to-day's sophisticated shoe machinery, shoe manufacture has become a much simpler operation. This article takes a closer look at this financially rewarding business enterprise.

THE RECENT decision by the Nigerian government to ban imports of footwear has created a sizeable shortfall of shoes for consumption by the home market.

The time is ripe for the setting-up of shoe factories to satisfy a demand for shoes that will undoubtedly increase as the effects of the import ban begine to bite.

Because the shoe trade is sometimes seen as a labour-intensive industry that demands skill in certain operations, business people may be discouraged from setting-up a factory. However, today's sophisticated shoe machinery has de-skilled many operations, making shoe manufacture a much simpler and financially rewarding business enterprise.

Factors to consider

Nigerians live in what is probably the most advanced of the emerging African nations and the type of footwear they buy reflects this. Public demand ranges from the higest to the lowest quality, although the desire for good quality footwear is especially strong. Consumption varies from open sandles to childrens' footwear, from high fashion mens' and ladies' shoes to sports footwear.

Shoe fashion design is obviously based on appeal to the customer and is a very specialised area of shoe manufacture. To create a design which is pleasing to the consumer and yet cheap and easy to produce requires considerable skill.

It is therefore essential that any intending shoe manufacturer works closely with the machinery supplier to ensure that basic design and styling facilities are available.

Shoe manufacture is dependent on the raw materials that make up the shoe; these include upper materials (leather or synthetic), soling material, insoles, toe and heel stiffeners, tacks and nails, adhesives and shoe boxes.

For upper and lining leather, cattle hides are most widely used. There are four large tanneries in Nigeria, most them in the Kano area. While the amount of leather

Continued

inued

luced by these annually is not known, it thought that despite the banning of rts of hides, there are insufficient ntities in Nigeria to satisfy the potential ne market demand. At present however, cost of imported hides is competitive to se produced locally.

' lining leather there are several small nenes producing goatskin. This is ideal lining shoes, but many shoe nufacturers around the world find it ctical to use a 'man-made' material for ing shoes. This material is often purpose-signed for the job and is highly competi-e with natural leathers.

ost of the footwear produced in Nigeria ludes pvc pu and leather imported from veral sources including Italy, Spain and reat Britain. Very few sole units are roduced locally. The reasoning behind this that a great deal of technical assistance is equired in sole unit production. Leather ith the fashion considerations involved ole units will enable prospective shoe nanufacturers to compete on an equal ooting with the established factories.

The stiffener material used for the puffs and counters is, with few exceptions, man-made material imported into Nigeria. It is common practice in many countries, including Nigeria, to use inferior leathers for these components. Although adequate for certain types of manufacture, this practice is not consistent with mass production and anyone intending shoe manufacture in Nigeria should be prepared to import a good stiffening material. However, these compoents only represent a small percentage of the total shoe cost and with the known West Africa preference for a 'hard toe' are a sensible investment.

Grindery (tacks, nails, eyelets etc) would be imported. Shoe boxes would be manufactured locally. The adhesives used in shoe construction are neoprene, rubber latex, polyurethane and hot-melt cements. These would either be of local manufacture or imported.

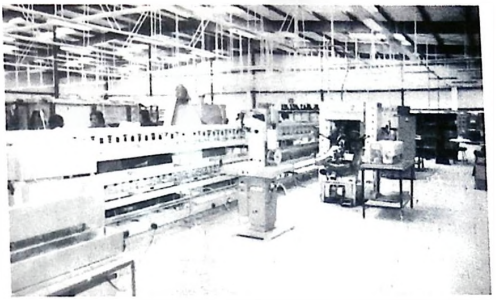
Labour

The indigenous population of West Africa is highly suited to a craft industry such as shoemaking and with a minimum of training a highly productive work force can be established in a relatively short period. For example, a shoe factory can be installed and producing good quality footwear in a few months. The production will increase as the labour force acquires the expertise. It is expected from worldwide experience that the average size plant would be on maximum production within 12-18 months.

The estimates used in this article are based on a production of 1000 pairs per day of mens', or womens' or childrens' shoes or a combination of any three, with cement lasted leather uppers and stuck-on sole units.

The factory

The type of buildings required for a shoe factory need only be of simple design. The structure can be of concrete blocks, with a steel span roof covered in galvanised steel or asbestos. The flooring does not have to stand heavy loading and can be concrete of a nominal thickness. Facilities should be included for storing raw materials and finished products.



The interior of a new shoe factory. This shows a 'lasting track' nearing completion.

A building with a floor space of 16,000 sq. ft. is adequate to produce 1000 pairs of shoes per day. This size of building would include the production area, offices, toilets, raw material storage and limited warehousing.

Shoe construction

There are several methods of shoe construction of which the most popular worldwide is the 'flat lasted' method. Much of its popularity lies in its simplicity. The machinery for this shoemaking technique is flexible and capable of handling leather, synthetic or canvas uppers and the various plastic, rubber or leather soling materials.

The basic shoe factory can be broken down into four major areas:- cutting, where shoe components are cut out of leather or synthetic raw materials; closing, where the cut upper components are stitched together to form the complete upper; lasting and assembly, where the upper components are 'lasted' and the sole unit is attached; finishing, where the assembled shoes are cleaned and sprayed prior to boxing.

Additionally, open-type sandles are in high demand in many countries where the climate is suitable. With a minimum of extra labour and using remnants of material from the main production unit, a very lucrative sideline can be established, enhancing profitability.

The suppliers

Anyone considering a turnkey contract for the installation of a shoe factory should ensure that the machinery suppliers agree to install their own machines and to train the operators to do their work to a standard which will enable them to work without supervision. In this way, the factory gradually becomes capable of producing footwear to an efficient standard before the machinery installation team leave.

Only a few companies in the world are able to offer a complete turnkey service in respect of shoe factory installation. The major UK manufacturer is The British United Shoe Machinery Company Limited who, through their export division USM International, supply a complete range of over 160 machines for every shoemaking process, make every shoe component except for leather, and also offer a total consultancy service on factory planning, production control, shoe design and factory budgeting. The company say that they have always tried to offer a complete shoemaking service. Each year their specialist planning department completes around 40 major projects for shoe factories worldwide.

The most recent factory in West Africa to be supplied and installed by USM International is the Standard Shoe Company at Owerri, Imo State. This factory is now producing a wide range of mens', womens' and childrens' shoes. These are now being sold all over Nigeria and the factory is having difficulty coping with demand.

Services

USM International state that one of the most important factors to consider for a Nigerian factory is a stable supply of electricity. Consistent production is crucial to profitability in a shoe factory. It is therefore, essential that any factory plan incorporates a stand-by generator system to provide a back-up supply if electrical supply failures occur.

Pneumatics play a major part in today's shoe machinery and an air compressor system would be included in a factory layout. This, too, is dependent on electricity and emphasises the need for a consistent supply.

The quantity of water used in shoe manufacture is negligible and no special requirements above the domestic supply are necessary.

Training

Any efficient shoe factory must have a nucleus of trained engineers to carry out everyday maintenance on machinery. Bearing in mind the maxim 'prevention is better than cure', a planned maintenance system is preferable to waiting for a breakdown. In any major factory installation USM International give training to selected personnel at their UK headquarters on numerous shoe machinery topics including electrics, pneumatics, hydraulics and shoemaking techniques.

This facility is then supplemented by periodic visits to the new factory by USM International engineers. □

West African CONSTRUCTION

Magazine within the Magazine

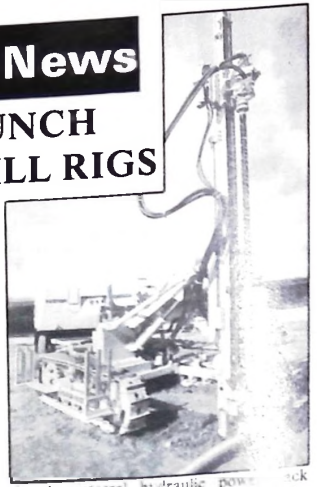
August 1978

Concrete being received onto working deck at Ashaka. See pages 91-95.

In this issue

Construction News

HOLMAN LAUNCH "No-nonsense" DRILL RIGS



Holman has launched a major attack on world markets for above ground tracked drilling equipment with a new "no-nonsense" range of drill rigs. Manufactured in the UK by the Holman Drilrig Division of CompAir Construction & Mining Limited, the Mk 5 range of drill rigs has been designed to meet worldwide demands from quarry and construction site managers for tough and efficient drilling equipment. Extensive research and on-site consultation has resulted in a series of six rigs which will meet almost every need. The use of proven standardised components means that rigs can be produced simply and economically to meet any specialist requirements.

All six rigs feature a common track base, fixed or articulated booms and a range of drifters and down-the-hole hammers. With one exception the new Mk 5 rigs obtain their power from a towed air compressor. The exception is an exciting departure for Holman — the HF 130 Voldril hydraulic rig. An integral hydraulic power pack provides all the necessary power for the execution total operation of the rig with the exception of high pressure air for the down-the-hole hammer. For more information contact **Holman Brothers (Nigeria) Ltd.** Apapa, Accra, Freetown.

New range of

A new range of excava... well as machines capable ... kind of material from soft ... be introduced to the Ni... machines manufactured ... **Smalley (Engineering)** ... proved in 65 countries ... believes that three machi... Five and Smalley Ten exca... dredging unit will be ideal ... Construction companies.

We would like to point out ... Range of generating ... Lister Power Plant and ... WATR July issue, Page 12... by UTC in Nigeria and ...

Blue Circle Success

Associated Portland Cement Manufacturers, part of the Blue Circle Group, made a pretax profit of £47.9m (₦56.5m) on a turnover of £370.8m (₦437.5m) in 1977. The group has interests in two Nigerian companies with equity holdings of 40 per cent in West African Portland Cement and 32 per cent in Ashaka Cement. For 1977 the following favourable reports have been recorded by the respective company directors.

"Construction activity and demand for cement continued at a high level and the West African Portland Cement Co. increased deliveries by some 20,000 tonnes to 706,000 tonnes and profits improved by 12 per cent."

"At Ashaka building continues on the new 800,000 tonnes per annum plant which is expected to come into production early in 1979."

"During the year APCM agreed to take a 10 per cent interest in the equity of Banbury Systems Nigeria Ltd. which is establishing a factory at Kaduna to manufacture concrete building components and pre-fabricated buildings. Further opportunities in other fields are also being studied."

Cement production grows

A ₦33m expansion programme of the Bendel State Government-owned Ukpilla Cement Company has been completed. The factory will be increasing its production capacity from the present 10,000 to 30,000 bags of cement daily. The labour force of the company currently stands at 529.

onstruction News

ntracts . . .

ser **Building Systems (Export)** of the . have recently announced a contract h **Telephone Cables Ltd.,** also of the UK £250,000 worth of overseas accommodation for Nigeria.

TCL are engaged on the installation of ephone systems as part of the Nigerian ational Telecommunications Plan in the ea of Maiduguri and urgently require commodation for their personnel orking on the communication projects.

Utilising some 46 of Lesser's 'Supaskid' erseas accommodation units in three amps will provide living, messing and ecreational facilities for 48 personnel of CL.

In addition to supplying the 'Supaskid' ccommodation units Lesser are also esponsible for the supply of the furniture or the living, dining and recreational areas nd also all of the kitchen equipment.

A ₦10m hotel complex with shopping centre and cinema theatre is to be built in Akwanga, Plateau State. The project financed by **Unihold Nigerin Ltd.** will take three years to complete.

McAlpine Bates has won a contract to build a 220 kms of International road between Axim in Ghana and Abidjan, Ivory Coast.

Williamson Cliff, of Stamford, UK have delivered a consignment of 33,500 refractory bricks worth ₦59,000 to line a new cement kiln at the **Ashaka Cement company,** Bauchi State. The new kiln will be able to produce between 23,000 and 28,000 tonnes of cement.

The ₦35m Murtala Muhammed Bridge across the River Niger in Kwara State has been completed ahead of schedule by **Dumez Construction Company.** The bridge was to have been completed in October 1978.

A contract awarded to **Tricon Ltd.** worth ₵1.7m for the construction of a drainage system on the 8Km Kaneshie dual carriageway Ghana has been terminated due to "unsatisfactory work". The contract has been re-awarded to **Carrefour Ltd.** the main contractors on the carriageway project valued at ₵7.7m.

The Plateau State Commissioner for Trade, Industry and Co-operatives has announced that a ₦12.5m international 300-bed Sheraton Hotel is to be built at Lamingo Dam, Nigeria. The hotel is expected to be completed within 18 months and ₦3m will be paid as equity shares.

The IMO State Government has cancelled the ₦32m contract for building the Aba roads because "the government was convinced that **Roads and General Contractors** (RGC) the company handling the job, could not cope with it."

The Oyo State Government has started preliminary work on the proposed industrial estate in Oshogbo. This was arranged by the state military governor in Oshogbo at the opening of the ₦500,000 leadpencil factory of UNIPAT Technical Company (Nigeria) Ltd.

He called on other indigenous and foreign companies to participate in various industrial projects earmarked for implementation by the state government. These projects include ceramics, cocoa processing, assembly of coolers and refrigerators, electrical accessories, hotel business, household utensils and wood exploitation.

The contract awarded to Vulyisteke Metallic Construction (Nigeria) Ltd., valued at ₦2m for the building of the **Federal Capital Development Authority's** offices and staff residential blocks at Abuja, the proposed federal capital has been cancelled. According to an official of the Authority the contract was cancelled because the company was behind target for the completion of the blocks.

Kobe Steel Ltd., of Japan have announced that **Societe Arabe des Industrie Metallurgiques (SAMIA)** of Mauritania have placed an award with the company worth Y30,000 million for construction of a two-million-ton-a-year iron ore pelletizing plant.

The planned plant will utilize the Grate-kiln system and will turn out high grade iron ore pellets for direct reduction processes.

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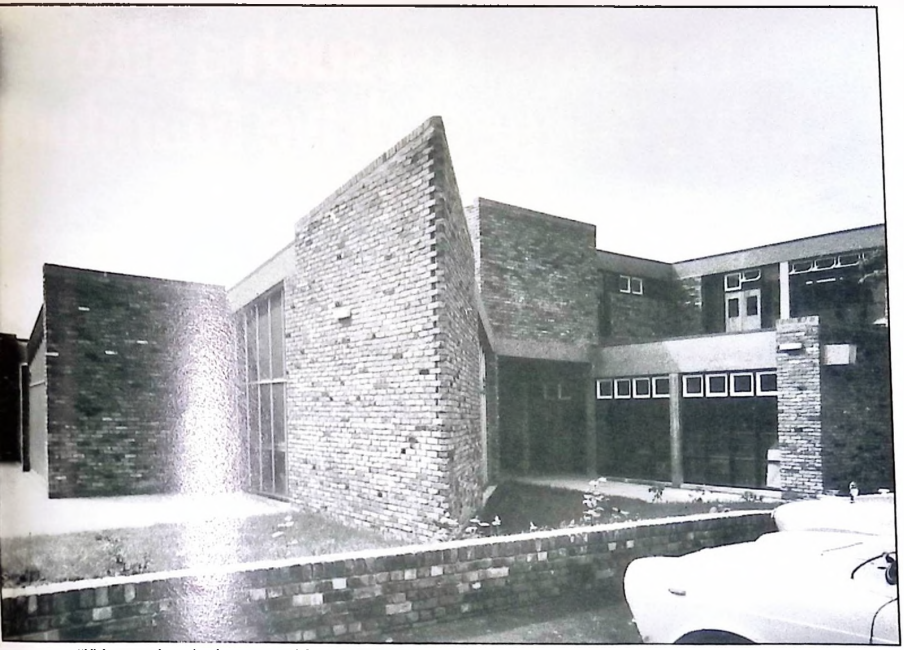

"Visitors to the school commented favourably on the brickwork which has I think some of the qualities which people admire in old brick walls"

BIRTH OF THE BRICK

In the first of a two part article on bricks and blocks by Noel Moffet, this first feature takes a close look at the development, production and lifespan of the brick.

THE PHOENICIANS are usually given the credit for having invented the brick, in the fifth century BC. Apparently they had lots of suitable local clay and also lots of straw. They used animal dung as a glue to unite these two materials, pressed the three of them together in the shape of a rectangular block "to suit the size of a man's hand", baked it in the sun, and the brick was born. The astonishing fact is that the Phoenicians' bricks measured 225 by 112½ by 75 millimetres — the same as ours — I suppose because a Phoenician hand was the same size as a modern one. One wonders whether they also had their brick development associations and their architects who preferred raked-out joints to flush pointing.

Throughout the last twenty-five centuries each generation of brickies seems to have found 225 by 112½ by 75 the ideal size. It is easily grasped by the fingers, easily thrown to a colleague, easily stacked in a hod and carried on the shoulder up ladders and along planks, easily placed in rows on mortar beds and easily stacked in kilns for firing.

From time to time the size of a brick has varied a little and "specials" have been made to turn acute and obtuse angles and to fit specific situations, but the vast majority of bricks manufactured today throughout the world measure 225 by 112½ by 75 millimetres — surely a compliment to the wisdom and commonsense of the Phoenicians.

This size of brick has been used throughout the history of architecture, in arches of many shapes and sizes, for barbicans, basilicas and bridges; in impressive Roman and Byzantine domes of huge dimensions; in church and cathedral vaults; in lofty chimney-stacks; and in humble, human dwellings everywhere.

Brick is beautiful

Everything seems to deteriorate with age. A man is past his best at 80; A woman is seldom as beautiful at 80 as she was at 18; steel rusts; aluminium pits; timber rots; concrete is stained by weather; plastics turn yellow. Brick is a notable exception. Age becomes it well. It weathers attractively, mellows interestingly and, as the years roll by, acquires a patina which appeals to the aesthetic sense of most of us.

It appeals to me too, as an architect. In designing a new primary school a few years ago, I chose a brick which appealed to me

Continued

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ause of its pleasant warm colour, resting texture and slightly irregular ape and also because these racteristics varied considerably in a ch of the bricks. I asked the brickies to the bricks in an irregular fashion, thout too much attention to geometric cision. They refused to do so and veral of them walked off the site mutter- something about a mad architect. In ter view I was of course asking them to uild bad brickwork. But the foreman came interested in my idea and ersuaded two brickies to do what I anted. The result was pleasant and teresting and many visitors to the school ommented favourably on the brickwork hich has I think some of the qualities hich people admire in old brick walls, although not of course the patina which an only come with the passage of

The bricks used were actually second-hand ones taken from two demolished buildings in the neighbourhood. It is interesting I think that many architects today prefer to use second-hand bricks for new buildings because they have already weathered to a pleasant colour, have greater variations in size than new bricks, resulting in a more irregular and a more rough-textured wall.

Brick can be beautiful.

Bricks are usually classified in three categories: common, facing and engineering.

Common bricks

Common bricks make no claim to give an attractive appearance. Their colour is usually uniformly pale and dull. They are made in very large numbers in very large, highly-mechanised factories, to an exact standard specification. They are reliable and serviceable, the end product of all-work and-no-play. Their great merit is their cheapness.

Most common bricks are flettons. Externally, they must always be rendered, painted or otherwise covered with another material — to protect them from weather and to hide their plainess. Internally, they are used mostly for partitions and the inner leaves of cavity walls. They are the plebs of the brick world; they do most of its hard work and get little credit for doing it, but they make possible the use of the patricians — the more interesting, more attractive facing bricks.

This size of brick (225 by 112½ by 75mm) has been used throughout the history of architecture. A mediaeval town in Poland.

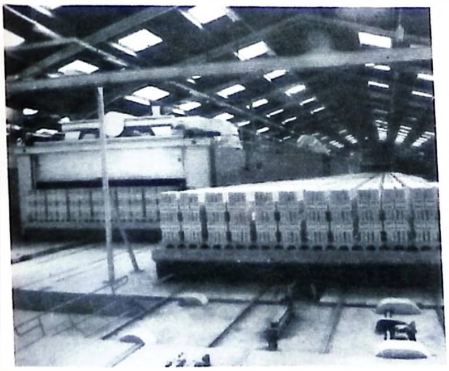
Facing bricks

It is in the facing brick category that the intrinsic beauty of brickwork can be seen at its most impressive. Normally used either as the external layer of a solid brick wall or as the outer leaf of a cavity wall, facing bricks are specially made to give an attractive appearance. This may result from the natural colour of the clay used or from a texture applied before the brick is fired.

The range of colour and the texture of facing bricks are enormous. Even in a relatively small area of sourthern UK, for example, the range extends from the off-white sand-faced Sussex brick and the yellow London stock to the dark purple Chailey. Even within the yellow London stock category — made from the soft yellow clay on which London is built — one finds individual bricks of a pale lemon yellow colour, yellow ochre, buff, light gray and even black. In the Hilversum area of Holland red bricks are found ranging in colour from pale pink, through light crimson, cerise, orange and vermilion to dark "brick red".

The bricks of countries like England, Holland and Germany have become known and admired throughout the world because their makers have recognised their dependence on the quality and character of local clays and have successfully exploited these characteristics and gradually improved firing techniques, over a long period of time.

West Africa's facing bricks are denser than those in Europe, principally I suppose so as to offer better resistance to tropical extremes of climate and sudden changes of temperatures. Sadly her brick industry remains curiously undeveloped. Perhaps the ubiquitous laterite does not contain the qualities which make other soils attractive to brick manufacturers.



Interior of a modern brick-making plant

WEST AFRICAN CONSTRUCTION

Engineering bricks

Brickwork readily resists large compressive forces induced by axial loads but is less able to resist tensile forces induced by wind or eccentric loading. Most building regulations rightly insist that all structures must remain stable under all types of load and pressure. It is sometimes found that, because of the imprecise way in which common or facing bricks are made, it is not possible to prove, with any degree of conviction, that a particular wall, column or arch will satisfy the regulations. The engineering brick is usally the answer to this problem.

It is stronger, denser and heavier than bricks in the other two categories its performance can be accurately calculated and guaranteed and, although its colour denotes its strength rather than the type of clay from which it is made, its colour range is nonetheless pleasant. Although it is usally an engineer who specifies which engineering brick should be used to solve a particular loading problem, the architect

Continued

Continued

often finds that the colour of the brick chosen combines happily, even in the same wall, with his own choice of facing brick.

Calculated brickwork

A plaque at the entrance to a ten-storey building in Chicago built in the 1890s declares that it is the ultimate in brick construction. Its walls are two metres thick at ground level. By way of contrast the Swiss, who pioneered calculated load-bearing brickwork, built in the 1950s an eighteen-storey block of flats at Schwarmendigen with outer walls of 38 centimetre thickness and inner walls of 18, 15 and 12 centimetres. The Swiss block was possible because each floor in the multi-storey building was used to overcome the tendency of the very tall, thin brick walls to buckle.

Today, as a result of research and development, experience and improved techniques, it is possible to design buildings of more than twenty storeys, using relatively thin brick walls if certain well-established and documented design principles are adopted. These are as follows:

(a) Walls should be shaped, positioned and linked together by concrete floors to produce a stable structure.
(b) Engineering calculations and specification should follow well-established techniques.
(c) Bricks should be used of known and consistent strength and quality.
(d) The mortar mix should be reliable and consistent.

"A sculptor (W. Mitchell) has been commissioned to sand blast the brick surface of a wall to suggest a decorative figure or emblem."

Brick production

In all the industrialised countries today most bricks are produced in very large quantities in very large factories, usually located near an abundant supply of suitable clay. The following description of the process is fairly typical:

(1) The clay is ground and screened before being stored in rotary silos which then accurately proportion the different types of material on to the production line.
(2) After being mixed with water and minerals to determine the colour of the brick, the plastic clay is extruded at up to 60 tons per hour — the equivalent of 25,000 bricks or one mile of clay per hour.
(3) After being textured and cut to size, the bricks are fed automatically into a setting machine which places them on to a kiln car.
(4) The kiln car (which can hold 7,000 bricks) is moved automatically through a two-chamber dryer where drying by cool, moist air first and then by hot, dry air takes place during a 36-hour period.
(5) The dried bricks are moved automatically into a long tunnel kiln where firing takes place, the firing cycle varying from 30 to 60 hours, according to the type of brick.

The automation of the plant is most [illegible] and controlled at three main centres: the clay preparation plant, the making [illegible] and dryer and the kiln control room.

The economic wisdom which makes this type of automated brick production necessary must of course be recognised. Nevertheless I think most architects find that the end product — the brick — bears the mark of its birth on its face: a certain cold, automatic line; a certain regularity of texture, a certain dullness of colour. In choosing a facing brick — if his client can afford it — most architects, I believe, would choose a brick from a smaller brickworks where the process of production is slower and on a smaller scale and where evidence of the craftsman's control of each stage of the production — dictated by his skill, his knowledge and his experience — is there, for all to see, on the face of the brick. Perhaps there is room, in our modern world, for [illegible] workmanship and autocratic [illegible] industry as elsewhere.

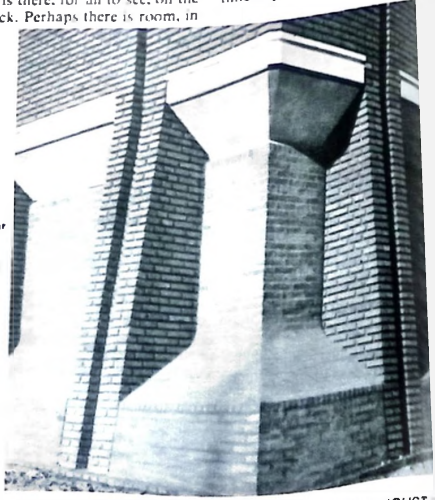
Bond

The British Building Reg[illegible] all brickwork to be "prope[illegible] define "bond" as "a disposi[illegible] wall usually designed to [illegible] cross joints in each course [illegible] one-quarter of the length [illegible] those in adjacent courses. [illegible] bonding is necessary in ord[illegible] both vertical and horizontal [illegible] larger area and a greater [illegible] (and so minimise the possibi[illegible] tial movement between brick[illegible] strengthen the junctions bet[illegible] that they mutually support. [illegible] Bonding is in fact part of the [illegible] and, once the architect has [illegible] type of bond he wants, he m[illegible] the brickie to work out the de[illegible] ing.

There are many different bo[illegible] them simple and straight[illegible] stretcher bond — which is [illegible] used in all cavity walling — an[illegible] sophisticated and complica[illegible] architects prefer Flemish bond[illegible] other of its forms (comm[illegible] quarter, or with snap headers[illegible] a strong wall and at the same [illegible] that wall a pleasing overall patte[illegible]

Mortar joints

The strength of brickwork [illegible] the shape and size of the wall, [illegible] of the brick and the strength of [illegible] joint. The British Model Specif[illegible] load-bearing clay brickwork [illegible] minimum strength required fo[illegible] mortar mixes. The right mix is es[illegible] successful brickwork and its d[illegible] depend on strength requirements [illegible] of brick, the degree of exposure [illegible] time of year.



Contrasting flush and raked-out mortar joints on a church in Birmingham, UK designed by John Madin Design Group

ntinued

Mortars consist of a sand aggregate and nder which can be lime, cement or a ture of both. They are in fact a gap- ng glue which provides a bed for the cks, enables loads to be distributed formly and helps to prevent the penetra- n of air and water through brickwork.

The appearance of a brick wall is ically affected by the treatment of rtar joints. This is usually done in one of o ways: by jointing — striking, raking or bbing the mortar while it is still green; or pointing — raking out the green mortar a depth of 13 to 20 millimetres and then filling the joint with fresh mortar. Both of ese methods give the wall a flat, flush, mogenous appearance. Many architects day endeavour to stress the "brick ness' the wall and the roughness of its ture nd, at the same time, to accent the attern created by the bricks themselves, y raking out the mortar joints and ng the pointing.

WEST AFRICAN CONSTRUCTION

Brickwork has two enemies in West Africa: water and soluble salts. Both of them fight, when they can, with sharp weapons and with determination. To conquer them other sharp weapons must be used and the right battle strategy adopted.

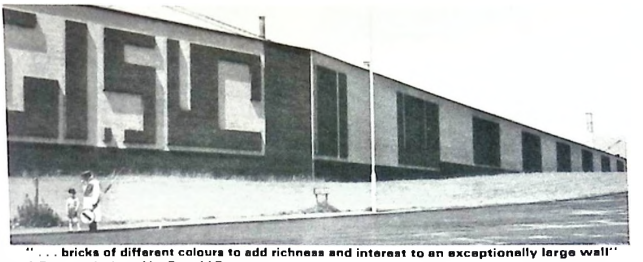
Water

In most European countries solid brick walls of one or one-and-a-half brick thickness have been traditionally considered sufficiently rain resistant, except in coastal or other very exposed areas where walls were usually rendered or tile-hung.

Today cavity walls are preferred as a more certain protection against rain penetration, particularly as the dry inner leaf offers better thermal insulation as well. It is generally assumed that rain will sooner or later penetrate the outer leaf and good detail design is necessary at points where the cavity is bridged — by wall ties, lintels, cills, floors or beams — and at DPCs, flashings and weep-holes.

Strategically placed dense bricks with lower absorption properties will help too, but generally speaking the water resistance of a building depends on appropriate detail design rather than on the choice of brick.

The prolonged and torrential rainfall of West African countries has made the task of the designer difficult and exposed brickwork is not very often seen. Research is proceeding however and no doubt one day soon attractive bricks will be produced from local clays (as distinct from the ubiquitous block) which will resist both torrential rain and scorching sun. Nigeria's new federal capital city will create a demand for huge quanities of structural building materials and many people are hoping that the opportunity which this offers for stimulating the production of bricks from clays in the Abuja region will not be missed.



"... bricks of different colours to add richness and interest to an exceptionally large wall" A Factory designed by Donald Foster.

Soluble salts

Salts come from the clay from which the brick is made and from the sand in the mortar. Brickwork is wettest and absorbs salts immediately after being laid. It dries out most rapidly in the following spring when the salts migrate to the surface with the water and are left as efflorescence on the surface when the water evaporates. This is an ugly phenomenon but it is temporary and harmless, as subsequent rain will dissolve and wash away the salts. Efflorescence will persist from year to year only if the details design of the building allows a constant flow of water through the brickwork to dissolve fresh salts.

Insulation

Walls which are heavy but not too rigid are generally the most economical and practical way of reducing sound transmission between rooms or between buildings to an acceptable level. The requirements of most countries' regulations are deemed to have been met if a brick wall is plastered on both sides with a minimum plaster thickness of 12½ millimetres and the whole weighs not less than 415 kilogrammes per square metre. Most types of brick satisfy this requirement and in fact the difference in sound reduction between walls built from the heaviest and the lightest bricks is scarcely discernable.

Thermal insulation requirements vary greatly for different types of building and in different countries. It is fortunate however that in Europe and north America the brick cavity wall in general use (two 112½ millimetre leaves with a 50-millimetre cavity) satisfies these requirements for a great variety of buildings and gives the demanded U value for a perimeter wall.

Decorative brickwork

Throughout history architects have tended to stress the intrinsically decorative characteristics of brickwork in the mass and to underline the attractiveness of the individual brick by careful selection of brick type, by choice of bond and by treatment of mortar joint. Occasionally however a need has been felt for a more specific decorative treatment, in addition to this.

Sometimes the architect has wished to underline the warmth, richness and texture of a large, plain brick wall by a slight modelling of the surface. This was done interestingly on the end wall of a small house in UK by asking the brickie to allow some very dark bricks (yellow London stocks were used) to project 50 or 60 millimetres in a random fashion.

Sometimes the architect has used bricks of different colours to add interest and richness to an exceptionally large wall, as Ralph Erskine did on the Byker housing estate in Newcastle-on-Tyne, UK and as Donal Foster did on a factory wall in Staffordshire, UK.

Sometimes too a sculptor has been commissioned to sandblast the brick surface of a wall to suggest a decorative figure or emblem, as William Mitchel did on a GLC housing estate in east London.

Landscape

Some bricks make excellent paving, presenting to the walker a non-slip surface and a welcoming scale and decorative pattern, and to the observer a richness, colour and texture sadly missing from the more commonly-used paving materials, such as concrete, asphalte and tar macadam. In the hands of a skilful, sensitive designer brick, as paving, seat, tree protector, retaining wall or space divider, can helpt to make the spaces between buildings attractive, pleasant, welcoming places.

Dilemma

So brick is sometimes beautiful. Its beauty is unique in the building world; it is compounded of scale, pattern, texture, colour, irregularity, firing technique, treatment of mortar joint, environmental harmony. Traditionally beautiful brick walls have been built cheaply, in a local context and with small-scale activity. But, to keep down the ever-increasing cost of the brick and to prevent it becoming a rich man's luxury item, modern economics demands mass-production and stadardisation. Can these opposing considerations be reconciled? That is the dilemma of the brick industry.

Perhaps the architect can show the way forward? By persuading the manufacturer to produce better-looking bricks, by more skilful selection of the right brick for the job and by giving sympathetic professional advice to those people who want to be their own brickie.□

Acknowledgment *The writer is indebted to the Brick Development Association and their consultant architect T. L. Knight for help with the technical side of brickwork design and for permission to publish some of the illustrations in this article.*

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IG. 1

Graphic representation of relationship between pressure "P" volume of flow "V" and engine horsepower in a "Constant Volume Hydraulic System"

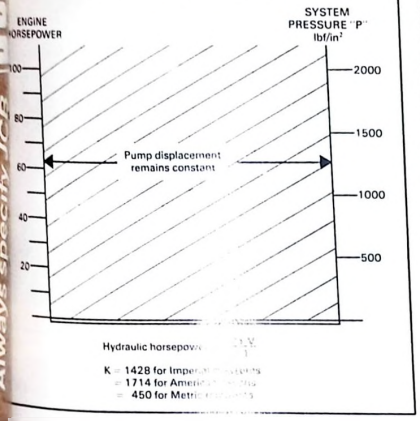
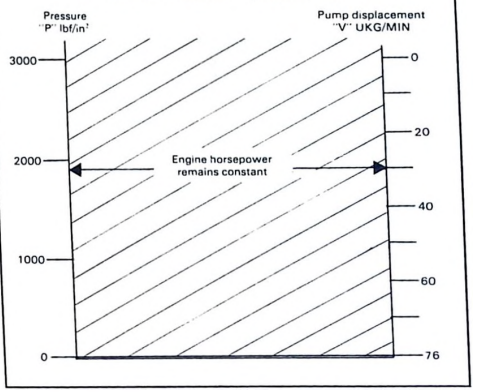


FIG. 1a

Graphic representation of relationship between pressure "P" volume of flow "V" and engine horsepower in a "Constant Horsepower" hydraulic system



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ystems, although there are variations of uch made by different manufacturers. One ery simple system is the Constant Volume ircuit, where a fixed displacement of oil s constantly circulated through the system ong as the engine is running. The other is a Constant Horsepower System which s highly complex with regard to both ircuit and component design but it does offer a superior digging performance. The amount of oil flowing into an actuator will determine the speed at which it will work, whilst the pressure in the actuator will determine the force it can exert. The pressure is determined by the resistance to actuator movement and it will increase proportionally to the resistance, until either movement takes place, or the setting of the relief valve is reached. The horse power required to drive an actuator is determined by the system pressure multiplied by the volume of oil flowing into it, divided by a constant, plus a percentage for overcoming the losses in the system. The formula is P x V . x / .

Where the quantity of oil being supplied is constant, as in the more simple systems, the speed of operation will also be constant and the demand for more horsepower for moments of high pressure demand, can only be met by installing a large engine with sufficient reserves to meet the demand. In the constant horsepower systems a smaller engine can be installed because, when the demand for pressure occurs, mechanical devices within the pump reduce the flow of oil and allow the pressure to rise without requiring more power from the engine to meet it and in this way the P x V formula is maintained. This is set out in Figs. 1 and 1a. Although the terms are not always used by makers, a Constant Volume System can be equally well described as a Variable Horsepower System, conversely, a Constant Horsepower System is also a Variable Displacement System.

The major advantage of the simple constant volume hydraulic circuit as fitted to the Hymac 580C, the Russian Belaz 5-5015A and some of the smaller Japanese machines, is the ease with which they can be maintained. The components and circuits are simple, low cost units, which can be serviced by mechanics after only a short training period whereas the more sophisticated systems now being installed with increasing frequency to give a constant horsepower facility, demand a degree of skill which takes a long time to acquire and needs servicing equipment which is expensive to acquire and complex in use. In the more remote areas of the world, the simple machines have some decided advantages to offer and it is very doubtful if the marginal gains in performance obtained from more complex systems will be very noticeable in machines up to 480 litres (5/8 yd³) even if they do have a constant horsepower hydraulic system fitted.

An O & K RH 75 excavator at work here in a quarry

What Size Is An Excavator?

Over the last few years the "sizing" of an excavator by quoting the bucket capacity has become something of a "nonsense" measurement. In the old days, when every maker's machines had much the same front end geometry and digging performance for machines of similar weight, it was a reasonable way to determine what sort of performance could be expected, but today, where the range of front end equipments are so large, bucket capacity has little or no meaning unless the length of the bucket arm and the digging depth is quoted as well. To take an example, The J.C.B. 808 is stated to carry a 0.4m³ buckets (0.53yd³) and this at first sight seems rather silly from a machine weighing some 22,827 Kg (22.4 UK Tons) until it is seen that this bucket is rigged on a bucket arm which will

Continued

10°W, 45°N (Italy)

Moving the earth on bo
The experience behi

O&K – setting one top-class performer against another, giving places a world apart a point of common contact. And the link? The O&K hydraulic excavator, combining enormous power and high mobility, sophisticated engineering and outstanding loading capacity, proven quality and excellent availability. Backed by more than a century of technological success in construction, mining, dredging.

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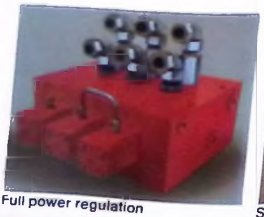

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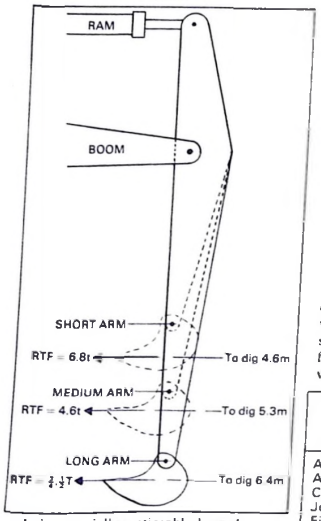
give a digging depth of 6.8 m (22.3 ft.) but if the digging depth is restricted to 4.6 m (15 ft.) the bucket capacity can be increased to 1.4 m^3 (1.8 yd^3). Not only will the size of bucket decrease as the bucket arm is lengthened, the digging force, in terms of Radial Tooth Force as it is sometimes called, will fall away quite rapidly and it is seldom realised how much digging power has to be sacrificed to gain a little more digging depth. Fig. 2 shows just what happens to the radial tooth force on a typical $\frac{3}{4}$ yd^3 excavator with different lengths of bucket arm.

FIG. 2
Effect of increasing bucket arm length on radial tooth (breakout) force



It is especially noticeable how the continental makers have restricted the length of their standard bucket arms to give a good hard dig performance with high Radial Tooth Forces and large bucket capacities. Standard bucket arms from Liebherr, O. & K., and Atlas, all German companies, are noticeably shorter than the British and American makers, some of which are shown in the following chart.

This means that where digging conditions are severe, the fitting of a short bucket arm will allow the machine to develop its full digging power better with the conditions. Again, when thinking of severe or hard dig conditions, although it may be possible to obtain increased digging depth by fitting a longer bucket arm, not only will this impose very severe strains on the excavators structure, the cycle time will be increased because of the unwieldy nature of a disproportionately long arm. Under these conditions it is far better to consider the use of a larger machine which may well prove to be more economic on a cost per cubic yard excavated basis, than its overstretched, smaller counterpart.

The MF 350C crawler excavator — a very versatile machine

Front End Equipments

Excavator front end equipments, that is the part of the machine which does the digging, have been the subject of a good deal of development and the versatility, in terms of arcs of movement, enables each machine to be very accurately matched to the work it has to do. Two piece booms, which allow the length of the boom to be matched to the length of the bucket arm and bucket capacity by sliding the top section into the appropriate position, are the rule rather than the exception. This is especially true of continental machines where the multi-position boom is considered essential. There is much to be said for the simple monobloc boom however which, because of its lighter weight, allows designers to obtain the performance, although over a working arcs. In monobloc and two offered by one make machine. Poclain, are good examples of widest possible

The Caterpillar C225, shown Nigeria in a land clearing project

WEST AFRICAN CONSTRUCTION

digging conditions can be however diverse they may be. special applications such as

Make	Model	Working weight Kg.	Short arm digging depth m.	Max. digging force Kg.	Coun
Akermans	H9B	17 700	5.3	12 100	Sweden
Atlas	AB1702	15 500	4.7		Germany
Caterpillar	215	16 330	5.3	11 200	U.S.A
John Deere	JD45	14 000	4.85	8 100	U.S.A
Fiat Allis	SL9	15 790	4.7	7 100	Italy
Ford	H45	14 600	5.3		Europe
Hitachi	UH07	18 300	5.6	10 100	Japan
Hymac	590C	15 400	4.93	8 000	United Kin
International	3964B	14 276	4.5	7173	U.S.A
J.C.B.	805	16 500	4.22		United Kin
Liebherr	R911C	16 100	3.4		Germany
Massey Ferguson	MF350C	10700	3.58	7.800	United King
Massey Ferguson	MF450A	16000	4.8	13.100	United King
O. & K.	RH6	17 100	4.1	12 000	Germany
Poclain	75CL	14 600	4.5	10 400	France
Priestman	Mustang 120	14 274	5.1	7 847	United King
Ruston Bucyrus	150RH	15 560	5.3	14 200	United King

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THINK TWICE

FIAT-ALLIS

ntinued

e clutches and multi-speed gearboxes, highly sophisticated torque convertor self-changing gearboxes with a full drostatic transmission as a third alterna-. Making a choice of which type to buy xtremely difficult as each offers certain vantages but hydrostatic units, which ve very high torque characteristics at y low wheel speeds, are the best for otiating soft ground but the simple echanical drives, based on truck and bus mponents are simple to maintain and are fficiently rugged to be trouble free under en the most arduous conditions. The ajor disadvantage to rubber tyred

Priestman's Mustang 120 hydraulic crawler excavator

Demag's H71 excavator ideal for qu[illegible]ork

excavator is their lack of stability when digging. Even with an outrigged stabiliser jacking system which takes the load off the tyres, they do not "sit down" as firmly as a machine on tracks and as they work, the stabilisers tend to dig into the ground and require the operator to constantly check their adjustment to ensure that the excavator is standing level and that it is the feet of the jacks that are taking the reaction to digging and not the tyres. This is especially important where deep, narrow trenches are being made where the side walls must be maintained truly vertical. It is impossible to say either tracks or rubber tyres make the best excavator undercarriage because this choice can only be made when all of the factors concerning the work have been correctly assessed.

WEST AFRICAN CONSTRUCTION

With so many hydraulic excavators being made all over the world, it is extremely difficult to analyse their capabilities and present the data in a compact form by the list on the preceding page will give a good indiciation of potential performance by classifying machines by weight and maximum bucket capacity. The list is representative only as in total there are at least 127 makers of hydraulic excavators world wide. □

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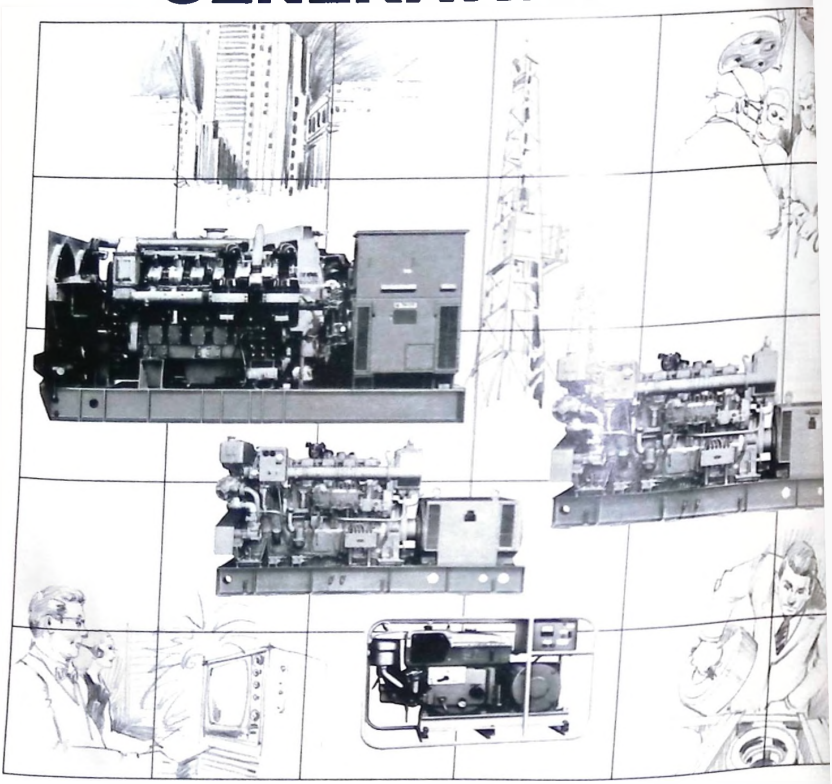

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VIBRATORY COMPACTION EQUIPMENT

As shown at EXPOMAT in Paris

EXPOMAT78

What is claimed to be the largest exhibition of Construction and Building Equipment in the world was held in Paris in May. Manufacturers from all over Europe and some from further parts of the world displayed their plant, being supported by the manufacturers of engines and components. Following our two recent articles dealing with Vibratory Compaction, we are reviewing some of the Compaction Equipment that was on show at Expomat. Many of the manufacturers showed in the name of their French companies or agents. We, however, refer to the manufacturer's names.

Albaret

Where vibratory compaction of soils and granular materials are concerned Albaret have for some years pioneered what they call their Sismopactors. These are self propelled, driver controlled mono and transverse tandem type rollers, balanced and steered by a trailing rubber tyred castor wheel assembly. Even remote controlled automatic cyclic pattern rolling on large flat fill areas can be carried out with these machines. In addition to showing their standard models, the TT900 of 8.5 tonne weight and their new TT1600 18.5 tonne that has a rolling width of 2.9 m. with a drum diameter of 1.6 m. and through 3 variable settings of the vibrator mechanism can deliver centrifugal forces of 18,000 kg., 27,000 kg. or 35,500 kg. max. at a frequency of 33 Hz. were on show.

A frontal view of the TT1600 18.5 tonne transverse tandem vibrating roller

Albaret also manufacture other types of compactors and their VA10 articulated frame vibratory tandem roller was also on the stand. This is a relatively new machine of 8.5 tonne weight and its vibrating and static design parameters have been calculated to enable it to carry out all types of compaction and rolling on all sizes of road construction sites.

Amman (Amman France displayed Amman, ABG and Duomat Equipment)

The DTV822, one of three tandem vibrating rollers on the Amman (France) stand

On show were 3 tandem vibrating rollers including their new DTV 22 tandem articulated machine. This has a weight of 8.8 tonne with a rolling width of 1.48 m. and through its hydrostatic transmission has a speed of 0-13 k.p.h. There is a choice of 2 positions for the vibrator giving high or low amplitude at frequencies of 33.3 Hz. or 50 Hz. to suit the type of material being compacted. Also new is the DTV 12/8 articulated steering, hydrostatic duplex vibrating roller that has a weight of 1.0 tonne, drum width of 800 mm. and frequencies from 35 to 50 Hz.

ABG

In addition to their well known towed vibrating rollers for soils and rockfill compaction and their famous Alexander series of tandem vibrating rollers for fill compaction and roadworks, they were showing their new Puma range of articulated frame rollers. The Puma 168/168A is a versatile all hydrostatic machine, consisting of a rubber tyred drive unit and steerable vibrating drum module, the vibration characteristics are variable and can be adjusted to suit a wide range of materials.

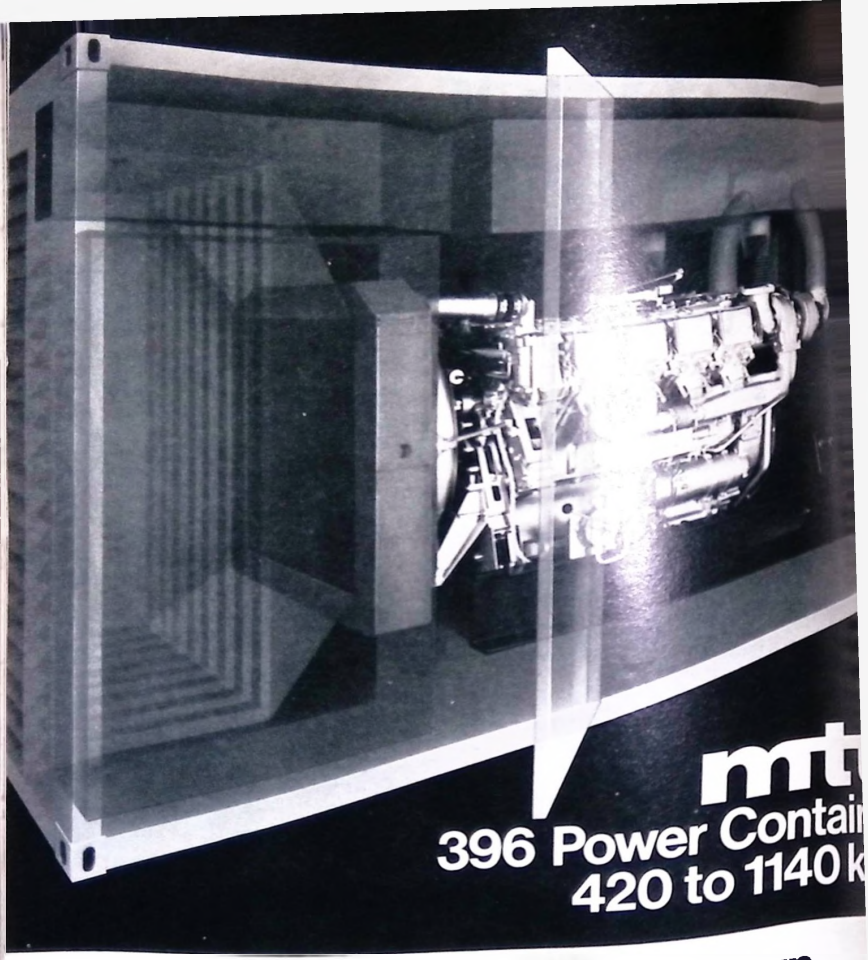
The Puma 168 standing among other rollers on the stand

It can have the twin heavy duty traction tyres interchanged with a four smooth rubber type assembly to enable it to be used on bituminous materials. The approximate working weight 6.72 tonnes. The larger Puma 181 model is available as a smooth drum vibrating roller or as the VS model, when it carries a vibrating sheepstooth drum assembly. The weight of the 181 is 14.5 tonne.

Duomat

Their range of vibrating plates and duplex rollers had an addition on show with the introduction of a small tandem

Continued



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...r, the DR100 weighing 1.6 tonne and ...ible of being ballasted up to 1.8 tonne.

...new DR100 small tandem vibrating roller

It has a front steering and rear vibrating ...um 850 mm. wide giving a linear static ...ce of 10.5 kg./cm. With its hydrostatic ...ansmission it has a variable speed in ...ither direction of up to 6 kph. The other ...w rollers being shown were the DR 66 ...nd DR 77 hydrostatic duplex rollers. ...These rollers weighed 580 kg. and ... kg. ...with drum widths of 830 mm. and ... mm. ...espectively. Both machines were fitted ...ith safety controls in the form of hand ...rmans' handles.

Bomag (Displayed by Maltetra, Bretigny sur Orge)

A comprehensive range of compaction equipment was on show with the introduction into the duplex roller range of the BW 65H, a fully hydrostatic vibrating roller weighing 680 kg. with drum width of 650 mm. The operator's control was of considerable interest. From a neutral position, if the spring loaded handle was gripped and moved up, the machine travelled forward, and if the handle was released it sprang back to neutral, bringing the machine to rest. Movement of the level downwards gave reverse traction with some degree of safety. The 651I is a hydrostatic version of the BW 65S and a special conversion kit is offered to convert machines to hydrostatic traction to be known as model BW 65 SH. At the heavier end of the scale the BW 220A tandem articulated frame vibrating roller weighing 12.6 tonne and having a drum width of 2,030 mm. was on show.

On its special display plinth the BW65H with, in the background, a BW212D and BW215

Designed primarily for bituminous material rolling, through its hydrostatics it has a traction speed of up to 10 kph. and multi-drum vibratory characteristics through infinitely variable frequency and centrifugal force (with the developed parameters) 28.3/40 Hz. and 2045/13608 kgf. per drum. Among other heavies was the BW 215D, 17.3 tonne articulated, rubber tyre module/smooth vibrating drum roller with a roller width of 2100 mm. and a diameter of 1500 mm. having full hydrostatics for traction and vibration drives.

Delmag (shown by Delmag France of Maurepas)

A full selection from their range was on show in addition to their vibratory pile driving equipment. Their vibrating plates ranged from the little SV 1611 machine, weighing 92 kg., through their heavy diesel powered uni-direction plates to the reversible mid and heavy-weight units. Of special interest was the carrying frame that could be attached to the boom of an all hydraulic excavator that could have fitted into it their model SV 5000 or SV 5001 heavy plate (600 or 800 kg. weight) to enable effective compaction of inaccessible or difficult positions to be achieved.

An impressive running demonstration of the SV3511 reversible plate compactor

A feature of the SV3511 plate displayed that applies to their reversible units is that by the movement of control lever the operator can not only select the direction but also the degree of compaction, even to holding the machine stationary and giving maximum compaction to any selected spot.

Dynapac

On show was a selection of equipment from their full range covering poker vibrators, plate compactors, soil and bituminous rollers. Also noticed on the stand was the Salco Bitumen Distributor manufactured by Salco Maskin A/B and now part of the Dynapac organisation, thus extending their activities deeper in the bituminous material field. Their CC 10. 2.3 tonne articulated frame vibrating roller with drum widths of 1070 mm. and diameters of 660 mm. with its full hydrostatics is as much at home on sub base and road base work as on ashphalt

The well proven CA25 to which the new compaction metre can be fitted

rolling. A new development in terms of compaction control was on show. Fitted to their CA 51S, 15 tonne articulated frame rubber tyre module/vibrating drum roller was their compaction meter that enables a driver to determine the degree of compaction whilst rolling. This is achieved by first taking a reading of an area compacted and density checked to specification and setting a digital read out meter. When the roller makes passes over soil and granular materials being compacted, a sensor is feeding in readings and averaging them in 5 or 30 second intervals.

When they agree with the digital setting a light comes on at the panel to inform the driver he has reached the required density. This device will enable compaction costs to be reduced and greater compaction accuracies to be maintained. Among their rollers displayed was the new CK04. This is a frame housing 2 vibrating drum assemblies powered by an engine set at an inclined angle. The frame has a towing hitch provided and the set can be raised and lowered on slopes to effectively compact such work as canal banks, dam faces, long slow embankments, etc. The unit has a weight of almost 8 tonne.

Marini

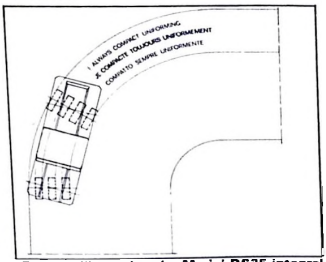

Diagram illustrating the Marini DS25 integral steering system

Among their exhibits the new rubber tyred roller DS 25 was on show. It is claimed that this is the only multi-wheel pneumatic tyred roller available in Europe with the special integral steering system in which both sets of wheels pivot simultaneously to a maximum steering angle of 40°. The roller has a basic weight of 14 tonnes and can be ballasted up to 25 tonnes. The rolling path width at all times,

Continued

...ing turning is 1.98 m. The unit has ...c suspension that ensures a constant ... pressure at all times.

...wman (Newman ...ustries S.a.r.l.)

...e full range of CEL hydrostatically ...led vibrating rollers were on show.

The CEL Hydroller Mk.2 hydro...atic ...mission mono cylinder vibrating ...er

...interesting feature was the safety device ...ed in the form of a 'dead mans' handle ...of standard design for all their duplex ...chines. The Mk.2 monodrum roller has ...railing wheel attachment that can be ...ed as an optional extra that relieves the ...erator of considerable manual fatigue ...en rolling large flat areas. This roller has ...weight of 446 kg., a drum width of 710 ...m. developing a centrifugal force of 1050 ...g at 75 Hz. and has full hydrostatic ...ansmission.

Piquard et Durey-Sohy

The B11 as shown on their stand. Note the operator's controls are to the left side of the driver

Of considerable interest on their stand was the new B11 articulated duplex vibrating roller. With a weight of 1.2 tonne and a drum width of 900 mm. it was equipped with hydrostatic transmission. The roller is driver controlled and the driver can select to have vibration on 1 or 2 drums in either direction. The articulation of the two frame modules gives great flexibility in following ground profile.

Poclain (Poclain, Derruppe)

Among the range of Poclain equipment on show were a selection of vibrating rollers. At the smaller end of their range was the CD2 hydrostatic tandem with articulated frame steering weighing 2 tonne and having a rolling width of 960 mm. Whilst at the upper end were the CD400 self propelled articulated rubber tyre/smooth drum 9.4 tonne machine for soils and granular materials and the CD4 weighing 11.6 tonne with special

The CD4 articulated frame vibrating roller ready for asphalt rolling as seen on their stand

bituminous material rolling qualities. The CD4 has a rolling width of 2.0 m., has continuous variable frequency and amplitude control and is, therefore, a multi-purpose machine. It is fully hydrostatic and incorporates articulated frame steering in its design.

Richier

In the vast Richier/Ford exhibition hall among other exhibits a selection of rubber tyred compactors and rollers were on show. The king of their rubber tyred compactors was the C791 which with ballast

Continued

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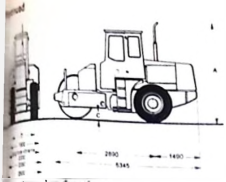

...dimension drawing of the new Richier ...

...maximum weight of 35 tonnes spread ... two wheel sets over 7 tyres. This ... is over 6 m. long and has a rolling ... width of 2.15 m. New and of great ... was the A625 articulated ... tyre/smooth vibrating drum roller ... a weight of 10.8 tonne and a drum ... of 2.2 m. A special feature of the ... is that the front module with the ... drum assembly can be offset from ... by approximately 15 cm. to enable ... rolling to be achieved or on ... by in-setting the drum. The first ... can be made with the rubber tyres only ... on the edge of the mat. Another ... combination is the CV415 which, ... being an articulated roller, has the ... module with a smooth drum vibrating ... of 2.2 m. width and the rear module ... 4 pneumatic tyres covering the same ... This roller has a weight of 17.8 tonnes.

Sovemat

The full range of rollers had as its backbone an impressive display of duplex machines including their new SA91 driver operated articulated duplex roller. This unit weighs 1.95 tonnes and has drum width of 910 mm. It is a fully hydrostatic machine that is extremely flexible both in operation and the type of materials it can handle. The well established ST duplex rollers have a new addition in the form of the ST 75. This has hydrostatic transmission and like all ST rollers can embody their Pivant Steer system as an extra. A 'dead mans' handle control is fitted as standard. It has a weight of 1090 kg. and a drum width of 750 mm. An old favourite in many African countries, the SMCP85 tandem was on show. This has a weight of 1035 kg. and embodies a pivoting steering drum beneath the driver's position, guiding the vibrating traction drum assembly. It has a rolling width of 850 mm., mechanised transmission giving 2 speeds 1.3 or 3.8 kph. The drum frequency is 3300 vpm.

The new SA91 seen here with sun canopy fitted

Wacker (Shown by Wacker France)

A full display of equipment from their range covering vibrators, plates tampers and rollers. Among their vibrating plates the models DPS.2340 and 2350 have the feature of dual amplitude settings. This is achieved simply by moving a small knob in or out on the eccentor housing. This gives either the standard centrifugal force output of 1300 kp. or 2300 kp. at a frequency of 90 Hz. The machine is uni-direction but extremely versatile in application. A special vibrating roller for soils and granular materials with very remarkable manoeuvrability is the WDH 84. This is a split roll duplex roller with 4 vibrating drums (in 2 axle pairs) each with individual hydrostatic drive. The drums are chevron barred to give a high traction effort. The operator walks behind the unit, controlling it with 3 hydraulic valve levers. The release of these instantly brings the unit to a dead stop. The weight of the machine is 1.3 tonne and the total developed centrifugal force is 4500 kp. The overall rolling width is 870 mm.

A scene on the Wacker stand illustrating the new driving attachment for duplex roller

A duplex roller with attached steering frame and driver seat and controls was on show, based on the W95. The steering wheel assembly incorporates a water tank and spray bar for the 3 rubber tyres fitted to the steering axle.

WEST AFRICAN CONSTRUCTION

Vibromax (Vibromax France, a company of the Losenhausen group)

Their display of Vibration Equipment was headed by the new W1101 and W1601 self propelled articulated rollers and the W100 and W125 hydrostatic duplex rollers incorporating electrostatic circuitory. The W1101 has a weight of 11 tonne, a drum width of 2.15 m. with a diameter of 1.5 m. It has a frequency range of 30-36.7 Hz. The W125 weighs 16 tonne, a drum width of 2.15 m. and a diameter of 1.6 m. The

The electrostatic insulators can be seen on the handle assembly

frequency of this model being 25 Hz. Both are fitted with cabs equipped with every comfort, including radios. A special safety feature is the 'cut out' button. No matter what function the roller is performing, if this button alongside the driver is touched, it kills the engine immediately and this cuts all function dead. The W100 and W125 duplex rollers are hydrostatic with weights and rolling widths of 1.12 tonne, 1.29 tonne and 750 mm.; 850 mm. respectively. The operator must be physically in touch by hand with the control steering arm. If he is not, then it breaks the electrostatic ground-earth and a valve opens to cut the hydraulic flow to the traction motor, halting the roller instantly. Simply by retouching the handbar does not restart traction, the manual control must be brought back to neutral and a fresh start made.

Weber

The Weber versatile diesel powered plate compactor for trench work shown on their stand, with plate extension wings

From their range of compaction equipment, a reversible diesel engine powered vibrating plate designed for use in trenches was capable of being used in trenches 14" wide. A flexibly mounted long control bar could enable an operator easily to control the unit in a trench while he remained above it, if he so wished. When not in trenches, the width of the sale plate could be increased by almost 50% by the addition of two side wings. It then became an efficient easily manoeuvred conventional width reversible plate compactor, suitable for use on soils and granular materials.

This review is not intended to be comprehensive, and does not include all of the compaction equipment that was to be seen on show at the Expomat.

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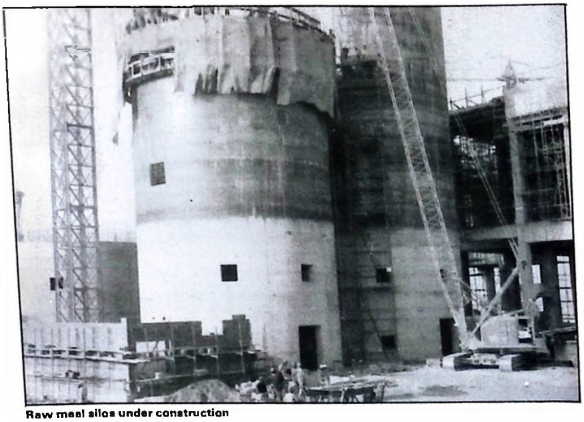
Company focus on Proteus-Bygging

Slipforming for the Ashaka Project

The Ashaka cement project in northern Nigeria constructed by Costains (West Africa) Ltd, is due to go on stream later this year with an annual production of 800,000 tonnes. Proteus-Bygging were called upon to construct the silos. This article looks at the slipforming method that was used.



Raw meal silos under construction

CLOSE TO the main railway line to Maiduguri, about 100 KM from Gombe, lies the new £25 million-plus Ashaka cement factory — a vital link in the development programme for Nigeria's North East region.

And for one British firm, Proteus-Bygging Ltd. of Chester, UK, completion of work on site recently marked the successful introduction of the slip-forming construction technique in West Africa.

For the company have already applied the slipforming method to plant construction in South America and in the Middle East but the challenge of blistering temperatures posed a severe test . . . but the result was an unqualified success.

The company faced the task of constructing nine cement storage silos each 25 metres high — but it took just an average four days to slipform each one.

And according to Mr. Eric Downey, Managing Director, West Africa produced some of the finest results he had seen.

Proteus-Bygging Ltd. were called in by Costains (West Africa) Ltd., to construct the silos and work started early in January. When the cement works go on stream later this year expected production will total some 800,000 tonnes per year and the 2 kiln plant, located on an outcrop of cement's raw materials - shale and limestone — will be sufficient for an anticipated 30 years production

WEST AFRICAN CONSTRUCTION

Costains started on phase 1 of the project early in 1976 when there was nothing permanent on site. It was then at the end of the rainy season and access was a problem. Work on the plant itself started last September and concrete batched on site using local raw materials for the silo slides, was of excellent quality.

Mr. Downey explained: "Our first task was to train local labour to set up and use the slipform equipment under our supervision. They learned quickly and were delighted to work on the project using the new method and often it was a job to get them to sign off at night. It would have taken at least another seven months to build the silos using conventional methods."

Inside view of the slipform

The full labour team placing concrete and fixing re-inforcement

About seventy local workmen together with four expatriate supervisors completed the slipforming.

Many advantages of this technique

"There were many advantages of using this technique", he added. "The silos were fully monolithic constructions with no horizontal or vertical joints, making each watertight. And with the additional safety

Continued

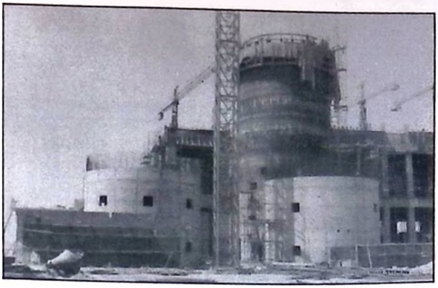
...there wasn't one accident during the ... operation."

...ome temperatures produced the ... test but it proved un-necessary to ...itives to the concrete mix. Sand ...tained from the bed of dried up ...a River and aggregates from the ... were ground and crushed on site. The ... project was overseen by Dr. D. S. ...wood, senior project manager with ...ins (West Africa) Ltd.

...me 34 x three tonne lifting jacks were ... for each slide, with a modular steel ...er designed and assembled by the ... of experts at Proteus-Bygging's ... Works in the UK.

...of the slipform before ... slide commenced

View of the first four raw meal silos



The four raw meal silos constructed had a diameter of 12 metres 700 mm with wall thicknesses of 450 mm on two and 225 mm on the others.

The four cement silos constructed were 14 metres in diameter with wall thickness of 250 mm. One raw meal silo was erected in two sections with a single slipform of 24 metres high with a two metre thick blending floor at the 30.5 metre level and a further 19 metres of slipform on top.

WEST AFRICAN CONSTRUCTION

And the total slipforming operation was actually completed on April 15 . . . one day ahead of forecasts by Proteus-Bygging experts, some twelve months previous.

Mr. Downey comments: "The job went according to our forecasts and we were delighted that the silos were completed almost exactly to the hour we forecast. This, of course, is another great advantage of slipforming. It allows much more accurate completion date scheduling."

How the system works

Proteus-Bygging offer a "complete" service from designing and supply of formwork, and jacking equipment to the operation of the slipform equipment, with on-site supervision by experts.

The design work includes the formation of the slipform assembly for the particular job including the working decks and

Continued

...d staging. It also includes work... ...etails for all purpose-made ...rk and special items of equipment ...for a specific job.

...the supply of formwork the ...ny offer three alternatives:

...he manufacture of purpose-made ...ber formwork for one or more uses ...a single contract which is non-...turnable.

The provision of full manufacturing ...ails for the local manufacture of ...ber formwork.

Manufacture of purpose-made steel ...mwork for one or more uses ... ...ntract which is also non-retu...ble, or

The hire of modular steel for...rk ...nels, wallings and fittings.

All formwork is pre-assembled

All formwork is pre-assemble... the ...pany headquarters and in cas... and ...this is delivered to site in th... largest ...acable units, to minimise site ...ction ...me.

Working deck and suspended staging ...erials are not generally include... except ...e case of small internal cells which can ...delivered complete and/or when ...ifically stated.

Internal bracing is normally included in ...rpose made formwork except that in the ...e of circular cells the radial bracing is ...ually comprised of hired standard ...mponents.

Standard components, such as steel ...kes, stage brackets and sundry fittings ...e common to both purpose-made and modular panel formwork and are ...corporated in the formwork assembly. These are supplied on hire and in general ...rpose made timber formwork all metal ...mponents other than connecting bolts ...e normally returnable.

There are three types of jack for three, ...x and 22 tonne capacities, respectively.

The most commonly used jack — which

Working on the slipform

proved so successful in the Nigerian project — is the three tonne jack, type 601 (27 mm O.D. tube).

A view of the dried-up river bed which produced raw materials for the batching plant on-site.

The jack tube here is very rarely extracted and some surplus tubing is normally supplied to site to allow for accidental damage. The tubing is normally supplied in six metre lengths and any surplus remaining on site after completion is returnable.

The six-tonne jack, Type 604, climbs on a 32 mm diameter bar. The bar may be extracted or left in as specified in any quotation. Casting in ensures maximum stability which is desirable when the jacks are adjacent to vibrating or shock loads such as hoist head frame and hopper mounted on the slipform.

The third variety of jack is 22 tonnes capacity, Type R72 which has a 71 mm O.D. tube. This tube is almost invariably extracted because of the high cost involved and the jack can only be used on wall thicknesses of not less than 250 mm.

The jacking equipment itself comprises jacks, pumps, valves, circuit piping, automatic timer, level control guides and if required, a hand operated pump. In addition to tools and spare components a number of completed jacks and one or more pumps can be provided as spares.

Proteus-Bygging Ltd., offer their slipforming service with three basic options:

1) For small jobs the company offer full assembly facilities and slide attendance if required.
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Steel fixers fixing re-inforcement for the first raw meal silo

WEST AFRICAN CONSTRUCTION

Since the majority of contracts involved the employment of joiners before and after the slide option 2) is the most commonly adopted with contractors new to slipform work whilst experienced contractors often require only advisory supervision of formwork.

The actual operation of the slipform equipment is normally carried out by company staff and is included in the overall quotation.

Proteus-Bygging offer a complete and efficient slipform service with a general consultancy service for every contract from **initial design to completion.**

The Ashaka project proved just how successful the slipform operation can be in West Africa from the standpoint of quality, safety and completion dates in particular, and there is little question that the modern slipform construction technqiue will be seen again in Nigeria. □

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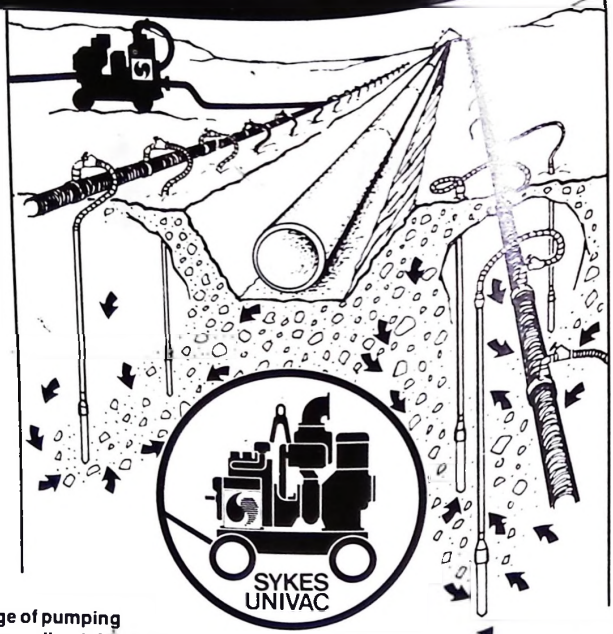

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WEST AFRICA

PUMP TROUBLE?

Don't let it get started

by Arnold LaFarge , Product Manager
Industrial Pump Division, Allis-Chalmers Corp.

THE REAL test of any industrial installation is trouble free operation. Pumps, which are often part of a continuous process, are particularly expected to perform. Waste pumps particularly meet stringent requirements.

Waste pumps also serve to demonstrate the value of teamwork in successful pump installation — any installation in any kind of service. The manufacturer can't do it alone, for he has design and shop techniques understanding. Neither can the consulting engineer and contractor, although they understand the application and its requirements. The user can't either, but he makes the greatest contribution in time terms because he uses and maintains the equipment often for decades.

Teamwork in successful waste pump applications comes to a head at the job site. Here, storage, installation techniques and day by day maintenance and usage join in keeping what was well started on the path to best long term results.

Let's see how to do it.

Care before installation sets the stage

Once the consulting engineer has selected the particular pumps to be used, a programme should be established for the proper care of the pump prior to installation and these instructions included in his written specifications. A few basic suggestions are included here, but for specific questions, consultants should go to the pump manufacturer.

First of all, the contractor should try to schedule delivery of the equipment so that it will not be on the job site for a long period of time before it is actually needed. If there is a change in the time it will be needed, the contractor should immediately contact the manufacturer for a change in the delivery date. Manufacturers are most interested in good performance and as a result are anxious to attempt to comply with the contractor's delivery request by rescheduling the pump.

If the pump is completed and ready for shipment, it could be a problem for the manufacturer to hold it in storage because of limited space. Depending on the length of time involved and the climate conditions, the contractor should consider locating some sort of protected storage, which could be much more economical than correcting trouble caused by poor storage.

If a pump is to be stored under construction project conditions and could deteriorate from exposure to the elements, the machines surfaces and exposed unpainted parts should be coated with a rust preventative. TECTYL 502-C is one of several products that provides a soft, wax type film for this purpose. As another precaution, the entire unit can be enclosed in plastic with adequate dessicant material enclosed.

The bearings are probably the most vulnerable part of the pump in storage. The bearings will have been packed with grease prior to shipment; however, the shaft must be rotated periodically to recoat the bearings with lubricant to retard oxidation and corrosion. The storage area should have slow changes in ambient temperature because if warm moist air comes in contact with a still very cold pump, condensation will soak even the interior parts of the pump. The necessity for turning the shaft and preventing an abrupt temperature change apply even after installation if there is going to be a long period before actual use.

Flooding is one other common problem with waste pumps because they are generally installed in low lying areas. Flooded bearings take special care. A flooded pump must be dismantled and the bearings cleaned and inspected and repacked with grease. If the pump were flooded for a long period of time and the bearings show rust, they must be replaced. Next, the stuffing box should be cleaned and any foreign matter removed. Mechnical seals should be cleaned and thoroughly flushed. Couplings should be dismantled and cleaned. If the coupling is of the lubricated type, it must be relubricated. If the pump has not been installed, the impeller and any piping that has been erected should be inspected and foreign objects removed. Remember — flood water is dirty water and leaves a deposit of debris and will cause rust.

A poor installation is hard to rectify

The next operation contributing to trouble-free use is proper installation. There is the old cliche that two things can ruin machinery — "Don't Know" and "Don't Care". Either of these can have a serious effect on proper installation. There is really no excuse for "Don't Know". Besides all of the general texts on pump installation, each manufacturer can furnish definite instructions for the installation of their specific pump, and the consulting engineer should insist in his specifications the contractor follow the manufacturer's instruction.

As far as installation is concerned, there are four steps. These will be covered in a general way. The specific instructions of the pump manufacturer should be followed in each case. The four points to be considered are: location, foundation, alignment, piping.

Function of location in installation

The location of the pump will, of course, depend on a number of factors. The pump should be installed as near the inlet supply as possible with the shortest and most

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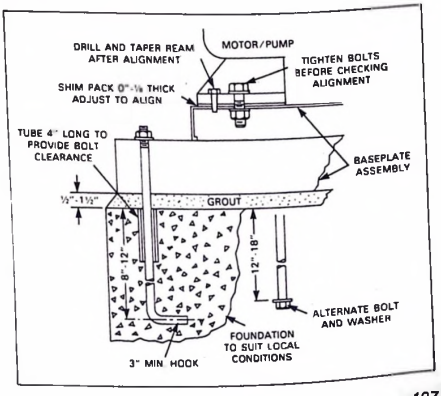

Fig. 1: Foundation section showing alternate foundation bolt arrangement

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...pipe. The total dynamic suction lift (...plus friction losses in suction line) ...not exceed the limits for which the ...was sold. These pumps must be ...ed before starting, so wherever ...le, the pumps should be located ...liquid level to facilitate priming and ...re a steady flow of liquid. This condi... provides a positive suction head on the ... It is also possible to obtain this con... ...by pressurizing the suction vessel. ...pump should be placed with suff...ent ...ssibility for inspection ...nd ...enance. A clear space with ...ple ...room should be allowed for the ...of ...overhead crane or hoist suff...ly ...ng to lift the unit.

Function of foundation of Installa...n

A substantial foundation and ...ting ...ld be built to suit local cond.... It ...d form a rigid support to ...tain ...ment. It is advisable to is... the foundation from adjacent cement ...k to prevent vibration from being trans...ted to the pump. The local Portland Cement Association representative can off... recom...mendations for a particular installat...on.

Foundation for horizontal pumps

The foundation should be poured without interruption to within ½ in. to 38 mm. (1½ in.) of the finished height. The top surface of the foundation should be well scoured and grooved before the concrete sets. This provides a loading surface for the grout. Foundation bolts should be set in concrete as shown in Fig. 1. A 102 mm. (4 in.) long tube around the bolts at the top of the concrete will allow some flexibility in bolt alignment to match the holes in the baseplate. Allow enough bolt length for grout, shims, lower baseplate flange, nuts and washers. The foundation should be allowed to cure for several days before the baseplate is shimmed and grouted.

The foundation surface must support the pump and driver with shims and plates under the baseplate at the foundation bolts. The foundations should be smooth and level at these points to distribute the load evenly on the shims. A thin metal plate levelled in a puddle of mortar or grout is often the easiest way to achieve this level and smooth surface. Use thick shims wherever possible to reduce the number of shims used.

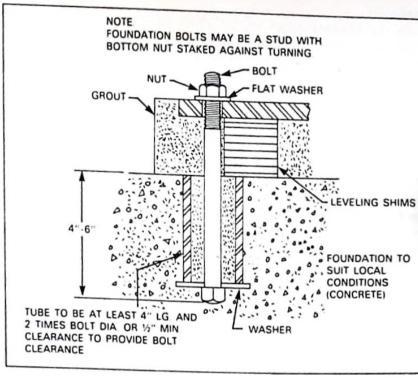

Fig. 2: Vertical pump base or motor ring base

Levelling bolts made of cap screws and nuts are very useful when levelling large baseplates, but they should not replace blocks and shims for supporting the load.

Baseplate setting before piping calls for its own technique. This procedure assumes that a concrete foundation has been prepared with anchor or hold down studs extending up ready to receive unit. It is understood that pump and motor have been mounted and roughly aligned at the factory. The manufacturer cannot assume responsibility for final alignment.

- Use blocks and shims under base for support at anchor studs and midway between studs, to position base approximately 1 in. above the concrete foundation with studs extending through holes in the baseplace.
- Level unit by adding or removing shims under base until pump shaft and flanges are level and plumb.
- Draw anchor nuts tight against base, and observe pump and motor shafts or coupling hubs for alignment. (Temporarily remove coupling guard for checking alignment).
- If alignment needs improvement, add shims or wedges at appropriate positions under base so that retightening of anchor nuts will shift shafts into closer alignments. Repeat this procedure until a reasonable alignment is reached. Reasonable alignment is defined as that which pipe contractor and the accepting facility (final operator) mutually agree upon. Final alignment is covered under manufacturers' "Alignment Procedures".

Foundation for vertical pumps

Foundation bolts should be sized and accurately located. Each foundation bolt should be located in a bushing two diameters larger than the bolt to allow free movement of the bolt in conforming to the mounting holes in the pedestal. When vertical pumps are used with intermediate shafting, the motor mount baseplate should be securely attached to the floor.

Vertical pumps should be mounted as shown in Fig. 2. The pump must be levelled with a carpenter's level, placed across the suction and discharge flange. Use solid shims between the pedestal and foundation. The pedestal should not be drawn down by mounting bolts until properly shimmed. This is accomplished by adding shims of equal thickness at these mounting bolt locations. Place base or pedestal on the shims and then add required shims to fourth location to prevent deflecting the base as the mounting bolts are drawn down. After the base is properly set on the shims and levelled it can be grouted in place.

Grout compensates for uneven foundation, distributes weight of unit, and prevents shifting. Use an approved, non-shrinking grout as follows, after setting and levelling unit. (See Fig. 2):

Build strong form around the foundation to contain grout.

Soak top of concrete foundation thoroughly, then remove surface water.

Baseplate should be completely filled with grout and if necessary, temporarily use air relief tubing or drill vent holes to remove trapped air.

After the grout has thoroughly hardened, retighten the foundation bolts. Check the alignment after the foundation bolts are tightened.

Approximately 14 days after the grout has been poured or when the grout has thoroughly dried, apply an oil base paint

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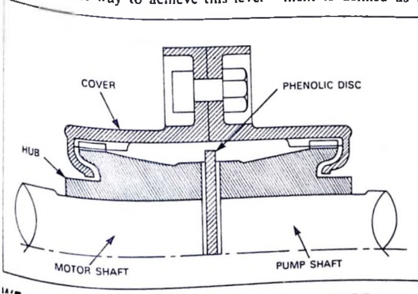

Fig. 3: Limited end float coupling arrangement

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to the exposed edges of the grout to prevent air and moisture from coming in contact with the grout.

Fabricated steel baseplates should be filled with grout and packed or tamped until the grout completely fills the space between the baseplate and the foundation. Forms are not required for enclosed type fabricated steel baseplate.

For cast and formed steel drip lip baseplates, the grout should be poured into the base cavity through every large hole in the top of the baseplate. It is important the baseplate be completely filled with grout and no air pockets remain.

Allow the grout to set completely before proceeding with alignment.

Function of alignment in installation

Any baseplate, regardless of size or style, can be warped in shipment or when installed on a foundation. Because of this, the pump and driver must be aligned in the field.

Some flexible couplings will accept some degree of misalignment for short periods of time, but should never be used to compensate for misalignment.

For units with drivers having sleeve bearings, the coupling halves must be set to limit total shaft axial movement to less than one-half of the motor rotor assembly end float. This is accomplished by inserting a phenolic disc, or equivalent, of a specified thickness between the motor and pump shafts (See Fig. 3).

Allowances are to be made for thermal expansion during cold alignment so the coupling will be aligned at operating temperatures. Actually, if alignment is critical, it should be made at operating temperatures. In all cases, a coupling must be in alignment for continuous operation. Misalignment causes excessive wear, vibration and bearing loads that result in premature bearing failure, rubbing and galling and ultimate seizing of the pump.

Misalignment can be angular, parallel, or a combination of these, in either the horizontal or vertical planes. (See Fig. 4). Final alignment should be made by moving and shimming the driver only. For single element couplings, proceed as follows (See Fig. 5):

1) Adjust coupling halves to the gap dimension as shown on the manufacturer's certified drawing.

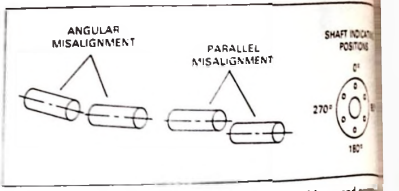

Fig. 4: Kinds of misalignment

2) Mark both coupling halves with a reference or match mark.
3) Mount an indicator as shown in Fig. 5.
4) Slowly rotate both shafts together and take all readings between the match marks.
5) Adjust driver until coupling alignment is within a total indicator reading of .004 inch for both parallel and angular alignment.
6) Assemble the coupling and tighten all bolts and set screws.
7) Remount dial indicator and check.
8) Permissible misalignment will vary with the make of coupling. Consult the coupling manufacturer's data if in doubt.

For double element floating shaft spacer, coupling misalignment should not exceed 1.59 mm. (1/16 in.) to 3.18 mm. (1/8 in.) per foot of plane separation. This will vary with each make of coupling. It is generally recommended to offset universal joint coupling alignment by 3.18 mm. (1/8) to 6.35 mm. (1/4 in.) for the best operation. Again — consult the coupling manufacturer's data if in doubt.

After the pump has been in operation for about a week, the pump and driving unit should be dowelled. Recheck the alignment first and correct if necessary. Then drill holes through opposite pump and motor or drive feet 0.397 mm. (1/64 in.) less than the dowel pin to be used and clean out the chips. Ream the holes to the proper diameter of the pins (light push fit) and again clean out the chips. Insert pins to be approximately flush with pump feet.

Function of piping in installation

We are now ready to consider the piping as the last part of our installation instructions. Pipe friction robs valuable suction and discharge pressure and thus, if improperly installed, will make it impossible for the pump to function as rated. Also pipe strain can cause mechanical pump problems and contribute to objectionable vibration.

Piping should be installed with the shortest, most direct runs. Elbows should preferably be of the long radius type. It is desirable to increase the size of the suction and discharge pipes at the pump to reduce pipe friction losses. The amount of this increase should be determined by the length of the run. Both suction and discharge piping should be supported independently with rigid supports or anchors to prevent strain from pipe expansion. This will prevent strain from pipe expansion, bending or twisting forces, or from the pressure acting directly on the pump.

The piping should be erected so that it can be connected without springing it or pulling on the pipes. Pipe strain on the pump casing can cause hard to trace troubles after the pump is erected and running. A few of the troubles that can be caused by pipe strain are coupling misalignment, rubbing impellers, shortened bearing life, and broken shafts and castings.

All piping joints must be air tight. Flanged joints with full face gaskets will provide tight joints as well as reduce pipe friction. Be sure the inside diameter of the pipes line up. Remove burrs and sharp edges when making up joints.

Installing inlet piping

Horizontal inlet lines should be installed with a continuing slope upward to the pump as shown in Fig. 6. Any reducer must be an eccentric type installed with a flat surface at the top to avoid trapping air at high points in the piping. This air can later be drawn into the pump and cause loss of prime.

The sizing of the suction piping is extremely important. It must be selected and installed so that pressure losses are minimized and sufficient liquid will flow into the pump when started and operating. To insure the proper flow of liquid to the pump, it is recommended using a straight run of suction pipe just ahead of the pump. The length of the straight run should be equivalent to four or five pipe diameters.

Many NPSH (Net Positive Suction Head) problems can be directly attributed to improper suction piping systems. To facilitate cleaning pump liquid passages without dismantling the pump, a short section of pipe, "spool piece" so designed that it can be readily dropped out of the line, can be installed adjacent to the suction flange. With this arrangement, any matter clogging the impeller is accessible by removing this pipe section.

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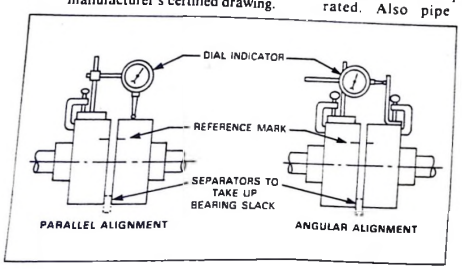

Fig. 5: Checking alignment with an indicator

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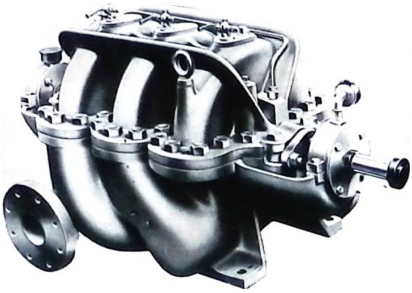

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…two or more pumps are con-
…the same suction line, a gate valve
…be installed so that either pump can
…d from the line. The pump should
…be throttled by the use of a valve on
…side of the pump. These valves
…always be installed in position to
…air pockets.

…stalling …charge piping

…charging piping may be installed … an increaser at the pump flange to re… the friction losses. This increased si… of … particularly necessary with … of piping. A check valve c… be …d before the throttle to pre… … flow through the pump wh… … is shut off. A gate valve i… …d …the check valve can be used to … the pump for maintenance, priming, start- … and stopping. Incidentally, clo… the … valve slowly before shutting … the … will prevent the water hamm… effect … so often occurs when a pum… stops …ptly and a check valve slams sh…

…proper installation will cause problems

Unexplainable problems can often be …ed to improper installation. This is best …trated by a recent troublesome …rience with a vibrating vertical waste …mp. The pump had passed all tests at the factory, including measurements of vibration. As measured, vibration was well within the limits specified by the Hydraulic Institute, however, after the pump was installed in the field, the customer reported excessive vibration.

Field service engineers were sent out, but they were unable to locate the cause of the vibration or reduce its intensity. After further analysis, it was agreed the pump unit should be returned to the factory for further testing.

A carefully executed testing programme at the factory established the fact that the pump and driver were not at fault. Vibration was measured at the same points that were used for field checking and all readings were less than one half what they had been at the job site.

The installation was rechecked and difficult-to detect errors in the foundation and grouting were found. When these deficiencies were corrected, the pump unit operated without difficulty. This illustrates clearly that to get good operation, the Total System must be well engineered and properly installed.

Maintenance is with us always

The final point considered is maintenance. There are so many varieties of pumps operating under such a wide variety of conditions that it would be impossible to make any specific recommendations. One should look at the broad picture of maintenance instead.

First of all, consider general housekeeping. Keep the whole area clean. This has a two-fold result. Dirt is a menace to all machinery and the less dirt there is around, the less there is to get into bearings, into the grease that is going to be put into bearings and into the windings of motors. The other point is the psychological one in that the average worker is going to take better care of a piece of equipment that looks like something than he is of a pump that no one — including management — seems to have any regard for.

The next thing you should think about is maintenance education. There are two ways this can be accomplished. Most manufacturers are able to send field men to your plant for instruction of maintenance personnel. Some conduct schools in their plants to which you can send your people for instruction. Manufacturers sometimes charge a nominal fee for this type of instruction.

The other way to learn about maintaining your equipment is to read the instructions furnished with the pump. The instruction book generally will refer specifically to a piece of equipment and will have been written by the people who designed and built it. This Instruction Manual should be the "bible" for your maintenance people. One of these manuals is furnished with every pump sold and if yours has been lost, you can obtain another one from the manufacturer at a nominal charge.

Another consideration in the maintenance programme is supervision. Someone has to be sure the man who is actually adding the grease knows how much to add and when to add it and that he had added it at the proper time. Motivate the oiler! Remind him that if he adds an ounce of grease at the right time he won't have to go through all the effort of dismantling that pump for repair or having to stay overtime to repair it when he wants to go bowling. Try to get him to take pride in how long his pump has run without failures or downtime.

Make some kind of "Pump Maintenance Record" form, such as shown in Fig. 6, to keep a record of when the pump was last inspected, of exactly what was done to it and a record of its hours in operation. The instruction book on the individual pump will list the daily, weekly, quarterly and semi-annual checks that should be made.

Finally, remember that your pump is a piece of rotating machinery and that no matter how well you maintain it there are some parts that are going to wear out and have to be replaced due to normal wear and tear. Seals, packing, shaft sleeve and bearings are going to wear out. Again check your instruction book. This book will list spare parts you should keep in stock. Keep these on the shelf and schedule regular "downtime" for your pump so worn parts can be replaced as a normal maintenance measure rather than on an "Emergency Breakdown" basis. □

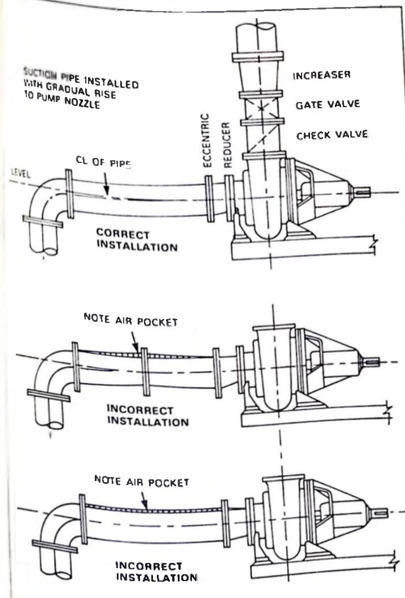

Fig. 6: Suction piping installation

Arnold LaFarge is Product Manager of Industrial Pumps Division, Allis Chalmers Corp. in Ohio, USA.

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Provision of on the job training is considered essential for crane operators. Shown here is a group under-going instruction at Blackwood Hodge (Nigeria) Ltd.

A NEW APPROACH TO TRAINING — THE NIGERIAN EXAMPLE

In this second article on training development F. W. Greig, Deputy Director of ITS, looks at the way in which Nigeria is tackling her national training problems and the potential these approaches may offer to other developing countries.

Manpower and Training problems in West Africa, fall into several categories, many of which were discussed in Part I of this series. This second article looks at three of the special problem areas, which are of particular concern to a country which is expanding as fast as Nigeria:

(a) **The poor provision of on the job training within the individual enterprise:** this is a major factor in a number of the problems listed above: the shortage of maintenance skills and low maintenance standards, the need to train better, more versatile technicians, the improvement of operator standards, and the raising of the status of the supervisor.

(b) **The training and development problems which arise when a completely new plant is being erected;** in some cases this gives rise to the need for large scale importation of expatriate technologists and managers, the numbers of which could be greatly reduced, and their terms of office greatly shortened, if a clear-cut methodology for the planning of training in new plant conditions could be made available. Such a methodology now exists (see the reference in the recent book "The Invergordon Story" by Gordon Drummond (Publisher: Hutchinson/Benham) which deals in Chapter 9 with the special problems of training in new plants). The story is of the construction of a large aluminium smelter in the Highlands and the Industrial Training Service were consultants on training in this as in a number of similar projects, mainly in the United Kingdom.

(c) **The development of close co-operation between technical education establishments and industry** in the preparation and implementation of integrated programmes of education and training. Where this close relationship does not exist there can be gross misuse of public resources in attempting to remedy skill and knowledge shortages within the economy.

If the above and related problems in the

continue

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manpower and training area are classified, it can be suggested that they be grouped under four main headings in which action may be needed to remedy the situation:

(i) The need for a national training system: instigated by Government and institutionalised in ways which are appropriate to each individual country to ensure that what needs to be done in the above areas *gets done*.

(ii) The need for planned action in each of the main occupational categories where a shortage of skill has been identified to increase the flow of skilled manpower at a rate which can sensibly be sustained, and all the incidental action including the creation of new institutions which this requires.

(iii) Action to be taken in the main problem areas listed; and particularly the inplant and the new plant training problems.

(iv) The need for a massive increase in the amount of available training know-how, including an appropriate increase in the quality and numbers of training staff.

One would rate progress in developing a manpower and training policy in any West African country in terms of what was happening under each of the above four headings, rather than in the number of training centres built, or the number of courses run, or the number of post-graduate students sent to the USA or Europe. Concentrating overmuch on the latter may involve mistaking the shadow for the substance.

A case study in training and development in West Africa: Nigeria

Although a great deal of work yet remains to be done, it can be suggested that Nigeria in 1977 provides a very good example of a West African country which is tackling its national training problems along the lines indicated above and, for this reason, may ultimately prove to have pioneered approaches which have applications in many developing areas of the world other than West Africa.

1. The statutory initiative

In 1971, the Military Government of Nigeria set up by decree an Industrial Training Fund, as the national training authority commissioned to undertake the overall task of promoting and encouraging "The acquisition of skills in industry and commerce with a view to generating a pool of indigenous training manpower sufficient to meet the needs of the economy". This task has to be started against the immediate background of economic recovery from the effects of the Nigerian Civil War, but looking to a future of economic growth and rising living standards, a process to be fuelled initially by oil revenues, but to be sustained in the long run by the exploitation of Nigeria's other resources, of which ... important of all was manpower.

Unlike the training system in ... like Britain, where Training Boards ... been set up for single industries ... of industries, the Fund covers ... facturing industry and commerce ... given the power to raise a levy ... employers, pay training grants ... inducement to good training, and ... training advisory services as a means ... the end in promoting and encouraging ... growth of a highly skilled workforce.

2. Constitution and structure

Thus, the Nigerian Government's ... first main step towards creating ... ong and vigorous system of ... ining as a mechanism through which ... power aims in the area of ... ld be achieved. To ensure a ... ernment influence in the Council ... Fund, its Governing Body, ... ant number of Council Members ... senior Federal Civil Servants ... State Ministries, together with ... esentative of employers, trade ... education. The Council operates ... its Chairman, through a number ... committees, with an appointed ... ector or Chief Executive under whom ... three main Departments: Training, ... Finance and Administration.

The most important department ... Training, which has a range of support ... services based on HQ concerned with ...

continued

...h. information and training ...ment Area Offices in all the ...States (and in all States eventually) ...basis from which the Fund pro... a local advisory and consultancy ...in training to any contributing ...

3. The staff of the Fund

During the past few years, the Fund has ... up a staff of over 50 Training ...elopment Officers, and this number is ...ed to increase progressively over ...next year or two. Thus a major con...tion has already been made to build... a cadre of first class training offic... Nigeria, and already the Fund has ... some of its people to companies ...which can only be regarded as a healthy ...elopment) and is replacing them and ...ing to them with others recruited both ...the United Kingdom as well as Nigeria.

Primarily the training staff of the Fund ...seen as consultants and advisers, but ...of them obviously function part of ...the time as course runners, and numbers ...employed at any on either short or ...term research and development ...(e.g. devising new style training ...programmes, conducting special surveys ...etc.)

Training of the Fund's staff was ini...ly carried out by programmes of ...course and project activity in Nigeria, ...jointly planned by the Industrial Training ...Service with the senior Training Staff of ...the Fund, and during the period 1974/76 ...over 100 Nigerian firms of all types and ...sizes were involved in this training, and ...because more were aware of the work of ...the Fund and the help which it could give.

4. Developing Nigerian staff as trainers

Working to the multiplier principle, the Fund has become a major resource for multiplying training know-how and training activities throughout the Nigerian economy. Starting at the professional end, training courses for both instructors and training officers have been evolved, and have a strong practical bias involving company projects. Thus, as training know-how is disseminated, and training staff trained, new programmes are developed which can serve as models for other companies to inspect and be influenced by.

5. Improving the quality of in-plant training in Nigerian Companies

This is an activity in which progress can only be said to be slow and steady. The most important point to be registered is that the Fund regards this activity as a key role of its Area office staff, and that they are now increasingly well equipped to carry it out. First things first: professional competence and mechanisms for applying it must be created before this kind of activity can be carried out on a major scale. Otherwise attempts to multiply know-how in training will lose credibility because of unsatisfactory practical

Following the Multiplier principle — students in a training centre set up by Multico.

results being achieved.

6. Surveys and data collection generally

A major task of the Fund has been to conduct a range of surveys on an industry or a problem centred basis, and to compile directories in great detail on the training facilities available in Nigerian industry and Commerce. This ensures that as the Fund evolves its role in the future it will do so from a base of increasingly reliable information on where the real needs, problems and relevant resources lie.

7. Problem areas and future trends

Since 1973, when the Fund really started to grow and develop its role, its task has been very much to create a national training system, and to develop a staff and a procedure to make the system work. For example, it is still in the process of reviewing and improving its financial system, i.e. the levy grant procedure. In the here and now, it is looking among others at the following problems:

a. Vocational training centres

Although there are already considerable provisions in this area, the Fund will undertake a "gap-filling" role to design and erect centres which are needed in the light of immediate manpower needs.

b. Group Training Schemes

The Fund is examining the scope in Nigeria for the development of Group Training Schemes as an aid to the small company. A senior member of its staff has spent a period in Britain recently looking at this subject.

c. The Area offices

The Fund plans to invest even more effort into strengthening its area office organisation as an indirect means of strengthening its services to the individual company. It is in the areas and in the relationship between the Fund's training development staff and the individual enterprise that the Fund sees its central activity. Helping the individual firm to handle its own training problems better may serve the interests of Nigeria better than almost anything else the Fund may do.

Still a long way to go before Nigeria's potential is reached

The above examples of fund structure, staffing and activities *are* examples only from a wide range of issues which could have been mentioned. The Fund has yet a long way to go before it is making the powerful contribution towards solving Nigeria's manpower problems of which it is potentially capable. These examples are, however, given to demonstrate a new trend in training development and a new trend in West Africa: whereby a nation starts to take full responsibility for managing its own learning needs, in an essentially practical and positive kind of way.

To revert to the mathematical term used earlier in this article, Nigeria is learning that it is better to multiply training than merely add experience. There may be a lesson here for others. □

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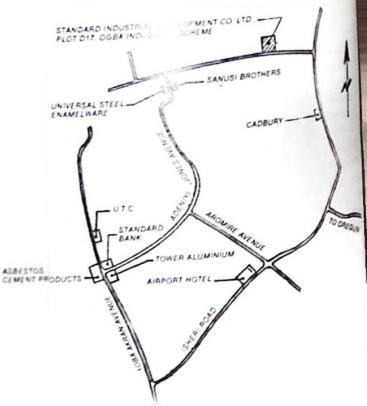

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OMMERCIAL VEHICLE — MERCEDES-BENZ

Although long-distance freight transportation is a major growth area in West African territories, the distribution of smaller consignments on a door-to-door delivery basis remains a vital function, calling for smaller trucks and vans, typified by the 'Dusseldorf' range of transporters from Mercedes-Benz. Alan Bunting reports.

Side loading doors are an option on the L508D van range

"PHYSICAL distribution management" has become a key phrase among manufacturers and transport concerns in Europe and North America. And its application are beginning to be appreciated in areas like West Africa where the concept of road transport as a separate operation (handled by either an outside haulier or small's carrier, or by an isolated transport department in a large concern) is now largely outdated.

If the cost of getting the goods from the end of the production line — or the farmer's field — to the customer's door is to be reduced to a minimum, then the road transport function must be regarded as an integral part of a "total distribution" system, embracing transport, warehousing, packaging, materials handling and indeed marketing.

No longer can companies afford to employ a fleet of delivery vans which are standing idle for half the day. Vehicles must be cost effective; they and their drivers must achieve acceptable productivity levels — like any other capital equipment.

Part of the secret — and it is no secret really — of minimising distribution costs is to specify vehicles which are tailored precisely to the job. For short-haul multi-drop delivery of merchandise, in urban areas especially, trucks or vans are needed which can carry a half day's or full day's consignments, but which are of acceptable dimensions in congested city streets where room for manoeuvrability is at a premium.

L508D most popular in West Africa

Falling directly into this size and weight category are the Mercedes-Benz 'Dusseldorf' vans and trucks, of which the most popular model in West African markets is now the L508D. It is rated at 5 tonnes gross vehicle weight, and can carry payloads of between 2 and 2.5 tonne depending on the body configuration.

Unlike most of its competitors offering vehicles in the same weight class, Mercedes produces both chassis-cabs intended for mounting locally-built or specialised bodywork and so-called integral vans, where the cab and the main body shell form a complete all-steel structure. The most important practical day-to-day advantage of an integral van is that the delivery driver can step straight into the load space behind, thus avoiding tedious repeated door openings and having to step up through a rear or side door into the body.

When delivering items small enough to be picked up easily by hand, such as laundry parcels for example, this walk-in facility is of great benefit. In the semi-forward-control Mercedes transporters the engine cover is set well forward of the seats where it does not hamper access from the driving seat back into the load area.

Extras available from Mercedes for the L508D integral van include half-and full-bulkheads between the cab and loadspace. A half-bulkhead, usually behind the driver only, provides a "safety barrier" preventing the load from shooting forward under fierce braking. The full-bulkhead, while defeating the object of an integral van from the access point of view is nevertheless specified by many operators for security reasons; it minimises the risk of pilfering or outright theft.

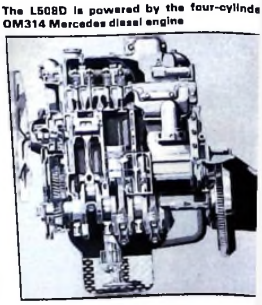
Why an integral van?

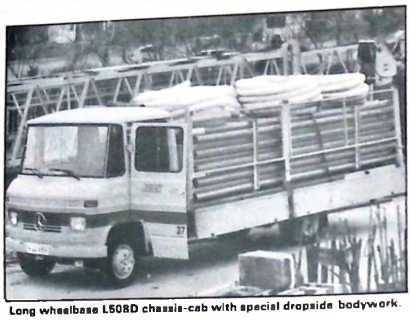
Why have an integral van at all if you are going to specify a full bulkhead? The answer in most cases is that Mercedes' factory-built integral body-cab structure is more rigid and durable than most proprietary box-van bodes and could be expected to give a seven-or eight-year life in operating conditions where an aluminium or even a steel box-van body would need extensive renovation (because of deterioration through so-called "racking" and vibration) after maybe five years.

On the L508D three van wheelbases are listed: 2.95, 3.5 and 4.1 metres. With the standard roof hight of 1750 mm (maximum interior dimension) these lengths give nominal body capacities of 9,12 and 15 cubic metres. The shortest wheelbase (2.95 m) version is available with a lower (1600 mm) roof, where body capacity is reduced to 8.35 cu.m. The other option, on all three wheelbases is a high (1900 mm) domed

Continue

The L508D is powered by the four-cylinde OM314 Mercedes diesel engine





Long wheelbase L508D chassis-cab with special dropside bodywork.

A full bulkhead can be [illegible]fied behind the crew area in integral

Continued

roof, which puts up cubic capacities to 10, 13 and 16 cu.m respectively. It has to be remembered however that the extra "cube" is all above cantrail and loading door level; as such it is only useable for certain types of load.

Other important dimensions in the L508D vans are the deck length — 3, 4 and 5 metres for the short, medium and long wheelbases respectively — and the width: 2.1 m external on all versions. Bodywork options include the bulkheads, already mentioned and slide-open side loading doors.

Companies needing a higher (cubic) capacity van or some other form of bodywork — perhaps a dropside or stakesided type — can specify an L508D cassis-cab from Mercedes. The same three wheelbases are listed and the floor lengths quoted above provide an indication of recommended body sizes.

Van and chassis-cab versions essentially identical

Forward of the rear cab door pillars, the van and chassis-cab versions of Mercedes' Düsseldorf models are essentially identical. And both configurations feature a full ladder-type chassis frame: in other words the van bodies are not integral in the same way as a typical car-derived van whose body -shell provides much of the vehicle's "chassis" strength. The Düsseldorf vans have a full pressed-steel channel-section frame, giving them comparable strength to the chassis-cab variants. That is to say extensive accident damage can be suffered by the bodywork without jeopardising the vehicle's overall strength characteristics. The non-structural floor is of non-slip replaceable plywood construction.

New standards ergonomically

Ergonomically the Mercedes Düsseldorf models set new standards when they were introduced in the mid-sixties. It is a tribute to the original cab design that today they remain largely unchallenged. The door layout behind — rather than ahead of — the front axle makes for easy step-in access: it is in fact possible to get into the driving seat using no hands. Except on the shortest-wheelbase low-height model, it is possible for an average-height driver to stand up in the cab.

The fascia has recently been updated. Its black non-reflective finish and instrument [illegible] follow the pattern of Merc[illegible] heavy truck models, with [illegible] assis on good visibility and ea[illegible] switches and controls.

An integral van from the Mercedes Düsseldorf range is available in three roof heights

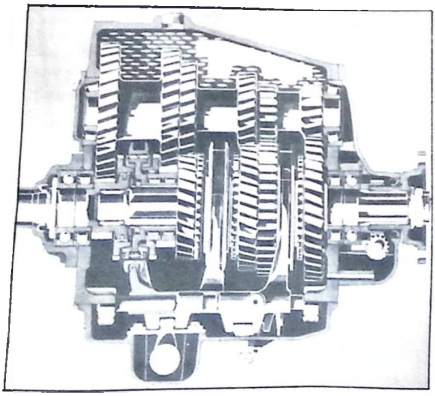
Much of the appeal of Mercedes' lighter trucks and vans comes from the fuel economy and reliability of the German company's popular direct-injection diesel engines. The four-cylinder OM314 used in the L508D range is a 3.8 litre unit developing 86 bhp at 2800 rpm and a maximum torque of 174 lb-ft (235 Nm) at 1800 rpm. It is essentially the same engine found in Mercedes' 240D car where it is noted for its smoothness and quietness (for a diesel) at all speeds above idling.

In the L508D the diesel (with no petrol engine option) drives through a 250 mm dry plate clutch and five speed syncromesh gearbox, operated by a sturdy floor-mounted lever and 4.1 to 1 hypoid axle. At the front all Dusseldorf models have solid (beam) front axles, with leaf springs and shock absorbers.

A hydraulic brake system is provided, augmented by a vacuum servo drawing its power from an engine-driven exhauster.

The electrical system is slightly unusual in that a 24 volt supply is provided for powerful reliable starting, but the lighting circuit is only 12 volts; thus bulbs and other items are cheap and readily obtainable.

Sole selling and service agents for Mercedes trucks in Nigeria are Leventis Motors Ltd., PO Box 390, Apapa-Lagos and in Liberia, Jos Hansen & Soehne (Liberia) Ltd., P.O. Box 28, Monrovia. The company has branches throughout the country and a number of vehicles are also sold through local dealers says Mercedes.□



Five-speed syncromesh gearbox, matched to the OM314 Mercedes, diesel engine

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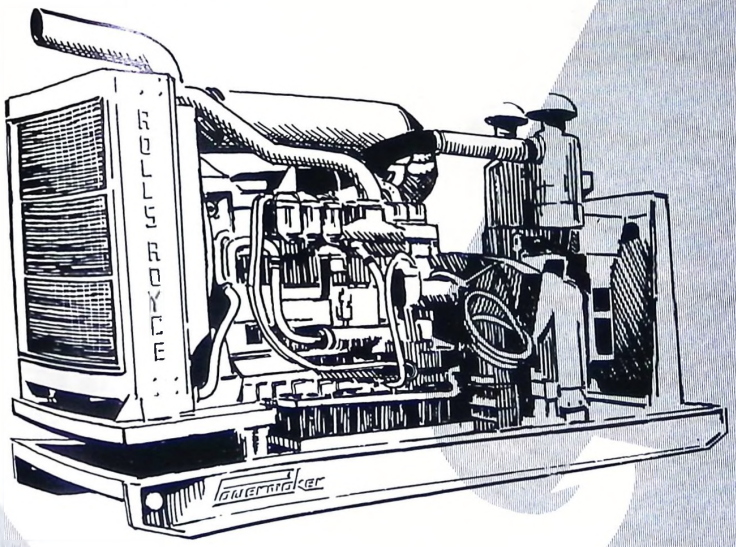

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A key feature of the machine is that it is equipped with a newly developed control system. The development allows significant reduction in give-away. A single adjustment of the scraper blade ensures more accurate control of biscuit weight, without deformation of the biscuit shape. In a highly automated factory, pre-set weight can be monitored by a sensing device. This will constantly scan the dough pieces and will instantly and automatically make the adjustment to the scraper blade by servo operated control. For further information contact **Mekios Ltd**, Lagos and **Ibaertle & Co.** Kano.

Soiled Linen Trolley

A trolley has been introduced by **Siddall & Hilton (Hospital Furniture) Ltd.** Invaluable for handling bulk quantities of soiled linen which reduces bed-changing times. Single, or dual bag capacity models available.

...is model is available in two ... to accommodate either ...mm deep x 450mm ...meter bags or 900mm deep x ...mm diameter bags. Bags are ...de from 12 oz cotton duck ... 4 oz nylon and are supplied complete with draw-string.

Portable self-flushing lavatory

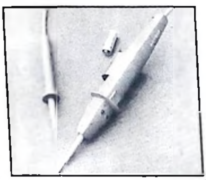
A hygenic portable self-flushing chemical lavatory incorporating a re-cycling system which requires minimum use of fresh water for flushing purposes has been developed by **Elsan Ltd** for use in any location lacking mains drainage. Examples include caravans, long distance coaches, boats, camping sites, building sites, rural housing and any other place where human sewage has to be physically carried to a central disposal point.

Called Portaflush 3, the unit is completely self-contained and elegantly designed in durable, easy-to-clean plastics. Its re-cycling system, similar to that used in aircraft lavatories, enables an initial mixture of water and a strong germicide, with subsequent additions of filtered liquid waste, to effectively flush out, thoroughly clean and disinfect the lavatory bowl as often as necessary without any further use of fresh water.

Compared with other portable chemical lavatories of the self-flushing or manually flushed type which require a fresh supply of water for every flushing this system represents a considerable saving in the use of water. This is an important consideration in areas where water is scarce or, in the case of caravans or boats for example, when there is limited space for storing the comparatively large quantity of water required.

Dual-purpose tester for voltage and continuity

The PTC resistor-voltage tester recently introduced by **Siemens** — incorporates two light-emitting diodes, suitable for the voltage range 4.5 to 380 V and indicates the polarity of dc voltages — is now also available as a dual-purpose tester for continuity checks. The new tester operates with a built-in battery; one of the LEDs lights up if the test is performed in the forward direction, for connection at between 0 and 20 k.



The external appearance of the original voltage tester with two black handles, the bare test probes and the 65 cm probe connecting lead has hardly been altered. There is however a red pushbutton on the larger of the handles of the dual-purpose tester, which is used to cut in the test circuit. Incorrect operation causes no damage.

The dual-purpose tester can be used to check electrical connections for continuity and to check the forward and reverse directions of semiconductor components, for instance. The tester is VDE-approved and is patent-and-design-protected.

For further information contact **Siemens (Nigeria) Ltd**, Apapa.

MD6201 Integrated Teller

The 6201 is capable of offering all the banking services available in the **Chubb** 6200 series of automatic tellers. Designed primarily for online operation the 6201 works equally well in an off-line mode using high security magnetics. Not only does the 6201 dispense cash, transfer funds and respond to account balance enquries and service requests, it also accepts deposits of small packets and envelopes. These special features make the 6201 an ideal choice for offering customers a 24 hour banking service.

Customer/machine interface is a robust but attractive stainless steel fascia recessed for extra privacy. The illuminated fascia houses card entry, money exit, voucher and deposit slots. A vandal-resistant keyboard and versatile TV-type display unit (protected by hammer-resistant toughened glass) enable customers to accomplish in a speedy and simple way the many different options available.

Personnel Carrier

The P.C. (personnel carrier) from **Shetland Boats Ltd.** has seating for 10 people, with large storage space under the seating for luggage and extra fuel tanks.

The P.C. is designed to be unsinkable with foam under the floor and in the hull sides. This extremely attractive craft, with its very high construction specification has many uses from commercial taxi operations in the Niger Delta to private pleasure trips along your favourite river or coastline. For further information contact **Allens Marine**, Port Harcourt.

More information may be obtained on any item by using the form facing page 128.

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The body style is simple and …holstered, with insulated panels on a strong steel framework said to meet the …est European roll-over safety requirements and to be fully corrosion-protected. Jig-construction ensures interchangeability of parts and ease of repair.

As well as a variety of optional seating layouts, alternative features make the bus suitable for a range of duties in different climatic conditions. Examples include left or right hand drive; large single-piece curved or split flat windscreen; full, two-thirds or top only sliding windows in clear or tinted glass; manual or power-operated door; and different types of floor covering. For more information contact Willowbrook Ghana Ltd., Accra.

Refrigerated 'strong-boxes'

Collis Cold Containers' exceptionally rugged, refrigerated ISO containers, which have proved so popular with road and sea freight operators since their inception in 1977, are finding increasing favour for unusual and demanding applications, particularly in West Africa where sophisticated handling gear is not always available.

The insulated containers are especially resistant to damage from rough handling and this has further led to their attractiveness in transporting goods requiring extra protection.

The robust nature of these versatile units and their resistance to corrosion is appreciated also by operators in countries where the ambient climate can impose extra demands on such equipment. In Africa, for example, they have an established popularity for use as static cold stores.

Now available from Collis on lease/hire arrangements only, the containers are built to a very high quality specification. The double skinned sides are of all-welded, impact resistant, high-yield steel with strengthened front and rear-end-frames and corner posts with heavy-duty fittings allowing vertical lifting by hook-, shackle- or twist-lock-bearing gear with spreaders.

Towing device substitutes tow truck

E-Z Tow is a rubber-tyred lifting and towing device that can often substitute for a more expensive tow truck when towing automobiles, pickup trucks, and vans. According to the US manufacturer, **Pool Hopkins International Inc.**, E-Z Tow attaches to any standard automobile or pickup truck that is equipped with a solid-ball hitch. It can also be used as a car lift.

These features make it suitable for use in vehicle fleet garages and repair shops. The E-Z Tow has two slide panels which act independently to level an off-balance car to the proper towing position.

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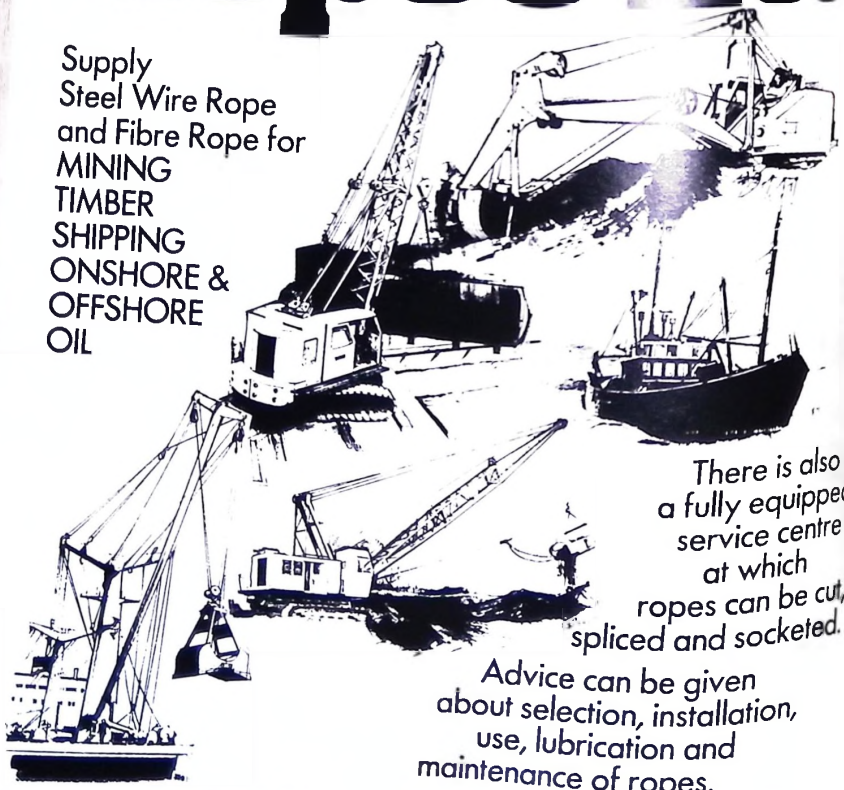

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Floats, paddles or levers can be bolted to the threaded rod at the bottom of the capsule. The rise or fall in the level of any type of material, liquid or solid, produced the 5° tilt — or the 5° degree return to vertical — needed to actuate the switch.

Infra-pak pallet wrapper

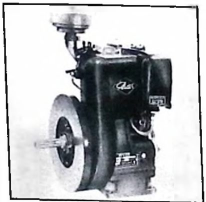
Timperley Engineering's Infra-Pak range of pallet stretch wrapper are available with new prec... turntable indexing to link ... with conveyor systems, ens...ng that all conveyorised pall... wrapping operations fun... with the minimum of su...ision and with a new au... height sensor which ob...s the need for manual ad...ment to different pallet he...

Over 2000 Infra-Pak pallet wrappers have so far been sold world wide. Purchasers comprise a wide range of users including forwarding agents and stevedores, brewers, publishers, food processors, chemical and fertiliser plants and manufacturers of engineering, telecommunications, household, building and other products.

Two models are manufactured the SW 4000 and the Rotarap, the latter being for loads up to 1500 kg and the former for heavier loads up to 2300 kg. Both apply stretch film from a single vertical reel to a pallet load rotated on a turntable. The operating cycle is fully automated and the wrapping programme quickly changed to suit different pallet loads by means of externally located controls.

Petters lightweight range

Studies carried out by F.A.O. have emphasised the benefits of mechanising small fishing boats particularly those traditional vessels (including canoes) in wide scale use in developing countries.



The solution frequently adopted is the use of outboard motors which have the advantage of portability and relative cheapness. Diesel engines have tended to be overlooked because they are usually bulkier and relatively heavy. The advent of the **Petter** lightweight range of units in particular the 6 hp AC1W Mini-Six and the AC2W provides the opportunity to look again at this duty.

Petters have been involved with diesel engines for many years and are widely accepted as leaders in this technology. The 'A' range engines were commercially released about 5 years ago and already hundreds of thousands of units are operating successfully over a wide range of applications and under a variety of climatic conditions. The units are light, compact, fairly high revving and with the inherent diesel characteristics of being safer, more robust and utilising a lower cost fuel. For more information contact **Tecmat** Apapa.

More power for industrial lift trucks

Modifications to its range of 50, 60 and 70D gearbox and hydrostatic transmission industrial lift trucks, including the replacement of the current three cyclinder power unit with a four cyclinder David Brown engine to give increased power, have been announced by **Bonser Engineering Limited,** manufacturers of lift trucks, dumpers and attachments.

A power output of 55 bhp at 2200 rpm is developed by the four cylinder 3195cc (195 cu cm) David Brown 449505 series engine, which replaces a three cylinder 2696cc (164.4 cu cm) David Brown unit with an output of 46 bhp at 2200 rpm.

Increased power has improved gradeability on all models, particularly those with a manual gearbox, where gradeability is up from 43% to 57% — an improvement in terms of climbing an incline of from 23 degrees to 29 degrees laden.

Further benefits of the David Brown four cylinder engine are easy starting and better fuel consumption, as a result of the more efficient utilisation of power output. For further information contact **Leventis Motors Ltd,** Apapa.

Is this the compressor you are looking for?

IT'S OUR NEW 16m³/min MODEL

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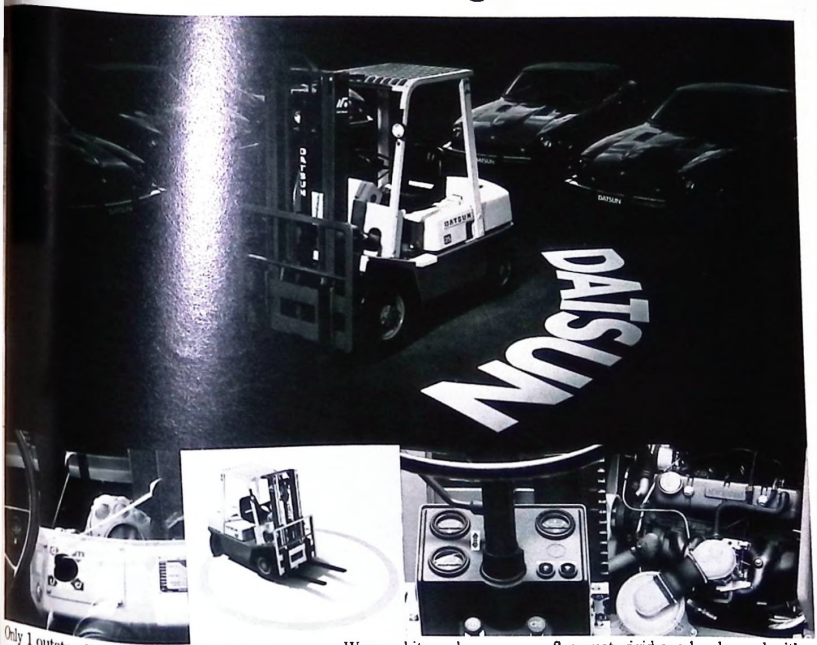
Telephone: 47010, 48117

WEST

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 with rain drip channel and duo-servo, self-adjusting brakes instill greater confidence. Plus other recommendable optional safety equipment is available.

Simplified servicing further enhances traditional Datsun reliability. The maximum use of standardized, heavy-duty components provides superior, long-life operating economy.

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

*Standard gasoline engine models.

DATSUN FORKLIFT

Product of NISSAN

NISSAN MOTOR CO., LTD. 6-17-1, Ginza, Chuo-ku, Tokyo, Japan

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 128.

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., Apapa.
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.
Hallam Graders, Leicester, UK.
Leventis Motors Ltd., Apapa.
Mekin 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, Isolo-Mushin.
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.

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Blackwood Hodge (Nigeria) Ltd., Apapa.
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Guthrie (Nigeria) Ltd., Lagos.
Joy Manufacturing Co., USA.
Rutam Limited, Lagos.
R. T. Briscoe (Nigeria) Ltd., Apapa.
Holman Brothers (Nigeria), Apapa.
Phoenix Motors Ltd., Lagos.
Waateco Ltd., Technical Division, Lagos.
Wayne (West Africa) Ltd., Apapa.

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Adeoye Adejobi T. S. Ltd., Ibadan.
Drake & Scull (Nig.) Ltd., Lagos.
Equip Iard (a Division of Scoa (Nigeria) Limited), Lagos.
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Haven Nigerian Computer Co., Lagos.
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Mandilas Limited, Apapa.
Nigerian Engineering Works Ltd., Port Harcourt.
Norman Industries Ltd., Ikeja.
Morpol Industrial 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.

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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.
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Matori — Oshodi.
UTC Technical Division, Isolo-Mushi.

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M. & E. (a Division of UAC of Nigeria) Ltd.
Morpol Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
Tarpaulin Industries (WA) Ltd., Apapa.

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J. Allen & Co. Ltd., Apapa.
Leventis Motors Ltd., Apapa.
NITECO, Apapa.

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UTC Technical, Oslo-Mushin.

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Cubitts Nigeria Limited, Lagos.
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Taylor Woodrow of Nigeria Limited, Lagos.

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Bisiolu Enterprises Ltd., Apapa.
Chellaram's Building Materials Department, Apapa.
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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.

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Air Marketing International Group of Co's, Crawley, UK.
All Counties Business Agency, UK.

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Nirexim GmbH, Vienna.
F. Steiner & Co. Ltd., Lagos.
VYB (Nigeria) Ltd., Apapa.
C. Zard & Co. Ltd., Lagos.

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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.
UTC Technical, Isolo-Mushin.

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Haven Nigerian Computer Co. Ltd.
Leventis Technical Ltd., Lagos.

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Morpol Industrial Corp. Ltd., Apapa.
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UTC Technical, Isolo-Mushin.

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Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Holt Engineering (a Division of J. Allen & Co. Ltd.), Apapa.
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Nigerian Motors Industries Ltd., Apapa.
Stronghold (Nigeria) Ltd., Engineering Services Division, Ikeja.
Waateco Ltd., Technical Division, Lagos.

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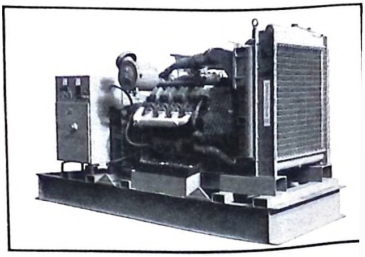

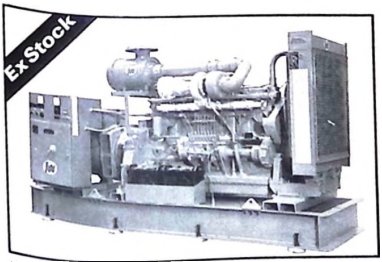

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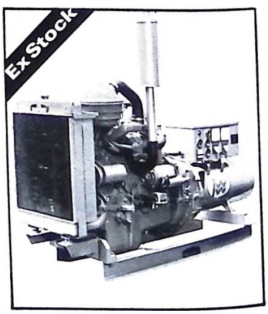

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Stokvis Nigeria Limited.
Stronghold (Nigeria) Ltd., Engineering Services Division, Ikeja.
Structor Technique, VYB (Nigeria) Ltd., Apapa.
UTC Technical, Isolo-Mushin.
Waateco Ltd., Technical Division, Lagos.
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Nigerian Motors Industries Co. Ltd., Apapa.
Scoatrac, Isolo.
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Haven Nigerian Computer Co., Lagos.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
Mofat Engineering Co. Ltd., Lagos.
Nigerian Computer Co., Lagos.
NITECO, Apapa.
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Holman Brothers (Nigeria) Ltd., Apapa.
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NITECO, Apapa.
Phoenix Motors Ltd., EB, Lagos.
Waateco Ltd., Iganmu.

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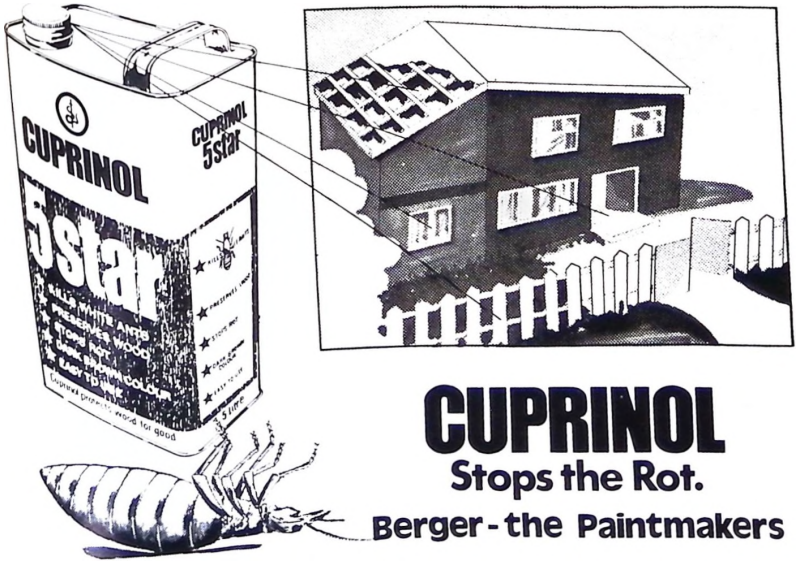

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Leventis Stores, Lagos.

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Phoenix Motors Ltd., Lagos.
Stokvis Nigeria Limited, Ebute Metta.
UTC Technical Division, Apapa.
VYB (Nigeria) Ltd., Apapa.
Waateco Ltd., Technical Division, Lagos.

Quarry Plant
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Waateco Ltd., Technical Division, Lagos.

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Tel. 47107/47049

Bostik Ltd.,
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Tel. Leicester 50015. Telex 347...

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Costain (West Africa) Ltd.,
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Dexion Dept.– Gottschalcks Building Materials,
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