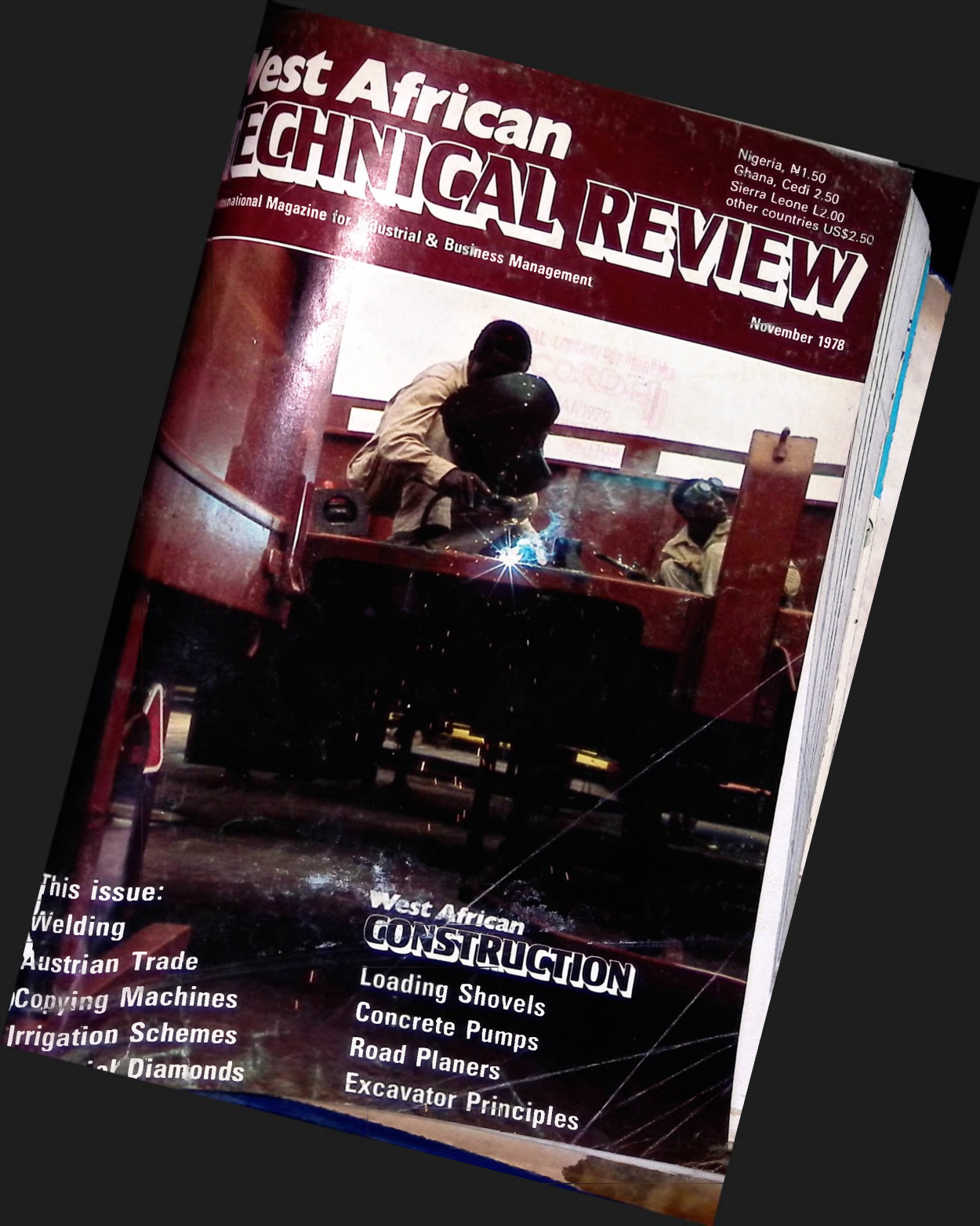
West African TECHNICAL REVIEW

International Magazine for Industrial & Business Management

Nigeria, ₦1.50
Ghana, Cedi 2.50
Sierra Leone L2.00
other countries US$2.50

November 1978



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Co-Publishers
Derek C. Fordham.
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Published by
Alain Charles Publishing Ltd.
Printed in U.K. by
H. E. Warne Ltd, St Austell.
Phototypeset by
Printout, Douglas, Isle of Man.
Editorial and Advertising Office
Alain Charles House, 27 Wilfred Street, London SW1E 6PR, UK.
Tel: 01-828 6107 Telex: 28905. (Ref. 178)

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USA — West Coast
Jobson/Jordan/Harrison & Schulz Inc., 119 W. Bellevue Drive, Pasadena, California 91105. Tel (213) 796 9200.
USA MAILING AGENT
Expediters of the Printed Word Ltd., 527 Madison Ave., Suite 1217, New York, NY 10017.

CONTROLLED CIRCULATION PAID AT NEW YORK, NY.
West African Technical Review is published monthly for personnel in executive and managerial capacities in government, industry and commerce operating in West Africa.

ABC
Member of the Audit Bureau of Circulations

14,000 copies printed this issue

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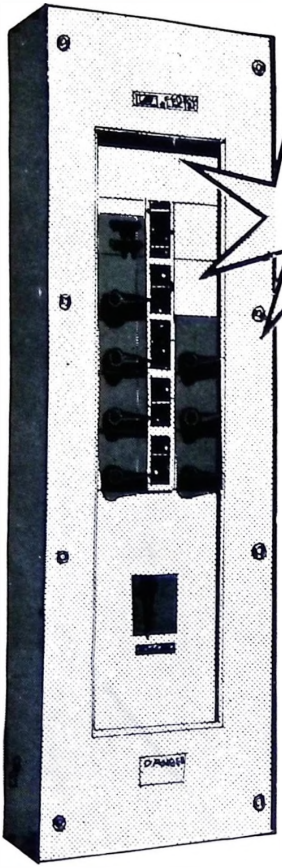

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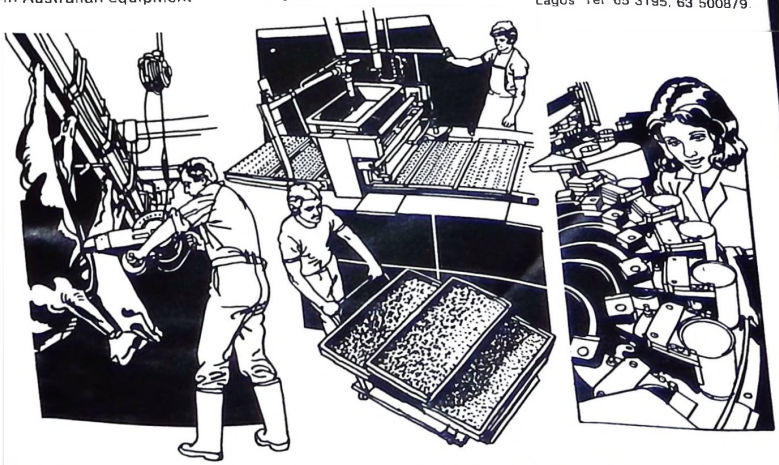
Ask the man who knows Australia

The Australian Senior Trade Commissioner can give you details of suppliers. He can also advise exporters on ways to research or develop markets in Australia. You can contact him at —

KENYA — P.O. Box 44719; Nairobi. Telephone: 334666;

NIGERIA — P.O. Box 7974, Lagos. Tel. 65 3195, 63 5008/9.



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NORTHERN EUROPE — NIGERIA
MEDITERRANEAN — NIGERIA

ld Bank lending hes new heights

nd Bank and its affiliate, the Development Association approved loans and credits to for African countries south the during the fiscal year 1978 This is the first time lending by the World Bank and IDA West Africa surpassed the 000m mark in one year. Agriculture the single most important sector 30 per cent of all lending operations. main areas of concentration were holder food and cash crop production with strong emphasis on the tional and infrastructural aspects of culture.

xhibition site Ivory Coast

Government of the Republic of Ivory Coast is considering a study and the carrying out of the building of a permanent exhibition site in the Riveria zone. This site will be the permanent location for all fairs, exhibitions and other similar activities, it will cover an area of 30.02 hectares.

To work out the specifications of the project, pre-selective tenders are called from national and international firms; they are meant to collect ideas and suggestions for the activities in the exhibition centre and the closing date is December 31 at the Ministry of Commerce. The competitive tendering consists in submitting to the Ivorian Government propositions for the maximum use of the infrastructure.

Apart from classical commercial usage, such as specialised Fairs and Shows, the tenderers will have to present also an original programme of activities.

To participate, the interested parties will have to:

— provide references
— establish a file with the following items:
  a) General conception of the Exhibition Centre.
  b) Detailed programme for the exploitation and activities of the Centre.
  c) Structure of management and plan for personnel training.
  d) Cost for development and income of the project.

Only the candidates chosen after this pre-selective competition will be authorized to tender for the study and realization of the Exhibition Centre in the conditions which will be given later.

Huge increase in vehicles

Nigeria witnessed a huge increase of over 57 per cent in the total number of vehicles registered in 1977. 118,397 private cars were registered compared with 80,180 for 1976. 69,292 commercial vehicles registered in 1977 against 30,045 registered in 1976, whilst 721 tractors were registered in 1977 against 475 in 1976.

Expert advice for exporters

West African firms who wish to export to Britain are free to draw on the services of the IOO (The UK's Import Opportunities Office) who make no charge to firms from developing countries wishing to export to the UK.

The IOO's job is to introduce importers to exporters, and to give advice about potential demand and advise which firms in Britain are likely to be interested in its products. The organisation also supplys information about the tastes of consumers in the UK, the type of packaging which is attractive to them and regulations about weights and measures and commercial practices in Britain. Firms in West Africa interested in taking advantage of IOO's services should send detailed information about themselves and the product they hope to sell, stating exactly the type of assistance they want. Prospective exporters should write to Import Opportunities Office, 69 Cannon Street, London EC4, UK, or can also obtain assistance from the International Trade Centre in Geneva (Palais des Nations, 1211, Geneva 10, Switzerland).

If a firm with an original product, succeeds in getting an initial order, a note of caution: it is important to meet the delivery date given to a customer. Inability to do so could mean failure to get another order!

Indo-Nigerian business council

A joint business council has been established by the Nigerian Chamber of Commerce & Industry and its Indian counterpart.

According to the agreement, recently signed in New Delhi, the council will provide for exchange of information between the two organisations. Furthermore, a Nigerian desk will be created in the offices of the Federation of Indian Chambers of Commerce and Industry. A similar seat will be created in Lagos for the Indian Organisation.

New consultancy

Management consultants MSL International, following two years of close study of the problems and needs of organizations operating there — including those of Government departments and the public sector — have come to a working agreement with A. W. Consultants Ltd., one of Nigeria's leading management consultancy firms, to provide a joint service to meet the human resources needs of this rapidly expanding economy.

Nigerian-German Trade grows

The German Federal Republic is now Nigeria's second most important supplier nation after the UK, and is Nigeria's fifth biggest importer of crude oil. According to official figures the total volume of goods exchanged in 1976 was ₦1,440m. with a marked improvement in 1977 to ₦1,724m. Nigerian exports to Germany stood at 2,553.1m Dm. in 1977 and imports at 2,988.0m Dm. During 1977 Nigerian exports to Germany were 90.3% oil, 6.2% raw cocoa and 1.7% oil fruits for food. Nigeria's imports were as follows, motor vehicles 25%, machines 21%, electrical products 8.3% and ironware 8.2%.

Many of our older readers will recall this poster, one of the most creative ever produced in Africa. It is reproduced from a booklet recently published by Lintas Ltd., the Lagos advertising agency, to celebrate their 50th anniversary. Lintas is now the largest advertising agency in Africa and in the world's top hundred. The celebrations include functions in Lagos and London where many of the people involved in the agency's history got together.

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...Leisure Services Ltd. is ...ging a ...e in Nigeria" exhibition ... Lagos ...r November 12-18, 19... to be ...ld at the Tafawa Bal... Square, ... According to the ...hibition ...ger more than 30 co...ies have ...dy booked space for t... exhibition. ...e exhibition is based on ... expanding ...ficance of the domestic ...nufacturing ...or and the current ...ort by the ...vernment to encourage ...Nigerian's to ...mote locally made goo...

Power plan for Sierra Leone

...e Sierra Leone Government is to employ ... firm of West German consultant ...gineers Oskar von Miller to advise on the ...habilitation and extension of the power ...ply in the Provinces as part of a long ...m electricity development plan. Fourteen power stations will be surveyed including Bo, Bonthe, Lambia, Lungi, Port Loko and Kenema.

'Habitat' conference

The African Development Bank has held a conference in Abidjan to discuss housing and living conditions in Africa and to develop a long term policy on the subject.

West Africa-UK trading up to July 1978

The following table gives a summary of total imports and exports between West Africa and the UK up to July 1978. Nigeria is clearly shown as the most prominent trading partner with the UK followed by Ghana and Liberia.

West Africa-UK trading Decembers	July 1978 Exports to UK £.000	July 1978 Imports from UK £,000	For 7 months ending July 1978 Exports to UK £,000	For 7 months ending July 1978 Imports from UK £,000
Senegal	1,291	973	8,431	5,510
Gambia	806	1,285	4,460	9,610
Sierra Leone	7,980	2,045	28,416	16,263
Liberia	2,630	3,812	8,001	17,548
Ivory Coast	6,279	1,876	41,054	14,909
Upper Volta	660	80	3,348	544
Ghana	7,291	6,581	80,613	66,642
Togo	1	968	3,432	10,512
Benin	25	750	34	6,713
Nigeria	21,939	104,030	179,620	718,437
Cameroon	577	2,258	6,750	11,627

Figures compiled from the Overseas Trade statistics of the UK July 1978, Dept. of Trade and Industry

₦20m on educational equipment

The Federal Government spends an estimated ₦20m annually for the purchase of technical and scientific equipment for education. This was announced by the Kaduna State Commissioner for finance at the opening of an exhibition staged by the Nigerian Audio-Visual Association. The Commissioner noted the important contribution which audio-visual aids can make to teaching. The firms taking parts in the exhibition include the Northern Nigerian Publishing Co. and the Institute of Adult Education.

NHL Welfare Scheme

Nigeria Hotels Ltd. has introduced a welfare benefit programme for its workers. Every employee in the organisation will continue to enjoy free meals while on duty and a housing scheme which will complement a free bus ride to and from work, the Managing Director of the organisation Mr. Samuel Alamutu disclosed in Lagos. Mr. Alamutu has recently been awarded a Member of the Order of the Niger.

Nigerian delegation to Jamaica

A Nigerian trade and economic delegation is to visit Jamaica before the end of next month to consolidate agreements reached between the two countries during Prime Minister Manley's visit to Nigeria. According to official sources in Lagos, Nigeria will buy cement and sugar from Jamaica in exchange for the sale of crude oil.

Apart from the trade agreements, an accord on economic, scientific and technical co-operation was initiated. Personnel and airline pilots from Jamaica will also train in Nigeria.

Cocoa conference

The seventh international conference on cocoa research, which will focus on environmental influences in cocoa production and the possible creation of an international scientific cococa association, will be held in Douda in Cameroon from 4-12 November.

EXECUTIVES' CALENDAR

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

NOVEMBER		
22-26	MEDICA '78 International Congress with Trade Exhibition — Diagnostics	DUSSELDORF
24-10 Dec.	3rd International Fair	DAKAR
25-3	EAM Eurafrique Machine Exhibition International Exhibition of Inventors & New Techniques	GENEVA
26-30	Middle East Building Materials and Construction Machinery Exhibition	BAHRAIN
27-28	Nigeria Tomorrow — First International Lagos Conference	LAGOS
27-30	Expo '78	LAGOS
27-1	HORESCA — International Hotel & Restaurant Equipment Exhibition	BRUSSELS
28-1	International Subcontractors & Components Fair	COPENHAGEN
28-2	SCANAUTOMATIC '78 Hydraulics Pneumatics, Transmission Equipment & Control Techniques Exhibition	GOTTENBURG
28-2	IFAS — International Trade Fair of Medical Practitioners and Hospital Supplies	ZURICH
29-2	International Medical Trade Fair	STOCKHOLM
DECEMBER		
2-8	Interbuild — 38th International Building and Construction Exhibition	BIRMINGHAM
3-10	STOREXPO — International Exhibition of Blinds and Shutters	PARIS
4-8	PEMEC '78 — International Plant Engineering & Maintenance	BIRMINGHAM
5-8	Construction Show	TORONTO
5-9	Environment Expo-International Pollution Control Technical Exhibition	PARIS
5-13	International Materials Handling Equipment Exhibition	PARIS
9-11	FORAINEXPO — International Exhibition of Fairground Equipment	PARIS
12-17	Berlin Christmas Fair	BERLIN

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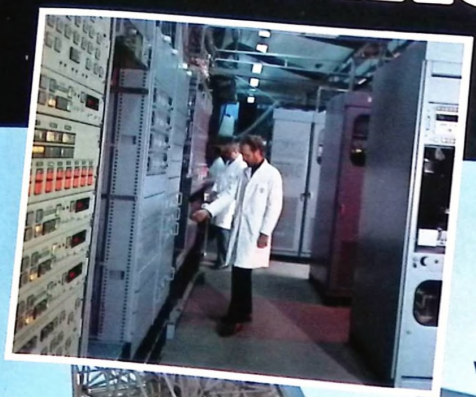

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ommercial review

EPA hopes grow

Ogorode Power Station ne Sapele finally started operations. T hermal ower station, costing ₦230m xpected improve the nation's power y by 20 cent. The project was d ed and ecuted by Shawmont Nig td. and st ₦250m to complete. racts for construction of the plant awarded several foreign compa including Brown Boveri, Sadelmi, Babcock and the Monier Construc Company. The new station has a full acity of 720 megawatts, consistin of six 120 megawatts units. Only one nit is ready for operation, the other five are to be completed by 1981. With the commissioning of this station it is now hoped that electricity supply to homes and industries should be more regular from now on.

New market scheme

A ₦10m. market resettlement scheme is to be carried out by the Borgu Local Government in Kwara State. The designs of the market were drawn by the Kwara State College of Technology, Ilorin, while the Nigerian Army School of Military Engineering carried out the survey of the land. The chairman of the local council urged the Government to establish agro-allied industries in the area so that the agricultural benefits of the Kainji Dam could be fully realised.

Colour TV for Ghana

The new ¢3m. Ghana Sanyo plant at Tema has started to make refrigerators on a trial basis. It is hoped annual production will reach 2,400 regrigerators, 1,200 air conditioners and 1,200 deep-freezers. Next year Ghanaian technicians will be going to Japan to study techniques for colour TV set production, to start in Ghana at the end of 1979.

Niger to train village health teams

The Republic of Niger will receive $14 million over the next five years to train and retrain village health teams for service to its rural and nomadic population, according to the Agency for International Development.

Under a grant authorization, the Niger Ministry of Health will receive $2 million in fiscal 1978 to begin training some 1,500 health teams (about 6,000 health workers) to serve an estimated 3,500 villages or one-third of the country's 5 million people.

Niger, a drought-prone nation in Africa's Sahel region, has a ratio of one doctor to every 43,000 residents. About one-fifth of its population consists largely of Tuareg, Toubous and Peulh herdsmen who inhabit the arid northern and western sections of the country. Most of these people live in temporary camps and exist on dry-season saline vegitation. Many Nigerians suffer from malnutrition and disease such as tuberculosis, bacillary dysentery and amoebiasis, meningitis and complications from pregnancy and childbirth.

Many rural people in Niger depend on traditional medical practitioners — midwives and herbists — for their medical care. The government is seeking to maintain and equip its village and mobile health units to work with these traditional practitioners to make modern basic health care available to most villages.

The AID-assisted project will help upgrade and expand the number of professional workers and at the same time improve the capabilities of the village health workers through training. The objective is to expand the coverage of the rural population with basic health services which will reduce the need for costly health services at medical centers and hospitals. Other benefits of the project include: The furnishing of transport and maintenance vehicles, the construction of regional headquarters for the Ministry of Health at Agadex and Zinder and seven dispensaries in rural areas, and the provision of equipment and supplies for the mobile and stationary village health units. Five American technicians will assist the Ministry of Health in automotive repair and maintenance, medical equipment repair and sanitary engineering. Short-term technical assistance will be provided in such areas as health planning, budgeting and logistics.

The project is part of a national effort to improve the rural health delivery system of Niger with assistance from AID and other donors.

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The reputation of SULZER diesel engines is high enough to ensure that over a third of the world's larger motor ships are powered by SULZER machines.

But SULZER diesels are not all at sea. Chosen for their efficiency, economy and reliability, they power many landborne generating plants. Supported by an unequalled network of spares and service.

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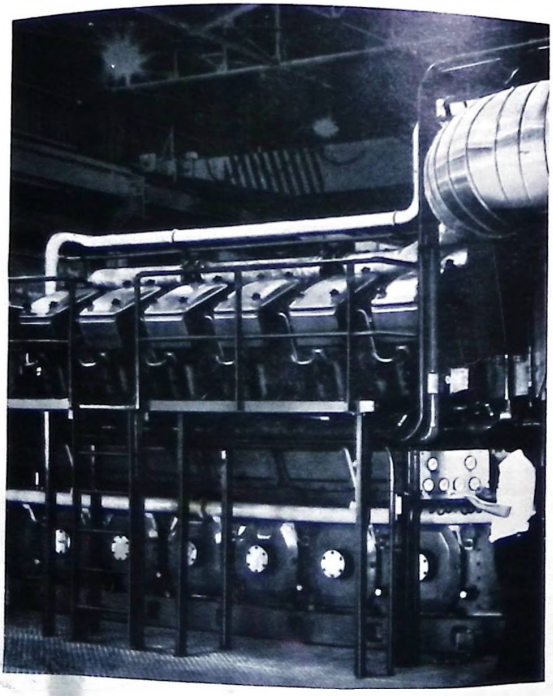

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Commercial review

Record earnings for NPA

Nigerian Ports Authority ac[hieved] a [£]440,278,751 in respect [of] services rendered during August this [year] at the Apapa Port Complex alone. In the same month last year it earned only [£]87,674. According to a report in the Business Times, NPA sources explained that the increase was due to the fact that more outstanding bills scheduled to the Accounts Department for imports and exports were cleared during the month and the general level of operation achieved had been the highest since the start of the financial year.

Container throughput reached a record high of 16,500 containers, comprising 9,000 containers landed and 7,500 containers evacuated compared with 12,692 handled in July. The increase has been contributed to the additional berthing facilities at the Third Apapa Wharf extension which was released to the Container Terminal Company Ltd. for use from August this year, making this the second berth released to the CTC this year on the new wharf extension.

Second new Ivory Coast vessel calls at Rouen

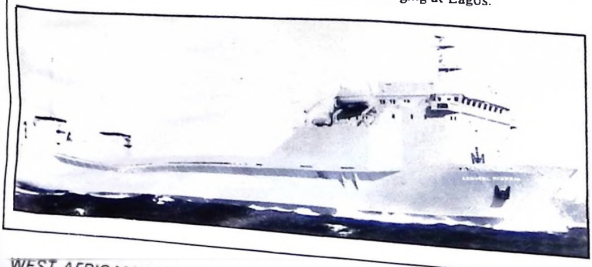
The "Bondoukou", the second of a fleet of three new multi-purpose ships for the Ivory Coast national shipping line Societe Ivoirienne de Transport Maritime, is now calling at Rouen to serve Dakar and Abidjan. The "Bondoukou" is a 16,000 dwt vessel capable of carrying up to 400 20 foot containers in a mixed cargo. The ship was built by Astilleros Espanoles, of Seville, as was the line's first vessel, the "Bouake", which has been calling at Rouen for some time. The third ship, the "Bonoua", is currently being built at Seville. The Ivory Coast line's departure is just one of almost fifty regular line departures a month from Rouen to the African West Coast.

Another ro-ro vessel for Nigeria

The 114 trailer-capacity ro-ro vessel "Admiral Nigeria" has now joined her sister ship "Admiral Atlantic" in the Europe/UK Nigeria services operated by BFI West Africa Lines Ltd.

Newly-built in Japan, the 16-knot, 3,528dwt. "Admiral Nigeria" sailed on her maiden voyage for the line in mid-September.

The two ships represent an increase in capacity for BFI West Africa Lines, which has previously operated smaller tonnage in its fortnightly ferry services to Nigeria. Loading ports for the service are Sheerness, Hamburg, Bremerhaven, Antwerp and Le Havre, discharging at Lagos.



Containerised shipping lines merge

It has recently been announced that Seatrain Europe BV, the American owned container line, is negotiating to take a significant stake in Sea Dantainer Lines Limited of Kano, Nigeria. Dantainer, a fully containerised shipping line operating between the UK, Europe and Nigeria, started operations in June of this year as a partnership between Aminu Dantata, a leading Nigerian businessman, and Walford Maritime, a leading UK based shipping and forwarding company.

The General Manager of Seatrain's newly formed Nigerian Division, said "We are delighted at the prospect of tying up with Dantainer. The tripartite involvement creates a finely balanced team. Walfords understand the trade to Africa. Dantata is actually in Nigeria with a comprehensive range of interests, and we at Seatrain understand the container market and are anxious to extend our range of services."

Dantainer offers 20' containers at quay to quay or door to quay lumpsum rates with off-loading at Warri where Dantainer has its own Customs approved terminal. A door-to-door service including onward transit to principal Northern and Mid-West cities as well as Lagos, using an assoicated company of Dantainer, Mainline Transport, which operates a fleet of custom built container trailers.

Progress for Nigeria Airways

The Nigeria Airways Trans-Atlantic, twice-a-week service to New York, which commenced last May is making progress according to the airline. There have also been reports of "tremendous progress" on flights to Nairobi via Douala and the recently introduced Lagos/Kano/Jeddah and Karachi service.

Nigeria-Kenya air agreement

Nigeria and Kenya have signed an air-services agreement, regulating traffic between the two countries. The agreement provides for Kenya Airways to fly twice a week from Nairobi to Accra via Entebbe, Kinshasa and Lagos.

Nigeria Airways would fly twice a week from Lagos to Bombay, via Douda, Entebbe and Nairobi. Kenya Airways plans to begin flights to Lagos next January.

Price increase for petroleum products

The Federal Government has announced plans to discontinue the high subsidy on all petroleum products, which runs into millions of naira each year, according to a report in the "Business Times." This means that Nigerians will have to pay substantially more for all conventional petroleum products. According to a report from a Nigerian National Petroleum Corporation source, even an increase of 100 per cent will leave the price of petroleum products in Nigeria the lowest in the international market.

Unipetrol (Nig) Ltd.

Unipetrol (Nig) Ltd. is to serve as a government agent for even distribution of petroleum products to all parts of the country. The Warri Oil Refinery, recently commissioned is also intended to ensure uninterrupted flow of petroleum products.

'Five star' petrol

The Nigerian motorist can now obtain "Five Star" Petroleum from the new Nigerian National Petroleum Corporation Refinery in Warri. The five star petrol is rated at 97 octane, and represents the highest grade petrol marketed anywhere in the world. The product is expected to help give automobile engines a longer life.

More oil at Warri

Nigeria's second petroleum refinery at Warri in Bendel State has been officially opened by General Obasenjo, who expressed appreciation for the successful completion of the refinery to the chairman of the ENI Group of Companies, Dr. P. Sette, whose company was the major contractor in the construction of the Warri refinery. He also commented that this marked the beginning of greater co-operation between Nigeria and Italy.

Pilkington expands

Pilkington Glass (Nigeria) Ltd., has recently opened a new branch in Enugu, Anambra State, forming part of the companies overall expansion programme. The new branch at Enugu is to supplement the efforts of the Aba branch in covering the eastern market.

commercial review

Call for agricultural innovation

The Chief of Staff, Supreme Headquarters, Brigadier Shehu Yar'Adua, has said at an address to the Nigerian Society of Agricultural Engineers, Zaria, that it was time developing countries provided the necessary ingredients, themselves for industrial take-off and technological advancement. The Brigadier said that the Federal Government was taking steps to ensure a complete modernisation of her agriculture. Plans are being made to set up a national centre for agricultural mechanisation in Ilorin to test and fabricate agricultural equipment adapted to Nigerian conditions as well as the proposed assembly plants to be set up by Fiat and Steyr. The Chief of Staff added that the FMG had made available ₦6m. to the States over the past two years to assist in land clearing and tractor hiring schemes.

New loan repayments for Gambian farmers

The Gambia has revised loan repayments for tractor ploughing services to farmers. Farmers who had 20-40% crop harvest in 1977 season would have their loans written off completely. Villages who harvested 40-70% of their crop would be required to pay 56% of the loan and farmers who harvested 70-100% would pay the full loans in respect of the tractor service to them. In the 1977 season 6,640 acres were ploughed by tractors and 2,398 acres cultivated by power tillers. Of the total acreage ploughed 4,451 acres were ploughed under the loan scheme.

Guide to world commodity markets

What is claimed to be the first book to deal exclusively with the various commodity markets trading all over the world has been published by Kogan Page, UK. The book covers some 90 markets in 19 countries in Europe, North and South America, Asia and Africa, in detail, listing addresses, cable addresses, telephone and telex numbers, names of chief executives, contract particulars, hours of trading, rules and regulations, currency dealt in and other particulars.

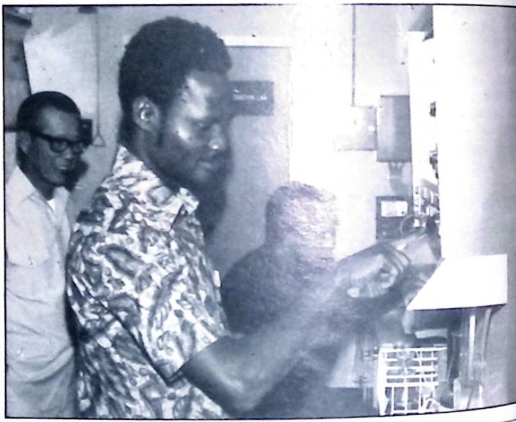
The publication provides an accurate guide to the operation and function of commodity markets, and explains their advantages and disadvantages for potential investors. The background to these markets is explained and their role and function discussed.

The book also includes 77 pages of appendices including lists of trading members of various future markets, a glossary of commodity market terms, a diagram of world time zones, conversion tables and an alphabetical list of the world's currencies — from Afghanistan to Zambia.

Indequip sponsors food technologist and workshop seminar

Indequip (West Africa) Ltd., specialists in Agro-chemicals, laboratory systems and technical equipments has recently sponsored a Laboratory Technologist from the Food Technology Dept. of the University of Ibadan. Mr. G. Famoriyo has been sent on a three week intensive course at Tecator AB Sweden. The course has been designed to expose him to the latest inventions and applications in the field of foods, feeds, soils and water analysis. It has always been Indequip's policy to contribute to the development of science and research efforts in Nigeria's Universities and Research Institutes.

The company in co-operation with Tecator AB in Sweden is planning a workshop seminar in the middle of 1979, to be held at the Inst. Agricultural Research and Tr. Ahmadu Bello University, Zaria a at the Institute of Agricultural R and Training, UNIFE, Moor Pla Ibadan. Amongst the top te scientists expected to deliver pap Professor Ajibola Taylor of UNIFE & T., Dr. Atanda Director, N Cereals Research Institute an Ilecosho, Director, Federal Inst Industrial Research. A leading S cientist Dr. Roger Mossberg a d Technologist M. Mole of Teca will be helping to write the lab alysis at the seminars.



Cocoa forecast

The International Cocoa Organization's first forecast for world production in the 1978/79 season (to the end of September next year) predicts a surplus of about 19,000 tonnes.

Production is expected to drop to 1,410,000 tonnes from the 1,469,000 tonnes of 1977/78 and grindings are expected to show a small rise to 1.[illegible] tonnes against 1,372,000 last seas[on]. committee's revised forecast f[or] 1977/78 season shows a surplus of [illegible] tonnes compared with the 49,000 surplus, predicted in July.

The forecast of a surplus is some[what] a surprise, since market sour[ces] generally been suggesting [illegible] possibility of a deficit in 1978/79 as [a result] of disappointing crops. Several mem[bers] the statistics committee are said [to] pointed out that this particular fore[cast] subject to considerable uncertainty.

Forecast of Cocoa production in the major producing count[ries] and in the world, 1978/79 to 1984/85

Country	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84
Brazil	253	267	287	315	351	402
Cameroon	113	116	116	117	120	124
Dominican Republic	36	37	37	38	39	41
Ecuador	65	65	65	66	67	68
Ghana	302	281	275	269	265	262
Ivory Coast	279	300	322	340	360	382
Nigeria	190	191	196	204	214	224
Papua New Guinea	32	33	34	35	36	38
Others	191	194	200	208	218	231
WORLD TOTAL	1,461	1,484	1,532	1,592	1,670	1,772

Cummins diesel. Now more than ever, the power West Africa needs.

It has always made sense to specify Cummins diesel engines; for trucking, genset or marine applications.

All over the world Cummins have built a reputation for quality, reliability and economy.

Now it makes even more sense to buy Cummins in West Africa. That's because Cummins have added another quality distributor – Scoatrac, in Nigeria.

Cummins know the special importance of an efficient, capable spares and service back up to customers in West Africa. Scoatrac with their modern, specialist workshops and technical expertise make an ideal choice to fulfil the service role, in the demanding Nigerian market.

Cummins diesel engines range in power rating from 80-1600 hp. Their durability and outstanding fuel economy suit them perfectly to tough West African conditions.

Cummins set the highest standards possible in design, build and performance. These are the standards which led us to choose Scoatrac.

Shouldn't these be your standards too? Find out more from Scoatrac very soon.

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SCOATRAC

Scoatrac, Lual Carriage Way, Isolo Industrial Estate, P.M.B. 1108, Ikeja, Lagos State. Tel: 4814/45249. Depots at Lagos, Kaduna, Port Harcourt, Enugu, Ibadan.
Other Cummins distributors: Electromaritime Inc., P.O.B. 1275, 25, Ashmun St., Monrovia, Liberia.
Marck Cosie Engineering Ltd., Ring Road West Industrial Area, P.O.B. M.120 Accra, Ghana. Tel: 28027/28077


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No. 2 COOLER
OMEGA
n teams are
They will tailor-
ur cold store
your exact
ments.

ommercial review

ber plantation development pr[oject] in Grand Bereby area of Ivory C[oast] is to [be] financed in part by a $20m. l[oan] from World Bank. The project i[n]cludes a factory, residences and acc[ess] roads.

geria has been chosen to p[ar]ticipate in international research pr[o]grammes for World's Meteorological S[er]vices based Geneva. The programme [is] the Garp Global Weather Experiment [and] the West African Monsoon Experim[ent] are to take place in December 1978 and October 1979.

Following three days of bilateral negotiations between Sierra Leone and the United Republic of Cameroon, an agreement has been signed which provides for the opening of the first direct air link between Freetown and Yaounde.

Following a conference in Geneva organised jointly by the O.A.U. the African Civil Aviation Commission, backed by the U.N. Development Programme and the International Civil Aviation Organisation. Sierra Leone is among 35 African States to receive assistance in equipment and manpower training in civil aviation.

Ghana's exported 808,000 cubix metres of timber to the UK last year, valued at £103m. This was the lowest for thirty years. Machinery replacement delays and balance of payments problems are seen as the probable causes.

A N50m integrated agricultural development scheme in Lafia and Awe areas of Plateau State, financed by the World Bank is to provide roads and 19 agro-service centres and pilot schemes for seed multiplication of varieties of cassava, millet and sweet potatoes.

The London *Financial Times* reports that following negotiations between German bankers and the Nigerian Government, it now looks impossible that a project loan for the **Warri Steel production plant** will be added to Nigeria's $750m Euromarket loan currently being syndicated.

As from September 1, **expatriates seeking work in Nigeria** must submit certificates or credentials for settling. The Ministry of Internal Affairs has stated that the regulation is necessary to ensure that only suitably qualified ex-patriates are brought into the country.

Nigeria's biggest growth industry, beermaking, is reported to be producing about 4.5m hectolitres a year, and demand is estimated to be between 20 and 50 per cent higher than that figure. However, with a number of breweries expected to come on stream this year, this demand should be met by the end of the year.

The Anambra State Ministry of Agriculture and National Resources is planning to organise training courses for farmers on new techniques in horticulture. The courses will include aspects like ornamental production, raising budded fruit trees and vegetables. The courses will take place at Enugu according to a senior agricultural officer in charge of Horticulture Development.

France is to help finance two projects in Upper Volta with a contribution of some £640,000. The money will finance a feasibility study for a hydroelectric project in the Sourou Valley and a poultry farming development project.

Czechoslovakia is to improve her balance of trade with Nigeria by buying more of Nigeria's traditional exports, namely cocoa, rubber, cotton, hides, and skins. Addressing a conference in Lagos the Czechoslovak Foreign Minister said that his country was also interested in Nigeria's crude oil.

A new dam is being built at Binie on the San Pedro and will provide the $3m^3$ of water per second which the factory need for its production.

Sierra Leone's Electricity Corporation is formulating a 10-year development programme based on forecasted energy needs. The government plans to employ a West German consultancy company, Oskan von Miller, to advise on the extension of power supply in the provinces.

The Savannah Sugar Company in Gongola State has secured an investment of ₦80m from **Nigerian Acceptances Ltd.**

A new ₦60,000 branch of the Savannah Bank has opened in the Badagry Local Government Council area. The chairman of the Savannah Bank said the location of the bank would assist farmers in the area to obtain agricultural credit assistance.

The first factory for manufacturing optical glass is to be built in Nigeria at a cost of ₦6m. The project is a joint venture between **Ashydeen Optical Services**, a Nigerian company and **Metzier International**, a German company.

The Gulf Oil Company of Nigeria has donated an integrated fresh water and dredging project which will guarantee the supply of fresh water to more than 2,000 people of Ugborodo, Bendel State at a cost of ₦1m.

The BCB (British Consultants Bureau) a multi-disciplinary association of over 250 UK consultants is to sponsor a members mission to Francophone, West Africa during 1979 to step up its export promotion activities.

Nigeria has been chosen as the headquarters of the Port Management Association of West and Central Africa.

A National Fire Safety Association h[as] been formed in Sierra Leone.

The **Kaduna Trade Fair** will be held fro[m] 17-24 February, 1979.

A ₦2m ultra modern hotel has be[en] opened in Zaria to help meet the prevailin[g] shortage of standard hotels. Declaring t[he] hotel open, the Kaduna State Cor[n]missioner for Trade and Industries sa[id] that gone were those days when hotels we[re] regarded as mere amusement centres.

A new tuna fish processing factory h[as] been opened in Abidjan. It is expected [to] produce 8,000 tons frozen tuna fish.

SICOR (Société Ivoirienne de Coco ra[w]) has just started its production of **grat coconut** in October. A production of 4,0[00] tons is expected now and will reach 7,5[00] tons in 1981.

Over one million tree seedlings are to distributed to the public by the Sok[oto] State Government to boost the gove[rn]ment's efforts to check desert encroa[ch]ment.

The Federal Government is impor[ting] 500,000 tonnes of fertilizers for the planting season.

Following the mission to the **Ivory C[oast] and Liberia** the London Chamber of C[om]merce and Industry is holding a re[port] back meeting to discuss the miss[ion] finding and impressions. The meetin[g] be held at the Chamber on Novemb[er] and a buffet luncheon will follow.

A London Chamber mission to Nig[eria] planned for May 13-25 1979. M[ore] interested in this growing mark[et] advised that the deadline for applica[tion] January 10, 1979.

The National Annual Production R[esearch] Institute (NAPRI) and the Agr[icultural] Extension and Research Liaison (AERLS) of the Ahmadu Bello U[niversity] Zaria have held a two day lives[tock] veterinary conference. The then[e] conference was "Self reliance [in] production, possibilities and cons[traints]

New appointments

● Mr Kebba N. Leigh, M.P. [has been] appointed executive director, S[ierra] Stores to represent the Gamb[ian] ment on the Board and to p[ro]vide day-to-day management of the [company]

● Mr John Henry Smythe, [C.B.E.] appointed the new chairman [of] Bank Sierra Leone. Mr Smyth[e] director of the bank since 197[3]

● A new chairman of t[he] directors of Aureol Tobacco [will] take office on January 1, 19[79] Coker.

commercial review

Nigerian farming delegation visits US

R. T. Briscoe (Nigeria) Ltd. in collaboration with John Deere of the USA has sponsored a Nigerian delegation to the "Farm Progress Show" in Taylorville, Illinois, USA. The show is intended to acquaint members of the delegation with John Deere Tractors and Equipment, to obtain first hand knowledge of the machines, with a view to adopting these products for better farming techniques in Nigeria. The participants included State Commissioner for Agriculture, Chief Agricultural Engineers and Chief Registrars of Co-Operatives.

New Land Tenure Plans

Tamale has been selected by a team of experts from the US Agency for International Development (USAID) as a potential site for demonstrating techniques for land use, integration and plan implementation in rapidly urbanising centres for developing countries.

Rice production up

Rice production in Nigeria is expected to reach 1.1m tonnes by 1980 against 600,000 tonnes produced last year, with rice imports estimated at 400,000 tonnes according to observations made by the Director of the National Cereals Research Institute, Ibadan. In an address to the West African Rice Development Association.

USA-Sierra Leone agricultural project

The government of Sierra Leone and the USA have signed an agreement for a $9m. agricultural project. The project, called ACRE (Adaptive Crop Research Programme) will be designed to identify and promote development of food crops which grow well in Sierra Leone; improve the agricultural extension system by which farmers receive the benefit of latest developments in agricultural production; strengthen the ties between Sierra Leone's agricultural establishment and international agricultural research institutions, and develop a long-range research and extension programme for Sierra Leone.

The project is scheduled to run over a period of five years and to diectly involve five hundred farm families.

Denmarks helps Sierra Leone fishing

The Danish International Development Agency is to provide three vessels for the development of Sierra Leone's fishing industry. This follows a Le4m. agreement signed between the two countries early this year.

The fleet will include a research and training vessel and two fishing trawlers. Part of the loan will also be used to improve the country's abattoirs.

Rice imports . . .

West Africa will have imported more than 1m. tonnes of rice by the end of 1978, according to the executive secretary of the West African Rice Development Association. Sidi Coulibaly, speaking in Niamey, said governments were faced with the problem of importing huge quantities of rice to cope with the growing population and changing food tastes of the region's peoples.

The 15-nation Association's eventual aim is to make West Africa self-sufficient in rice production by developing strains capable of resisting local diseases and insects.

New industrial complex in Abidjan

An industrial complex has just been created in Abidjan containing a factory of cattle food, a poultry farm, a poultry abattoir and a centre for eggs conditioning. The complex is promoted by the SIPRA (Societe Ivoirienne de Productions Animales).

The production which has started this year will be: 10 tons per hour of cattle food, 45 million eggs per year, 2.3 million chickens per year.

FAO gives fertilizer to Gambia

One thousand tons of compound fertilizer valued at D500,000 have been given to the Gambia Government by the FAO. The Ministry of Agriculture will distribute 700 tons to farmers directly to increase agricultural production. A fertilizer marketing and credit assistance project, for which the FAO has also provided cash assistance, will take over the remaining 300 tons.

More Beetles

Since inception three years ago, Volkswagen have assembled 56,000 Beetle cars in Nigeria. A company spokesman said the company now assembles 140 such cars daily, and that Nigeria is now the third largest purchaser of this type of vehicle.

A Birth Pill for men

A spoonful of sugar could soon lead to a powerful new weapon in the world-wide fight against over-population — a contraceptive pill for men — following top level research in Edinburgh, UK.

The substance had an effect on laboratory rats, causing males to be infertile — yet within a week of coming off the treatment they were back to normal.

Experts in the Medical Research Council's Reproductive Biology Unit in UK have started a project for the World Health Organization. The team's object is to try out the substance on monkeys — to show whether it is toxic.

A big plus for the new sugar is that it does not affect the male hormone, which males depend on for their aggressi drive. The female contraceptive pill would work on men, but it would p change their personality.

Gold deposits in Ivory Coast

New gold deposits have been disco lty, a village located 15km from I Ivory Coast. The Minister of Mi Gui Dibo stated that the mining op of the new deposits will begin nex production (the smallest of the Ivo Gold Mines) will be between 10 to a year.

The exploitation of the Mines w hands of three organizations (C presenting the Ivorian interes R.G.M. (Bureau de Rech logiques et Minieres) and LO presenting French and Englis rests).

mmins appoints oatrac as its gerian distributor

mmins Engine Company Limi ointed Scoatrac as its distribu geria. The appointment takes ef m 1 November 1978.

Cummins is the world's dependent manufacturer of diesel and Scoatrac will be handling all C diesel engines in the 80-1600 hp range. Also it will stock generator sets of 125-600 KVA c The Cummins engine range is availa a wide variety of duties including and marine auxiliary power, cons generator drive, truck and bus applications.

Cummins and Scoatrac have extensive preparations to pro one" service and parts cover. A product management group has formed by Scoatrac to h Cummins business. Three full ti ing and servicing specialists provided by Cummins. These train Scoatrac appointed m Some Scoatrac staff have alre specialist Cummins training in

For the first few months trained mechanics will be w Scoatrac mechanics in the fiel has extensive training facilities including a training school at Is Here Cummins staff will also g A parts supervisor has been ap Scoatrac to deal with major parts holdings.

Scoatrac with branches in Lag Port Harcourt, Ibadan and K currently spending around US $ per year on new branch facil Lagos, Scoatrac has an extensi equipped, modern air-conditioned overhaul workshop. From wh company runs an active exchange service. The Lagos engine work being doubled in size and the engi stock greatly expanded.

ommercial review

gerian artists omoted

...by four well-known Nigeri... artists ...atured this year in a ser... of eight ...stmas cards which have bee... sale in ... stores in West Africa ...om the ...e of September. The fou... tists are ...mah Buraimoh, Yussuf ... Bruce ...bakpeya and the late S... Okeke. ...t is hoped the cards w... ring their ...k to the attention of pe... throughout ...e world.

The cards are available fr... most major ...es but, in case of diff...lty, may be ...ined from Nigerian C...ards Ltd., PO ...7036, Lagos, who can also arrange the ...printing of companies' names and ...dresses.

N93m expansion plan

The Nigerian Paper Mill, Jebba is to start a four year development programme costing ₦93m. When completed the expansion programme will bring the cost of the entire factory to ₦143m. When completed the factory will have a capacity of producing 230 metric tonnes of paper per day from its current 40 metric tonnes a day. The General Manager disclosed that there are now 500 employees and this will increase to 1,300 after expansion.

Another boost for the Tourist Industry

The Federal Government of Nigeria has made a grant of ₦1m to each state in the Federation for the development of modest functional holiday resorts. The Federal Commissioner for Trade announced that his Ministry has started the classification of hotels to standardise food and accommodation tariffs. There are also plans to expand the Government Hotel and Caterer... on Lagos mainland.

More bitumen

In April this year, the SMB (Société Multinationale des Bitumes) at Vridi commenced operation and as from this month is capable of an annual production of 280 to 290,000 tons of bitumen. It is in a position not only to cover the local market but can also satisfy demands from Upper Volta, Mali, Niger, Togo, Liberia, Ghana, Senegal and even Nigeria. Togo and Nigeria are to become shareholders.

Glucose capacity doubles

Glaxo Nigeria is to double output of Glucose in its Apapa factory, following the installation of a new glucose blending plant designed by Glaxo Holdings, Technical Services Unit, UK. The plant comprises of canminutors, product elevators and sifters which feed two rapid mixers supplied by Beken Engineering, UK. These blend the dextrose and vitamin additive thoroughly during a three minute cycle.

More shoes!

The ₦4.3m Tannery and Shoe factory NEITAL in Maiduguri is to start production in January 1979. The Borno State Government owns 88 per cent share in the factory, the remaining 12 per cent is owned by an Italian firm. Initial production will be 500 pairs of shoes a day, rising to 4,000 a day in two years. The factory will be responsible for making shoes for the armed forces and police in the federation.

Nigerian chapter of NBCC soon to be fully operational

A forecast that the Nigerian chapter of the Nigerian-British Chamber of Commerce will be in being and fully operational by early next year has been voiced by Sir Peter Masefield, President of the Nigerian-British Chamber of Commerce and Joint Deputy Chairman of Caledonian Airways Ltd.

Reporting to the British Chapter of the Joint Chamber after visiting its Vice-President, Chief A. O. Lawson, in Lagos, Sir Peter said: "I am hopeful that by early next year the Nigerian Chapter will be in being effectively and contributing successfully to the Chamber's objectives being realised."

"Chief Lawson and I agreed upon the need for maintaining close contact during the interim period and a visit to this country by members of the Nigerian executive has been provisionally arranged for next April."

Chad visits China

The President of the Republic of Chad, General Felix Malloum, was an official guest of the Peoples Republic of China late last month, according to the West German publication *Handelsblatt*. General Malloum's visit could foreshadow increased trade between the two nations, which currently is minimal. The Chad President was met at Peking's airport by Chinese Communist Party Chief and President Hua Kuo-Feng.

Low toxicity fungi/bacteriacide wash

Liquid Plastics Ltd. has developed a low toxicity fungi/bacteriacide wash for industrial use in premises where exacting standards of hygiene are required. Called Biocidal Wash, it can be used for cleaning down walls and ceilings before they are redecorated.

Previously, where high standards of hygiene were needed — in the food and drink industries for example — concern was shown over the high toxicity level encountered in conventional bacteria and mould killers. This was frequently coupled with the need to wash off the excess solution after it had dried. There was also concern about the limited active life of conventional treatments which provided short-term protection only from infection.

Project for paper pulp factory

The project of a paper pulp factory in the Ivory Coast is due to be started with a view to commence operations in 1982. The factory will be located 30km from San Pedro and will produce between 250 and 350,000 tons of paper pulp. To achieve this production, a forest areas of 350,000 hectares has been earmarked for the sole use of the new factory.

Whisky distillery for Ogun State

The Nigerian company Olumo Rocks Whisky Factory is to set up a whisky distillery at Imala Orile in Ogun State at a cost of ₦100,000. The factory is expected to produce 1,000 bottles of whisky daily and will have 50 employees.

In brief . . .

The News Agency of Nigeria (NAN) has begun service in Lagos. The service, which is for a time restricted to the Federal capital, consists of bulletins of Nigerian news for distribution to a limited number of news organisations.

About 500 Nigerian students are expected to begin their five-year student-aid programme, at 10 universities and 11 community colleges in Canada. The students, who will take technical courses, including motor mechanics, are the first of an estimated 2,500 Nigerians who will study in Canada during the next five years.

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Telephone: 722443

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companies & contracts

...Kano State Investment Co... any has ...ded a N15m contract for th... ...nstruc-...of a dry-cell battery factory ... Kano to ...ion Carbide Corporation, ...n of the ...ey involved would be ... capital ...le the balance of over N1... would be ...d through commercial b...

...Cross River Basin ...elopment ...hority has signed a co... ...t with an ...digenous compa... Messrs. ...APCOTEC (Nig.) L... for aerial ...veys of specific proje... ...n the Cross ...ver and Qua Iboe rive... ...ns. The con-...ct is for aerial photogr... ...s and mapping ...the sites for three ne... flood protection ...d irrigation projects.

...anac **Consultants,** a subsidiary of the Canadian National Railways has been awarded a C$25.5m. contract for the purchase and inspection of rolling stock for the **Cameroon National Railway Authority.**

Mirlees Blackstone Ltd., a Hawker Siddeley Company has won an order for three 876 kW diesel generating sets to be used in Kaduna. To meet the promise of quick delivery, the sets are being transported overland by desert trucks. The sets will be protected en route by being encapsulated in a plastic envelope and transported on a 12 metre 'Supercube' trailer. The total journey is expected to take 25 days and the transportation contract has been awarded to **Trans Sahara Freighting International Ltd.**

Generating sets from Mirlees Blackstone on their way to meet an urgent delivery requirement in Nigeria.

The newsprint mill which is to be built by the Nigerian **Newsprint Manufacturing Company** beside the Cross River at Oku Iboku, 64 kilometres west of Calabar, will be ventilated and have its waste heat recovered by the British company, **Carrier-Ross Engineering** which is establishing a wide reputation for such installations as machine hoods, heat recovery plant and ventilation equipment will be supplying the equipment.

Carrier-Ross Sales Engineers have kept in close touch with the consulting engineers from the plannin... ...e of the mill and many of the key features are being incorporated in the buildings. There are now more than 25 countries with Carrier-Ross installations.

Douglas Electronic Industries, have just concluded a contract to build a transformer factory in Lagos, Nigeria, worth (₦60,000) £50,000. The new factory is 1,000 square feet in extent, a part of a large TV and radio manufacturing unit and the pilot staff will number 25.

The order was placed by **UAC International** who will provide the management of the transformer factory.

The factory is to make transformers for radio and electrical work up to 1,000 VA, including audio transformers. An output of 1,000 to 2,000 units depending on the size of the unit is the present weekly target.

The equipment installed to do the job includes two winding machines; all the mandrels, jigs, fixtures and necessary equipment to wind transformers to 1,000 VA; impregnating plant for vacuum varnish impregnation; a baking oven; and all the test equipment necessary for voltage testing and insulation testing.

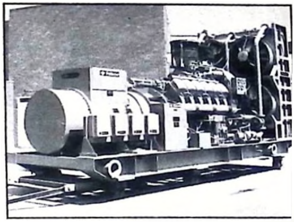
Photo-Scan Ltd. experts in the field of closed circuit television are supplying equipment for the Murtala Muhammed Airport, Lagos in readiness for the opening later this year. An order has also been recently received for systems to be installed in eight branches of the **Central Bank,** to be extended to 19 branches.

The **Nigerian Navy** has placed an order with **West Germany** for landing craft capable of carrying a battalion of soldiers with their equipment. The ships will be named in the Nigerian language.

GANZ Hungarian Shipyards and Crane Factory have signed a contract with the **Ghana Port Authority** to supply four harbour portal cranes of ten-ton capacity. The contract is valued at US$1,600,000.

The Hungarian company **Tatabanya Coal Mines** are to supply and operate a phosphate slurry-dressing plant for Togo through the intermediary of the Swiss firm **Hybogan.** The plant will be used to recover phosphate from the waste slurry, and owing to simple design and wear resistant pumps the system's maintenance costs can be kept at a minimum.

The largest generating set to be built by **Petbow Ltd.** has recently been completed for Nigeria. The set, model 1372W8 rated at 1700kVA will provide baseload power for the new Ikeja offices and printing works of one of Nigeria's leading daily newspapers, the **Daily Times.** It complies with BS649 and Din627A for baseload operations.



Powered by an SEMT-Pielstick 12PA... series 12 cylinder diesel engine the s... incorporates three separate cooling circui... — direct cooling, charge air cooling and ... cooling. Air flow is by means of ... quadruple motor driven fan installatio... Direct in-line cylinder air starting is al... used with the 12 cylinder Vee formati... engine.

The Broadcast Products Division of ... **Harris Corporation** has recently w... orders totalling $3.7m by the **Ondo St... Broadcasting Corporation of Nigeria** ... seven AM transmitters, studio equipm... and a UHF link system.

Marconi Communication Systems Lim... a GEC-Marconi Electronics company, ... just received an order from **Barmimo I... national** for the supply of two 50kW B... transmitters, together with progra... input equipment, an antenna sy... V.H.F. link and spares for installati... Sierra Leone.

The transmitters, ordered on beh... the **Sierra Leone Broadcast Service,** ... installed in parallel at Goderich and ... to the new studios. Under the terms ... contract, the transmitters are du... delivery in fourteen months and ... Marconi engineers will install and co... sion the equipment and train local ... nel in its use. The station should b... plete and working early in 1980, in ... the forthcoming O.A.U. Conference...

Mr. Samir... of Barmir... national ... Tom Maye... ing Dir... Marcon... municatio...

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Contracts

... 750 KVA generators, together with complete control panels, have just been shipped out to Port Harcourt where they will provide the electrical power supply for the Presidential Hotel being built for the Nigerian Government. The entire shipment was handled by freight forwarder Dawson Hyde & Willan on behalf of CES Contractors Export Services Ltd., who supplied the bulk electrical materials for this contract.

... Equipment Sales Ltd. have won an order for 10 diesel hardtop landrovers converted into mobile workshops as back-up for a civil engineering company engaged on a major road building scheme in Ghana.

The SMC has placed an order worth ₵3m for tyres from **Rumania** to supplement the current shortage in Ghana.

Gabon has ordered six and a half million pounds worth of VHF equipment to extend and modernise its civil aviation control system.

Seventeen sites will be installed in the next three years all over the country. Within four days of the contract being signed the first shipment of equipment was on its way by air from the **Airfield Systems Group of Plessey Radar.**

The network will consist of ground-to-air telecommunications centre and providing a permanent contact between the capital and aircraft flying anywhere over the territory. An instrument landing system will be installed at Port Gentil and other navigational and landing aids will go on other sites.

The Sierra Leone Government have awarded a £250,000 contract to **Tavern Furnishing Limited** to refurbish the 200-bed Cape Sierra Hotel in Freetown, closed since April of this year and due to re-open by Christmas. This is part of a major hotel development in the country in anticipation of a tourist boom in the 1980s.

The London company, are supplying all the furnishings — carpets, curtains, light fittings, furniture, etc. — for the entire public and bedroom areas of the luxury three-storey hotel, with its six VIP suites. Sierra Leone industry is supplying specialist joinery work from design and specifications prepared by the Birtish company, and under the quality control supervision of a Tavern Furnishing contracts manager. Other Sierra Leonese will also be involved in certain aspects of the refurbishment.

A full international athletics facility for the Ministry of Social Welfare and Rural Development for the Republic of Sierra Leone at the National Stadium, Freetown, is to be built by **En-tout-cas** of Leicester, UK.

The facility is to be surfaced with En-tout-cas Olymprene and the contract is valued at £308,000.

India's public sector **Rail India Technical and Economic Services (RITES)** has won a Rs200m (₦1.8m) contract to manage and run Nigeria's railways for three years. This was announced by the Minister for Railways, Mr. Madhu Dandavate who said 434 Indian experts are to provide the services needed under a contract he described as "prestigious and unique". The Nigerian railways are spread over 3,500 route kilometres and employs 27,000 people. The Indian experts will be concentrating on rolling stock utilization, passenger and goods operations, communications improvement of financial viability and the setting up of training facilities.

A new brewery, Africana Breweries is to be built at Ibadan at a cost of ₦2.4m. The project is being promoted by Investments and Credit Corporation of Oyo State and is partly financed by the Nigerian Industrial Development Bank.

The National Electric Power Authority (NEPA), Nigeria, has commissioned **Escher Wyss** to supply 6 vertical propeller turbines, each with a runner diameter of 7.1 m. and an output of 102 MW at a head of 30 m. The river power station designed by the **Montreal Engineering Company Ltd.** (Canada) is to be built on the river Niger near Jebba, about 400 km. north of Lagos. It is scheduled for commissioning in 1982/83 and will improve the regional power supplies.

A ₵1.5m. water reservoir is to be built by **A. Lang Ltd.** at Kotoka International Airport to offset the periodic water shortages at the airport.

Prequalification applications for supply and works contracts involved in exploiting iron ore deposits are being invited by **Mauritania's Societe Nationale Industrielle et Miniere.** The project, expected to cost nearly $400m, is expected to attract interest from makers of mining equipment, civil engineers and material handling specialists.

The Kano-State Investment Company has awarded a ₦15m contract for the construction of a dry-cell battery factory in Kano. The batteries will be used for either radios or torchlights. The contract was awarded to **The Union Carbide Corporation.**

The West African cold store industry is booming and fast approaching European standards, according to the sales director of UK insulation contractors **C. Hemmings and Co. Ltd.**, who has just returned from a five-country sales tour with firm orders worth £250,000 and enquiries valued at very much more.

Apart from Nigeria, he visited Gambia, Sierra Leone, Liberia and the Ivory Coast and says he found a universal enthusiasm for the Hemsec Super Panel insulation system because of the reduction in site work and ease of installation compared with competitive products from other countries.

Douglas Electronics Industries, the Lincolnshire-based UK company, has just concluded a contract to build a transformer factory in Lagos. The factory, worth £50,000 is a part of a large TV and radio manufacturing unit. The order came from UAC International, the largest subsidiary of Unilever, which operates in 41 countries with a range of 30 different types of business enterprise. UAC International is to provide the management of the transformer factory.

The Nigerian National Paper Manufacturing Company has ordered ₦300,000 worth of lifts for both passengers and goods from **Herbert Morris, UK.**

Thomson-CSF, the French telecommunications and electronics company has won orders worth more than £4.2m. (Ffr 36m.) for electronic and electro-mechanical exchanges. The largest order is for an electronic switching system for the Zaire domestic telephone network. Thomson will supply its AXE time-division exchange development by its subsidiary Thomson-Ericsson. Niger has also signed a contract for the extension of two exchanges with 2,400 additional lines.

The contract for the building of a new 614 beds central hospital in Abidjan has been given to an Argentinian group which had tendered for it.

For more contracts on constructions see page 92.

THE 245

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

The new GAF 245 diazo printer incorporates many time-proven features which have become the popular choice of professionals everywhere, together with improved operation and many new features to increase productivity and economy.

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The tenth and final part of a series by the author of 'The A-Z of Industrial Salesmanship,' and founder of the Institution of Sales Engineers, dedicated to all sales operations striving to achieve maximum results from their existing resources.

Packaging and Presentation of the Chosen Control System

IN THE first nine articles in this series, we have discussed in detail the many years of research and development carried out by the Institute of Sales Management, the Institution of Sales Engineers and their training division, Structured Training Ltd., into solving the problems of effective sales force control. Several of the best systems developed from this research are now being marketed by Sales Control & Record Systems Ltd., in which both ISM and ISE have a substantial interest.

We have established during the series that every company needs to search for steady growth, and that to conduct this search efficiently, a company first needs to measure where it stands in the market place, and the performance it produces as a selling whole, and which its salesmen produce individually.

We have discussed the need for sales forecasting in some precise detail, the planning of each month's and each week's work load, the need for calculating how many new prospects must be found in order for the company to achieve its new business growth target, and the necessity for up to date customer records and accurate action reports.

Ways to establish how much business the company can expect to secure next month, or next quarter, have been analysed, and a number of specific industries with specific requirements have been considered in depth.

Sales force must be effectively controlled

The one overall factor which is common to all these things is that for a sales force to perform effectively it must be effectively controlled, and for both these things to happen, the whole sales operation must have pretty strict disciplines. Without discipline, the system implemented, whichever it is, will never work satisfactorily.

And from the date of implementation, it will be at least a year before all the snags, hang-ups, misunderstandings, obstructions, negative attitudes and straight lead swinging are ironed out and the Sales manager can be really confident that his figures and projections are accurate and present a sound basis on which his company can plan ahead.

Once this confidence has been achieved, it can be passed on to the sales force, and, from then on, the team effort will be unbeatable.

One more target . . .

Just one more target to aim for.

One very effective way to short-cut this initial period, is to make the whole control system as attractive as possible to the salesman. A professionally presented, specially printed paperwork system will be accepted faster, and used with much more respect, than any cheaply duplicated sheets of paper held together with staples or paperclips.

The presentation also needs to be carefully packaged, because the system has to be used day in, day out, for several years and spend most of its life in the salesman's car, where vibration, dust, damp and radical temperature changes all contribute to shortening the effective life of any product.

Much research has gone into establishing the most effective, longest lasting, packaging and presentation for the sales force control system we have discussed in this series. The result is a series of five units, which house the component parts of the system.

A complete control system such as this is normally supplied with sufficient paperwork, files, cards, etc., for one year's operation. Subsequently, the company using the system can order replacement forms, files, cards, ring binders, clipboards, storage cabinets, as required.

Full instructions accompany package

Full instructions for the salesman on how to operate the system accompany each complete package, and usually, an executive from the company supplying the system will provide a one-day introductory training session, just to make sure all the customer's personnel are fully conversant with operating procedures and the concept and reasoning behind the system.

Well, that's all from me on this subject — at least for the present. There are many facets of sales force control we have not covered, but the same could be said of any subject as important and as complex, being given a similar number of pages of text and illustrations.

I have tried to explain to readers one system in particular which we know works well indeed, because we have developed it ourselves and seen it implemented successfully into more than 350 companies, covering a very wide mixture of industries.

If any reader wants help on a particular sales control problem, I will do my best to make a contribution. □

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PLANNING IN DEVELOPING COUNTRIES

This article takes a look at the complexities involved in drawing up a workable and successful National Development Plan.

In 1980 Nigeria's Third National Development Plan will be in its last year. The Fourth Plan will be about ready for launching. Much of the outline of the Fourth Plan must already be sketched in although a lot of the key matters and calculations are still for the future.

The preparation of the Fourth Plan must be a time of post mortem for much that has been in the previous one. It is important that this looking forward and looking backward should be done effectively and that the lessons of the Third Plan should be applied to the assembling of the Fourth. There is however one paramount reason why this should be done constructively and coolly by those who assemble the new one: Nigeria will be under civilian rule and it will go badly for the country if national planning becomes a political plaything.

Now, in 1978, before a balance sheet is put together on the old plan or a budget is set out for public scrutiny on the new one it is worthwhile looking at two basic questions. First, what can be expected of national economic planning and, secondly, what can be learned from the mistakes of other countries.

Broad indication of goals and policy

It is important to remember that no economic plan in a free society can be more than a broad indication of goals and policy. It can never be an accurate forecast or a piece of deterministic soothsaying — and woe betide those with political power who think or, even worse, say that it can.

Then why bother to plan in detail? Because the economic fabric of a country of 80 million people is vastly complex, more so even than say a large building. And even with a large building you start with the bricks and blocks of the foundations, not with the roof.

Then what good is a plan? It has one outstanding useful purpose which nothing else can do as its place. It assembles all the economic data which have to be kept under review for the next few years so that the need for change in policy can be foreseen and to some extent gauged. Paradoxically, a good plan is one you can alter, one where you can see in advance the need for change and one where you can estimate (if only approximately) what the effect of change will be. There is nothing rigid, categorical or unalterable about a good plan. If a national plan goes wrong or fails to fulfil some people's expectations, that is no stop drawing up a plan but to use it more realistically. That does not over-rule the fact, of course, that some plans have bad mistakes in them which have to be taken into account. But particular mistakes do not damn plans in general.

It is reasonable, however, to ask: why cannot economists get it right? Why are they so often wrong or overlook something which in retrospect is obvious enough? The fact is that even when the data available is accurate enough to give a clear picture of the past, economists are not left alone to plan.

If a group of Nigerian economists were locked in a room for six months with all the available statistics from the past, they would come up with a beautiful plan. But no one would believe it or agree to make it work. That sort of planning could only be done in a society of ants.

Economists and the like are paid to put together a plan which is acceptable to those with political power. This is not merely a cynical remark: it is a statement of the inevitable. But it is noticeable across the world that the political heads of governments and government departments like economists (and let them keep their jobs) if they come up with ideas that please their masters. There is no way round this: it is the politicians (in the widest sense, whether they are a military government or a political party) whose antennae sense what is politically possible. It is the politician who knows what the farmer, the trade unionist, the professional people, etc., will take. If politics is the art of the possible, economic planning is the resulting economic design.

Next comes the question of learning from other people's mistakes. For well over a decade national plans have been fashionable for developing countries and they have indeed been stimulated by international aid organizations like the World Bank. Countries both rich and poor have been going through the planning experience for long enough in sufficient numbers to have built up a number of useful pointers about the problem areas of planning.

Most plans make the same mistakes

It is apparant that most plans make the same kind of mistakes, fall short on the same sort of estimates and have the same kinds of success. This is true of oil rich countries like Saudi Arabia and Iran and less oil rich countries like Indonesia. It is even true of no-oil countries like South Korea (the apparant planning miracle of the decade) and of small poor countries like some of the islands of the Caribbean. All this has very little to do with race, colour or creed but a great deal to do with human nature.

The following are illustrations, taken from different countries, where planning forecasts and policies have not been realised.

The first of these is the unpredictable element, the disasters that could not have been forecast and very often they come several at a time. Nigeria has had its groundnut crop failures but others have had at least as bad fortune. Venezuela is oil-rich and looked set for a big boost to its prosperity in the mid-70's. Then in 1976 a lot went wrong.

Hundreds of millions of dollars were invested by government and the banks in agriculture in the form of tax incentive schemes, irrigation and a national silo programme. But the share of the GDP taken by agriculture dropped by 1.8 per cent against a planned increase of 9 per cent. There were two main reasons. Rats ate the rice crop and there were also floods and drought. Then again, some of the funds failed to get into Venezuelan agriculture: they finished up in US real estate and that is not included in what planners called "agriculture."

Remember possibility of power cuts

And what about power cuts? These seem to dog the progress of all development plans. Possibly the worst case has been Iran. Lack of electric power brought down the Prime Minister Hoveyda in 1977. In the fourth plan 2000 MW were installed out of a programme of 3200 MW. In 1977/78 output was less than 60 per cent of the fifth plan target.

To South Korea which has been most praised for its rate of economic growth rate and its ability to beat official planned targets there has come a problem which seems to afflict all fast developing countries, namely, a shortage of technologists and skilled labour. The country now needs 320,000 skilled workers out of a population of 35 million in order to keep up its phenomenal rate of progress. It is having to build 28 vocational high schools and 17 technical colleges. Some 560,000 technicians are to be found by in-plant training and there is now preferential tax treatment for on-the-job training expenses and purchases of training equipment. The total investment will be $1,547 million.

Port congestion is no isolated problem.

Continued

...Middle East has had lots of it. Rich ... Arabia had major trouble with this at ... There has had to be a maj... port ...ment programme to deal with this ... the recruitment of additional ...r. Because port congestion was ... to build up inflation an ambitious ...programme for the whole of the ...y had to be implemented. Between ... and 1980 it will have ... Saudi ... $US 2 billion to put right.

...me areas ...ficult for ...all industries

Then there is the problem of setting up ...l industries in some areas. These are ... stimulated on industrial estates to ...vide employment including office jobs ... countries (some of them small) where the ...cational system is turning out more ...cated school-leavers than there are jobs ...occupy them.

An example of this is the Caribbean where many of the small islands with populations of 50,000 to 200,000 have ...employment percentages of 15 to 20. But the return on this kind of industrial development is desparately slow. Government subsidised factory shells go up at the rate of half a dozen a year to give work to a ...w dozen or at best a hundred or two persons. There is political prestige in this kind of development but not many jobs.

Home markets are small and to prevent all the islands setting up new industries in competition with one another and so killing any prospects of an export trade developing, the Caribbean free trade area (CARICOM) had tried to arrange a division of activity so that, for example, if one island sets up a paint factory it is agreed that no one else in the area does so.

This is good thinking and has relevance in West Africa but it still has to be proved a working idea.

But the area in which plans have been most disappointing in their outcome has been rural development, especially agricultural yields and the flight of workers from the land. Country after country has over-estimated the rate at which crop yields would be raised and under-estimated the rate at which industrialization and infrastructure development would draw people into the towns thereby reducing agricultural labour and increasing the demand for food imports to feed the teeming towns. Several countries, not just Nigeria, have been obliged to start "feed the nation" campaigns and make cuts in the import bill.

In only one country has anything like a solution been found. In South Korea the "Seumaul Undong" (New Community) movement has kept agriculture in step since 1970 with industrialization. In the 1972-76 plan, the planned annual growth rate of GNP was 8.6 per cent: 11 per cent was achieved. In agriculture, forestry and fishing 4.5 per cent was planned: 5.3 per cent was achieved.

The movement operates at two levels. Local roads have been widened, meeting halls and storehouses built, sanitation improved and straw roofs replaced by tiles — all on a major scale by a do-it-yourself scheme for better village environment. At quite a different level has been the work to get across to rural communities faith in their own capabilities. By getting agricultural productivity higher in this way rural incomes of households have been made on a par with urban ones.

None of the planners (certainly not in the industrialized, developed countries) have yet found an answer to inflation.

But the fact that the planners everywhere, including the developing countries, make the same kind of mistakes or are proved wrong by the same kind of unforeseeable disasters does not mean that planning is wrong. Nor does it mean that planners and politicians should try desparately to plan to closer tolerances in the hope of getting more of the answers right. It means that plans should be realisitic, especially on timing, that short-sighted and over-optimistic competition for scarce resources should be avoided and that there should be a willingness to change targets as circumstances change.

One thing is becoming clear across the world. Planners are necessary to erect the framework of effort: others must go on and make intelligent use of it. □

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EXPO '78

A brief look at the 2nd EXPO to be held in Lagos this month will be followed by a more detailed review in our December issue, with news and photographs of some of the products on display.

As a result of the enormous success of the EXPO '78 AFRICA SUMMIT which took place in Lagos last March where companies met 1,624 high level government officials and buyers from 10 countries. 2nd EXPO '78 NIGERIA is to take place this November from 27th to 4th again at the Eko Holiday Inn Exhibit Centre.

According to Mr. Roger Nyashua, President of EXPO '78 Africa the 2nd Expo will be greatly expanded as the foundation is now firmly established and there is full backing from the local government agencies. It will handle over 150 exhibiting companies from all over the world. These companies are from a wide variety of spheres, and include communications companies, firms manufacturing agricultural machinery and equipment, transportation, electric and electronic machinery, wood, leather products and furniture, paper and allied products, rubber and plastic products, construction machinery, audio visual machinery, food and beverages, to mention but a few.

The Eko Hotel, which is also accommodating all the exhibitors, has been specifically selected because of its strategic position, in Lagos with excellent facilties to cater both to the needs of this vast and influential trade audience that shares the same need for exhibits for top-level sales and joint venture discussions face-to-face under one roof and restricted to the trade.

Simultaneously during the first two days of 2nd Expo a full conference is taking place in the Federal Palace ballroom. Called the 1st International Lagos Conference on Trade, Technology and Training, it provides a unique opportunity to examine and discuss Nigeria's needs in meeting the challenge of change, and identify the challenges from both local and international competition which confront mangement in the successful implementation of trade and joint ventures in Nigeria.

The conference offers a comprehensive and wide-ranging programme in which the country's goals will be outlined by experts in their various fields, and the steps towards making this transformation reality will be discussed.

The programme outline is as follows:

Improving the Climate towards Foreign Investment — Chief O Akinkugbe, Chairman, Nigeria Industrial Development Bank
- The government's role in regulating competition
- Investment inducements
- Protectionist trends
- Borrowing on the world markets
- Infrastructural development
- Fiscal and monetary considerations

Technology and Training: The Keys to the Future — Chief S Adebo, Chairman, New Nigerian Newspapers
- Manpower availability
- Transfer of technology
- Trade union structure
- Labour relations
- Training institutions
- Training overseas

National Development and the Non-Oil Economy — Dr Uma Eleazu, Director, National Policy Development Centre
- National resources
- Sources of energy
- Government priorities
- Long term forecasts

Infrastructural Developments and Patterns of Communication — A Adam, General Manager, Nigerian Maritime Services
- Aspects of distribution
- Moving the goods
- Regional characteristics
- Railways, roads, ports, airports, warehousing

Aspects of Success in International Joint Ventures — Chief A O Lawson, Chairman, Nigerian Breweries

Establishing an Industrial Joint Venture — L J Tompsett, Managing Director, Dunlop Nigerian Industries

Changing Patterns in Construction Projects — A Massey, Senior Partner, APC International

Critical Factors Affecting Agro-Industrial Joint Ventures — J F Taylor, Chairman, Booker Agriculture International
- Government attitudes
- Contracts and liabilities
- Market size
- Selecting the participants
- Selecting management and manpower
- Sources of finance
- Regional characteristics
- Distribution

Workshop Discussions — T Jones, Chairman, Commonwealth Development Corporation, Nigeria
- Negotiating risk capital
- Sources of finance
- Government priorities
- Case studies

Regulation of business — C O O Oyedraa, Senior Partner, Coopers & Lybrand (Nigeria)
- Fiscal and taxation considerations
- Licensing
- The role of the trade mark
- Indigenisation of business
- Contractual guarantees

In addition to the extremely pertinent issues listed above, the sessions will include many other crucial topics. There will also be panel sessions with questions from the floor.

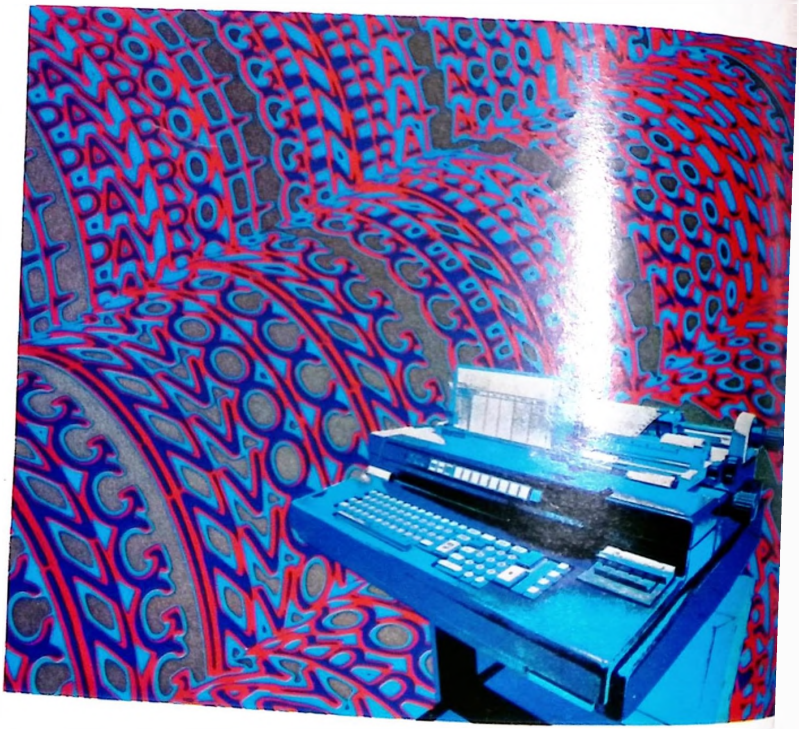
Both the 2nd EXPO and the conference are being sponsored by African Business and New African magazine in co-operation with West Africa Technical Review; however the London Chamber of Commerce and Industry and the Nigeria-British Chamber of Commerce in co-operation with the Nigeria Association of Chambers of Commerce, Industry, Mines and Agriculture are also sponsoring the conference.

EXHIBITORS*

1. Swift-Armour S.A. Brazil (UK)
2. Phoenix Refrigeration Ltd. (UK)
3. Clarke Engineering (Overseas) (UK)
4. Guring Vertriebsgeselischaft (W. Germany)
5. Mewaf S.A. (Belgium)
6. Enerpac (Switzerland)
7. Eusko Export S.A. (Spain) Lidcell (UK)
8. Denso-Export GmbH (W. Germany)
9. Armour Foods (UK) Ltd.
10. J. S. Trigge & Co. Ltd. (UK)
11. Group Iciet-La Marina-Inglen (Italy)
12. Denutte Steelstructure (Belgium)
13. Hanna International (USA)
14. Africa Overseas Corp. (USA)
15. Saturn Plastics/Engineering (USA)
16. Precision Processing Inc. (USA)
17. Burmeister/Wain (Denmark)
18. Continental Pharmaceuticals Ltd. (USA)
19. Communication Control Systems (USA)
20. Ibico (Switzerland)
21. General Motors (USA)
22. Fracarro Radio Industrie (Italy)
23. Savid S.P.A. (Italy)
24. Kano Sfeed S.R.D. (Italy)
25. Intercoop S.R.L. (Italy)
26. Bialetti-Fortis (Italy)
27. Armaturenfabrik Ernst Horn Kg. (Germany)
28. Henspapier Group (The Netherlands)
29. Consorzio Fabocart S.P.A. (Italy)
30. Triulzi S.P.A. (Italy)
31. O. Gruber Macchine (Italy)
32. Samsung (UK)
33. Oy Ja-Ro AB (Finland)
34. Pullman Swindell (USA)
35. Safai SPA. (Italy)
36. Necchi SPA (Italy)
37. Euteco SPA. (Italy)
38. C.I.C.A. SPA (Italy)
39. Fonderia Di Agnosine (Italy)
40. Morteo Soprefin SPA (Italy)
41. Cadore S.R.L. (Italy)
42. Young Metal Products Co. (USA)
43. Crossoceans Ltd. (UK)
44. Gentonian Ltd. (UK)
45. Ex-Cell-O Corp. (USA)
46. Siya & Co. (Exports) (Sri Lanka)
47. B. V. Amefa (Holland)
48. Schumag (Germany)
49. Tousdiamants S.A. (Switzerland)
50. Quayport Ltd. (UK)
51. Scanwater Engineering A/S (Denmark)
52. Henry Stephens Engineering Co. Ltd. (Nigeria)
53. I.D. Systems (USA)
54. Boffas Nigeria Ltd. (Nigeria)
55. Triana Industries Ltd.
56. Johnson Idowu Construction Co. (Nigeria)

*as available when going to press

The new Olivetti A5 electronic accounting syste caters for your changing needs



It'll be much more expensive without one

The small to medium size business changes fast and often. So an electronic accounting system that gives you the processing capacity you need, no matter how much your needs change, makes sound common sense.

The new Olivetti A5 electronic accounting system. Modular, you simply add new modules as your changing needs dictate. Modular hardware peripherals, modular software; together they build you exactly what you need.

Program and data load, reading and memorizing are via magnetic card. And to increase input and output capabilities you simply add on a tape reader and punch or use magnetic tape cassettes (ECMA standard).

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Olivetti A5. No specialist operator training, hand up to four separate documents simultaneously.

Your payroll's anything from around forty to two hundred employees; or you're posting and process up to 2,000 invoices a month.

You'll be hard put to better Olivetti A5. The longer you're without one, the more you'll be spend for far less return.

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Leventis Technical Limited

...remarkably low. On these machines, ... of staff to operate them and feed ... and to handle the other operations, ... as collating and binding that follow ... copying process, is being reduced ... to more and more sophistic... con... and auxiliary equipment. ... these ...ines, the impact of the sili... chip ...circuits is being felt. The la... ages ... Xerox machines, for ...mple, ...porate self-diagnosing fa...aders. ...e machines keep a constan... ...ck on ...eir own internal functions ... fault ...ces, the machine itself ide... it and ...ves a number on an illu...ed sign. ...e operator then becomes ...re that a ...lt has developed and the ...mber in the ...ectronic panel indicates wh... function is ...ing trouble. The operator might then be ...le to put this right or can contact the ...vice organisation and actually inform ...em which function needs attention from ...e engineer.

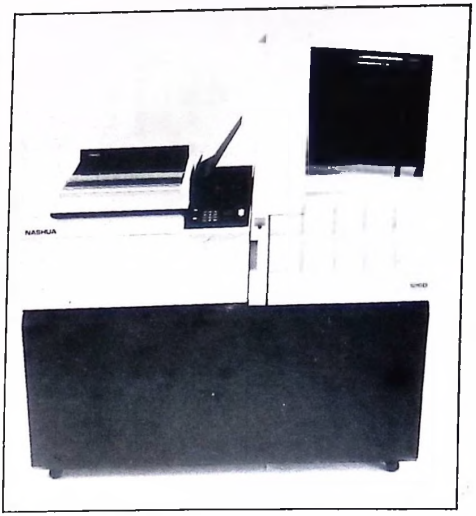
Larger machines sometimes more economical

Often a bigger investment on a more sophisticated machine is economical because of other savings, especially on paper. A machine that can automatically print on both sides of a sheet can effect huge savings — in fact, halving the paper cost on large production runs.

The most recent big machine from Xerox is the 9400 — this is a development of the 9200 and it offers the extra facility of double-sided copying at a remarkable rate of throughput. It prints two copies a second. That is 7,200 copies an hour and it also saves on labour costs through its automatic document handler that can accept up to 200 original documents of different paper weight, as the machine adjusts itself as the new original feeds in automatically. There is an automatic sorter with a capacity to sort 9,999 sets. When the sorter bin is full, and if the operator is delayed in emptying it, the machine waits until there is free capacity and then continues sorting.

Xerox has also introduced some new

Continued



Nashua Corporation, of USA, is basing its marketing on the decentralization principle, offering medium to low volume copiers for location in individual departments. They recommend six copiers, each able to produce 10,000 copies per month, for the price of one copier that can produce 60,000 copies a month. Nashua points out that downtime on any one machine then does not seriously affect productivity.

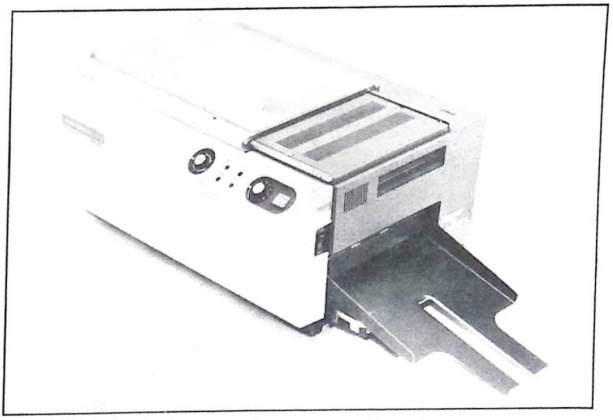
One brand new Nashua product is the Model 1260, which does 30 copies a minute and incorporates a collator of 20 bins, the machine being fed automatically with a series of different original documents.

...ment for the smaller volume user. The ...200 is new to the world market and ...ded for locations where monthly ... is less than 3,000 copies. Its output ... copies a minute on size A4 and 5 a ... for B4 size. The machine will ...matically provide up to 15 copies ...ding to the number dialled on the ...ator. A useful refinement that avoids ... is the provision for the drum return ... after each set of copies has been com... for it often happens in offices that ...one leaves the counter on a high ...ber and the next user neglects to ...ge the figure and gets a dozen copies ...ead of the one he intends.

...s often the small user that has to work ... the most unsuitable originals for ...ying. An office manager might require a ... of a thin carbon duplicate or of a ...mply hand-written letter of memo. In ...ny instances, there is difficulty in obtain... good copies of a print-out of figures ...m a computer. Many smaller machines ...e now incorporating more flexible con...ols for the operator to adjust the machine ...o improve the final copy quality. There are ...n the new Xerox machines, for example, ...copy darker" controls that give more con...trast and deeper tones so that copies of thin ...originals are not too light to read.

Japanese widening ranges

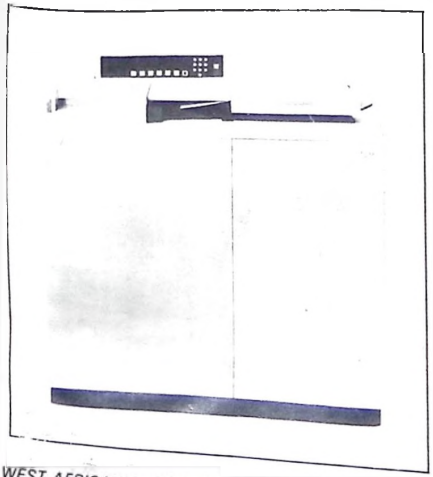
Japanese manufacturers are widening their ranges of copiers, especially in the medium and smaller volume machines. Mitsubishi U-Bix has launched an improved desk-top model 100. It is a plain paper copier that incorporates micro-computer controls for automatic production of up to 99 copies of an original. Paper feeds are in the form of inter-changeable cassettes, so that one can be standing by ready loaded for insertion within seconds.



Toshiba's 601 low-cost plain-paper copier.

Toshiba's BD-601 is a desk-top model that is comparatively low-priced. This machine has been designed with a view to reduced maintenance costs and is claimed to need attention only after each 10,000 copies. It is very versatile in the sizes of originals it will accept and the size of copies it can produce. It has cassettes that will accommodate B4, A4, B5 and A5 paper sizes, with up to 20 copies counted automatically.

Toshiba prides itself on the ability of its machines to cope with difficult originals, especially when making black and white copies from coloured original documents. The machines have a copy tone exposure control dial that, when adjusted by the operator, increases the quality of the copy and assists in getting crisp copies from half-tone pictures. A form of diagnosis of fault is also incorporated, as lights illuminate to indicate an empty paper feed or a misfeed.



The IBM Copier III Model 20 — this plain paper copier can produce up to 4,500 copies an hour and can offer two-sided printing to save paper costs.

Size reducing — a valuable asset

A valuable asset on a copier is the ability to reduce the size of copy, making it smaller than the original document. This means that less filing space is used for a record or that material to be posted to clients can be standardised or inserted in a standard catalogue format, even if the original is non-standard. The Toshiba BD-909 plain paper copier, for example, reduces originals, at the turn of a knob, from A3 to A4 which is half the size. This function also allows the operator to copy two A4 letters or documents on to one A4 copy, halving the paper cost and the filing capacity needed.

More and more companies are now becoming aware of the versatility of copying machines. They are no longer merely a means of saving a typist's time in reproducing a letter. Copies are crisp and clear enough to serve as promotional material in their own right and all kinds of display and design material can be produced because of the increasing ability of the machines to cope with a variety of originals for copying. Not only do they save time and give greater flexibility in choosing the style of material to be posted or filed, but they contribute to greater accuracy in office work. Original forms or handwritten material can be copied without the risk of errors that come when such material is transcribed by a typist. Lists of parts numbers on orders from customers, drawings of layouts on site from engineers or architects, instructions for delivery fleets, diagrams or details of operation for maintenance or paste-up for montage — all can be copied from originals speedily, in any numbers and without errors in transmission. This means that it is often worthwhile re-examining an office system where there is any form of typing involved, to see whether the system can be modified for use with a copier to achieve economies or greater efficiency. There is a lot of slogging work on a typewriter that is dreary, costly, error-prone and unnecessary. □

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SOLAR ENER
A Bright Futu

by Theodore B. Taylor

MOST CURRENT articles and speeches about energy carry the following messages: The world is running out of oil and natural gas. Substitutes for these fuels must be found by about the year 2000 if the world is to avoid severe shortages of energy and consequent economic disorder. The only prospective sources of energy that can replace oil and gas on a large scale during the next 50 years are coal and nuclear fission. Solar energy has many desirable characteristics, but it is not likely to play a major role in satisfying the world's energy demands for the foreseeable future.

I agree with the statement of the problem, but strongly disagree that our only hope for a solution is in rapidly accelerating the use of coal and nuclear power. And the prospects for economical solar energy are much brighter, I am convinced, than is generally acknowledged.

A serious concern about large increases in the use of coal is the possibility of changes in regional and world climate caused by the further buildup of carbon dioxide in the atmosphere.

The deepest concerns about nuclear energy relate to its possible use for destructive purposes. Any nation that really wants nuclear weapons will be able to acquire them, whether or not it is also using nuclear power for peaceful purposes.

During the last year I have asked many people the following question:

If it were demonstrated that solar energy could provide all energy needs world-wide at direct cost no greater than for all major energy alternatives, do you believe that it should be the primary focus of future world-wide energy development?

Without exception, the answer has been "yes" when I have asked the same question. But when I substituted the words "nuclear" or "coal" for "solar", the answer has frequently been "no".

Prospects for meeting energy demands with solar energy

What then are the prospects for meeting all energy demands world-wide with solar energy, at costs that are substantially less than using fossil fuels or nuclear energy?

There is strong evidence that people in many countries are finding ways to collect, store, and convert solar energy at reasonable costs, using concepts that are not new, but often put together in new ways.

Perhaps the most dramatic example is the construction of more than 4,000 million family-sized biogas units in the People's Republic of China between 1972 and 1976. These biodigesters convert animal wastes and crop residues to a gas, containing about 50 per cent methane, that can be used for cooking and lighting, and also for internal combustion engines and generating electricity. They also produce high quality fertilizers. The energy from which this gas is derived is solar energy that has been converted by photosynthesis to chemical energy stored in the plant wastes and the undigested plant material in animal manure.

The world-wide potential energy contained in farm wastes is equivalent to about 2,000 million tons of coal, which is nearly 25 per cent of present world annual energy consumption. Approximately equal amounts of energy are contained in the crop wastes and livestock manure. How much of this energy could be practically recovered remains to be seen. But in many

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USTRIA
RADE MISSION

pplement to West Af[illegible] Technical Review

November 1978

Steyr plus truck 1491. 260/K38 6 × 6 truck-tractor with swinging spring axle, 260 DIN-HP, 37 tons payload.

FULLY AUTOMATIC LINES FOR THE PRODUCTION OF FL
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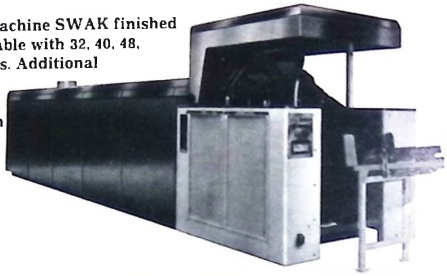
Automatic wafer baking machine SWAK finished in stainless steel and available with 32, 40, 48, 56, 64, 72 or 80 baking plates. Additional machines for creaming, cooling and cutting as well as for preparation of cream and batter provide fully automatic production of cream filled wafers.



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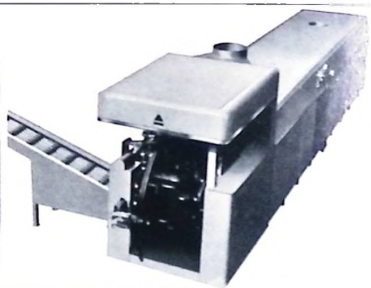

Automatic ice cream cone ba
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moulds or as a twin machine
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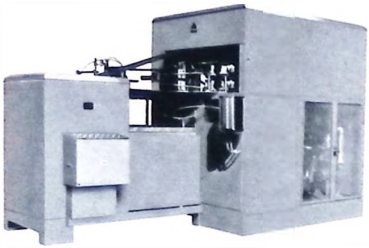

This machine produces rolled wafer sticks (sweet and savoury) in different diameters and lengths. Attachments are available for fully automatic cream-filling, chocolate coating, pressing and forming into fan wafers.

EWB

AUTOMATIC PANCAKE BAKING MACHINE

A universal automatic baking oven for the production of pancakes, omelettes, pizzas, "Kaiserschmarren" or endlessly produced pancake rolls (with fillings of jam, cream-cheese, meat, vegetables, etc.) as well as for products for adding to soups ("Fridatten"). Especially suitable for industrial kitchens, bakeries specialising in deep-frozen products and production of units supplying supermarkets.

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AUSTRIA'S ECONOMY

by Rudolf Sallinger

President of Austrian Federal Economic Chamber

STRIA, with her 7,456,000 inhabitants, a small but highly developed industrial ... Industry and business have a share ... per cent in the 1977 GNP of 790,000 ... Austrian Schillings.

In the field of industrial production, in ... the food and luxury foodstuffs ...ries scored the highest production ... with some 14 per cent, followed ... by the chemical industry with some ... per cent and the mechanical ...neering and steel construction ...tries with nine per cent. The shares of ...electric industry and the iron and metal ...ods industries lay slightly below eight per ...t. Those of the textile and the smelting ...dustries were exceeding five per cent. ...per, stone and ceramics industries, as ...ell as the automotive industry, contributed four per cent each to the total ...alue of industrial production.

Prime assets

Since Austria is poor in natural resources — her main assets are timber, iron ore, magnesite, as well as smaller deposits of petroleum, lignite, and non-ferrous metals — she has to cover her requirements of natural resources mainly with imports, and, as a result, she has to export intensively. If an economy is to be kept efficient, a country with a small home market cannot evade dependency on imports even in the fields of industry and business. Intensive participation in the international division of labour is a precondition for continual growth. Austria's efficient specialized industries need — and find — markets far beyond her frontiers. Bulk articles, on the other hand, could not be produced for the limited domestic market at a favourable price, therefore it is more advantageous to import them.

In the field of energy supply Austria depends for some two-thirds on imports, above all as regards petroleum and coal. An important role in energy supply is played by hydro-electric power which still offers considerable reserves for future extension.

Balance of Trade

In its structure, Austria's balance of trade is passive. The 1977 deficit, for instance, amounted to 73,000 million AS. Therefore Austria is always aware of the "pressure towards foreign trade". Already, at a time when other countries maintained strict import quotas, Austria's trade policy was kept as liberal as possible.

In 1977, imports amounted to 234,800 million AS, exports to 161,800 million AS.

Mr. Rudolf Sallinger

In world import Austria ranks 16th, in world export 17th.

Trading partners

Naturally, Austria's most important trade partners are the countries neighbouring her. Thus, the Federal Republic of Germany receives 26.6, Italy nine and Switzerland 7.1 per cent of her exports. In 1977, 84 per cent of Austria's imports came from, and 80 per cent of her exports went to European countries (incl. Eastern Europe). Some 75 per cent of Austria's imports and 66 per cent of her exports were transacted with OECD countries. 14.8 per cent of imports came from, respectively, 16.5 per cent of exports went to overseas countries; within this scope, imports from Africa amounted to 2.2 per cent of Austria's import total, while 4.3 per cent of her export total were deisgned for this continent.

Just in times of economic recession in the industrial states of Europe, the export endeavours Austria is undertaking in overseas countries are increased. In recent years a number of export offensives initiated by the Austrian Federal Economic chamber, as, for instance, trade missions, meetings with prospective customers, technological and scientific weeks, and participation in fairs, have led to exceedingly favourable results.

The stiff competition Austria has to stand on the world market in the face of offers submitted by financially often far stronger companies from rich industrial nations, necessitates a production conscious of quality and of price. Over and above that, Austrian export companies have realized that frequently their advantage lies just in the flexibility made possible by the relative smallness of their enterprises. Austria's economic structure is characterized by the great number of flexible small and medium-size enterprises. Only 0.6 per cent of all enterprises, employing more than 1,000 people can be regarded as large-scale. Small enterprises are much better suited than large-scale ones to go into particulars desired by the customers or to produce limited numbers of pieces for special requirements. Therefore Austria's export industry has made its object individual production and made-to-measure service; up to now this has brought considerable successes.

Of course, the realization of this aim requires a high degree of creativity and readiness to accept new developments. The fact that for centuries Austrians have made use of such a potential is proven by the important inventions made in Austria — which foreigners, however do not always associate with Austrians. These inventions were made in various fields: from the ship propeller, the sewing machine and the typewriter, the generator, the osmium lamp, the amplifier valve, the low-pressure turbine, to the first high-tensile chemical fibre of the world or the LD process which today is used for steel-making in more than 100 countries all over the world. The first workable slow-motion camera, the discovery of the gasoline-air mixture for combustion engines, quantitative microanalysis, the frictionless steel valve, the first objective for photo portraits, modern powder metallurgy, the wood bending process, water-soluble synthetic resin enamels for cars, the myoelectric arm prothesis, the composite construction method with reinforced concrete, or the first mobile unit for measuring the radiation intensity of nuclear reactors in operation, the first plant for the regeneration of hydrochloric acid complying with the regulations of total environmental protection — all of those are brainchildren of Austrian enterprises, inventors and researchers.

Exports up

The trend toward specialization has caused a number of Austrian enterprises to export 80, 90 or even more per cent of their products. A typical example are fully automatic track tamping machines with which two-thirds of the world market are supplied by an Austrian producer.

Besides the export of commodities, the export of large units — up to turn-key

Continued

plants — is gaining in significance. among the deliveries recorded during the first half of 1978. we find more dressing plants for Venezuela. exhaust gas purifying plants for Sweden. high-rise water tanks for Iraq. a thermal power plant for Yugoslavia. and decortication plant for Cameroon. In Nigeria. a complex of truck- and tractor-assembly halls is being erected on an area covering some 10.000 square metres. In addition. the complete prefabricated electric equipment for this plant is being supplied. For the third stage of development of a steam power plant in Thailand the electric equipment as well as the installations for the cooling water supply are being delivered; a hydro-electric power plant in Turkey is receiving its electric and hydro-mechanic equipment from Austria. In Algeria. an Austrian company is participating in the construction of a turn-key textile factory. complete with dwellings for the workers.

The Syrian port Tartous is importing electric weigh-bridges from Austria. Poland fork-lift trucks. Baghdad escalators. In Guatemala. an Austrian company is building a cable railway. while others are erecting a combustion plant for industrial waste in the USSR and an abrasives and sand-paper factory in Algeria. Further large orders include 200-ton floating cranes for Libya. supermarket fittings for the German Democractic Republic. and steel tunnels for under-ground railways in USA.

For a number of years. in the spheres of production and export the trend towards joint ventures. towards co-operation of equal partners beyond national frontiers. has become more and more apparent. The Austrian Federal Economic Chamber has actively participated in this policy of co-operation by arranging contacts. offering advice. passing on requirements. working out problems and making suggestions. It draws up the working papers for the mixed commissions and special working groups and procures data on the legal and tax situation in joint ventures.

Joint ventures

In this field. as in many others. an institution proves useful which takes account of Austria's structure made up mainly of small and medium-size enterprises: the Foreign Trade Organization of the Austrian Federal Economic Chamber. With the help of about 80 Foreign Trade Delegations on all continents it can offer these companies the services which small enterprises could not afford themselves. By picking representatives. dealing with authorities. transmitting offers. investigating markets and personally advising representatives of companies who are visiting customers. the Commercial Counsellors provide flexible and no-red-tape assistance in the negotiating of important export deals. Added to this are various events arranged by the Federal Chamber in Austria and abroad for the purpose of stimulating exports: from foreign trade meetings and company calling days at home. to org participation in fairs. meetings of p tive customers. trade missions. A Weeks. exhibitions in department and similar campaigns abroad.

Of course. the last two types of are designed primarily for the ex consumer goods. which is also p intensively and which quite freque related to specifically Austrian fact this respect let us mention the fi winter sports in which Austria p leading part — in the production of well as in the designing of sports fa Other sectors of consumer accentuate Austrian talent in art handicrafts. Fashions. lace broidery. leather goods. co llery and other design article red throughout the world. C s chandeliers lighten up politan Opera in New York a ference Centre in Cairo.

new material for glasses. as w design. have met with interest in tries. even in the Far East. In this made-to-measure service" is of in glasses specially framed nese noses.

Austria's tourist traffic is a so "export" factor. With more than million night's lodgings during Austria. together with France and I tops the list of European tourist count Totalling seven per cent of Austria's G her share of foreign exchange rever from tourist traffic is the highest in Eur

THE ORGANIZATION OF THE AUSTRIAN FEDERAL ECONOMIC CHAMBER

by Friedrich Gleissner

Head of the Department for Trade Policy and Foreign Trade, Federal Economic Chamber.

In 1946, four Austrian Foreign Trade Delegations were in existence up to the end of 1978, the Austrian Federal Economic chamber, by gradually adding to their number, has created a network of 83 Foreign Trade Delegations. These figures reflect the development of Austria's foreign trade: not only in quantitative respect but also in its regional distribution — in other words, its ever increasing geographic significance. Parallel to this quantitative and qualitative evolution of foreign trade, the tasks of Austrian Commercial Counsellors, the activities they have to carry out, have diversified and increased.

The main tasks of an Austrian Foreign Trade Delegation are to assist Austrian companies in the preparation and realization of export and import deals.

Within this far-reaching scope, the tasks of commercial Counsellors are manifold; they require a high degree of adaptability. It is expected of commercial Counsellors to be fluent in two universal languages — usually English and French; however, most of them have also acquired a good

Dr. Friedrich Gleissner

knowledge of the language spoken in the area where they are serving, so that they can improve contacts and receive as well as offer reliable and direct information.

A "classical" form of activity results from the desire of Austrian companies to export to a country with which no previous trade contacts exist or where trade contacts have not developed to their satisfaction. In such a case it is the task of the Commercial Counsellors to make market investigations, to arrange contacts with local businessmen and to acquire information on the solvency of business partners.

Another field of activity of Foreign Trade Delegations are interventions. This regards mainly interventions of Commercial Counsellors with foreign companies and authorities on behalf of claims or requirements of Austrian companies. The most important task of Austrian Foreign Trade Delegations is to accumulate, evaluate and channel business information. This function of passing on information aims into two opposite directions: Foreign businessmen want to get prompt and reliable advice on the possibilities of supply and marketing, respectively on other commercial data about Austria. Austrian business, on the other hand, demands information on export markets, covering questions from general market reports and

ion work directed towards Austria. The eign Trade Delegations are con- ously endeavouring to utilize a variety nformation: Besides purely statistical (which are more or less voluminous easily accessible, depending on the ective country), pertinent laws, regula- s and provisions, Austrian companies ve all demand assessments of market chances for Austrian products and of ential business partners. Important mations designed for an individual rian company or a limited number ompanies are made available to those tly and without any red tape.

ll news which might be of interest to a r field of Austrian business are con- d through the "Foreign Trade" news ce from the reports by Foreign Trade ations to interested parties.

In describing the activities of mercial Counsellors, the main er was put on export. In fact, the t Austrian Commercial Counsellors as well assistance for Austrian impo panies. However, they have other tions, too: Many of them act as ho representatives for the Austrian trade promotion and for Austrian fi general, all Austrian companies may the assistance of our Foreign Delegations. And they do. □

The first time in Egypt effervescent vita tablets are being produced with help Austria — with machines, special ingred and know-how from Austria. Topmar ion, the pharmaceutical manufac ion, technology in a closed vacuum s veloped by the firm of Chemofarm mu ssible to produce products sensitiv mp like effervescent tablets ev ical countries.

.G.

Krausstrasse 7, Postfach 301, A-4020 LINZ/AUSTRIA
Telefon: 56441 Telex: 021276 Cables: Elektrobau Linz

EBG

NIGERIA-AUSTRIA TRADE RELATIONS

by G. A. Richter, Commercial Counsellor at the Austrian Embassy, Lagos

SINCE the commencement of the trade relations between the two countries almost 7 years ago the pace of economic co-operation has increased considerably.

In 1977 Nigeria became the third biggest Austrian export market overseas, trailing behind USA and Iran only with a trade volume of ₦94 Mio, the Austrian exports amounted to ₦71 Mio.

The key to Austria's success in the African markets is her economic strength and the competitiveness of her products vis a vis those of the industralized countries. The structure of the Austrian economy, being mainly centred around small and medium sized enterprises, provided the ideal basis for an industry which could easily adapt to the requirements of the export markets and therefore "tailor-made" products and services could be offered to the Nigerian customers. A further incentive for Nigerian business circles to trade with Austria is her system of social partnership which almost eliminated strikes and other economic ills and therefore, guarantees stability as well as realiable and continued sources for the supply of goods, services and alike.

G. A. Richter

In the early stages the main pattern of Austro-Nigerian economic relations was the bilateral exchange of goods especially in the consumer field. Later on this was followed up by Austrian exports of heavy machinery and capital goods, like electrical and hospital equipment, turbines, printing, wood and paper processing, plastic extrusion machinery as well as turn key projects. The joint Austro-German steel-plant in Warri is the latest achievement.

It is worthwhile mentioning that Austrian activities are not only confined to the supply and supervision of the above mentioned goods and plants but that they have spread considerably in the field of joint-ventures with Nigerian partners. Apart from the biggest undertaking in this direction, a truck assembly plant in Bauchi which is expected to start production early next year, Austrian-Nigerian joint-ventures already exist or are being considered in the fields of textiles, electrical equipment, furniture, building, iron and steel and stationery industries.

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

Emphasis also is being given to the educational aspect in particular to the training of Nigerian students or factory workers in Austria. Presently there are several Nigerians studying or undergoing intensive training at vocational training centres or at private companies. The official visit of the Honourable Federal Commissioner of Industries, Dr. R. Adeleye, to Austria in July this year stressed the importance of Austria's role in contributing to the development of the Nigerian industry.

Continued

SIMMERING-GRAZ-PAUKER AKTIENGESELLSCHAFT

für Maschinen-, Kessel- und Waggonbau

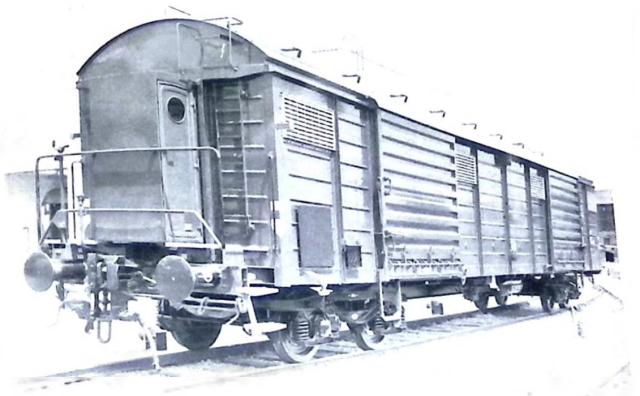
A-1071 Vienna, Mariahilfer Straße 32

Intensive efforts in international co-operation build a prerequisite for continuous growth. The Austrian company Simmering-Graz-Pauker Aktiengesellschaft is an internationally renowned partner, especially for the execution of all kinds of co-operation schemes.

One of the main recent achievements in the field of international co-operation was the planning of a wagon factory at Arak/Iran, within the framework of the industrialisation of the Iran. In 1974, an Iranian company, Wagon Pars Company, was founded with the purpose of producing goods wagons indigeniously and executing all repairs and services for wagons for the Iranian State Railways. Under the supervision of SGP experts a complete plant is being established on an area of 33 hectars. Initially goods wagons of various types shall be manufactured at this plant, at first approximately 1000 per year.

This is just a typical example of the method of co-operation of SGP with a partner in a foreign country in the field of railway rolling stock. Apart from manufacturing railway rolling stock of all kinds and types, the company manufactures containers, steam boilers, apparatus and industrial plants, cranes and conveying equipment, gear units, diesel engines, machine tools for non-cutting shaping, brickmaking plants and machinery, ore and mineral dressing, water and waste water treatment plants.

Thanks to research and development for a period of more than one and a quarter centuries, the company holds a leading position in the National Industries of Austria.



In order to offset the unfavourable balance of trade with Austria and to promote her products, Nigeria participated with an official Pavilion at the Vienna International Trade Fair (16th to 24th September, 1978) by displaying a cross-section of agricultural and handicraft goods etc.

In spite of the present "Austerity"-budget and the financial restraint on various projects originally ear-marked for an early completion there is still room for co-operation between foreign and indigenous partners in various industrial fields.

This is why the Austrian Federal Economic Chamber decided to organise a Trade Mission in 1978 as well which will visit Nigeria from November 27th till December 6th. So far delegates representing about 30 Austrian companies will participate which shows again the trust and the interest of the Austrian businessmen in the Nigerian economy.

Possibilities of Nigerian-Austrian co-operation and joint-ventures will be the main objective of this year's Mission which will tour several provincial towns in the Federal States of Lagos, Oyo, Kano, Kaduna, Bendel, and Anambra.

I am convinced that these continued efforts in fostering the bi-lateral economic co-operation between Nigerian and Austrian business partners will bear fruits and enhance the two-way flow of know-how, services and goods to the benefit of both countries. □

AUSTRIAN RESEARCH IN SOLAR ENERGY

"THE use of the sun's energy" is, according to the Austrian Nobel Prize winner Konrad Lorenz, one of the most urgent problems for the future.

Solar energy is completely non-polluting and available in all countries with great local variation. In equatorial regions it could be used all the year round — in other latitudes the sun's intensity varies considerably from season to season.

In Switzerland and Germany it has been estimated that solar energy will be able to cover five to 10 per cent of the total primary energy yield, or 15 to 20 per cent for smaller objects such as the heating of homes, swimming pools, etc.

In 1976 the Osterreichische Gesellschaft für Sonnenenergie und Wietraumfragen (Austrian Society for Solar Energy and Space) Ges.m.b.H. was founded, and deals with the co-ordination of Austrian and international research and development projects as well as with the training of specialists and the supplying of information useful to industry. In Austria several small-scale objects run on solar energy, mainly the heating of rooms and domestic warm water supply. The largest is the Eggersdorf Baths near Graz, where the solar collectors of the firm of Vogel & Noot cover a roof area of 720m² and heat the pool, the cabins and other rooms.

Among the Austrian firms concerned with solar energy, mention must be made of the following: **Vogel & Noot** (see above) of Wartberg, whose solar heating programme includes flat collectors for gravity plant, greenhouses and do-yourself installation, allowing heat supply even at relatively low temperatures and overcast sky. The **Vereinigte Metallwerke Ranshofen-Berndorf** specialize in flat collectors for domestic heating and swimming pools. They have developed a highly effective Alustar-Solar Collector which is remarkable for durability and easy-care. Flat collectors are also made by **Hammer** in Graz, while **Swarovski** Kristens make concentrating collectors with a highly reflecting surface of segmented mirrors, which can easily be worked into various materials, such as plastic, Eternit, aluminium, etc.

Basic research is concerned in Austria only with solar collectors but with several scientific projects as well. The results of this research have been recognized recently, thus Austria plays a leading role in the group "Solar Energy Systems" as part of the International Energy Agency. The development of a solar power plant is to be completed at the end of 1978 at Seibersdorf, should also be mentioned. This power plant will be especially useful for developing countries, who will receive the know-how free. □

FACTS AND FIGURES ON AUSTRIA

Area: 83.850 square kilometres
Population: 7,456.000 (1971)
Austria is a federal republic consisting of 9 provinces

	Population	Capital
Vienna	1,615.000	Vienna
Lower Austria	1,414.000	
Upper Austria	1,223.000	Linz
Salzburg	402.000	Salzburg
Tyrol	541.000	Innsbruck
Vorarlberg	271.000	Bregenz
Carinthia	526.000	Klagenfurt
Styria	1,192.000	Graz
Burgenland	272.000	Eisenstadt

Federal Capital: Vienna

POLITICS

Form of Government: Federal Republic
Parliament consists of two houses.

The system of social partnership is a specially Austrian phenomenon, in which the Board of Trade, the Trade Union Federation, and the Boards of the Chamber of Labour and of the Chamber of Agricultural Labour co-operate. The most important institution of the social partnership is the Parity Commission for wages and prices.

POPULATION

Total working population 1976	3,001.250
male	1,847.000
female	1,154.250
thereof dependently employed	2,685.900
male	1,632.500
female	1,053.400
foreign workers	173.900

Unemployment rate 1,8% (1977)

SOCIAL BENEFITS

40 working hours per week (since 1975)

Strikes 1977:

Man-hours lost through strikes	86
Number of strikers involved	43

Holidays: Minimum annual paid holiday for dependently employed – 24 working days (as from 1977).

Eligibility for old age pension:

for men	60–65
for women	55–60

ECONOMY

GROSS NATIONAL PRODUCT 1977

795.800 million AS

ANALYSIS OF GNP 1976

	in 1.000 mill. AS	%	variations in % against 1975
Agriculture + forestry	36,9	5,1	+ 8,3
Industry + commerce	230,1	31,6	+12,5
Construction industry	68,8	9,4	+ 6,2
Electricity, gas, water	22,5	3,1	+10,4
Communications	40,6	5,6	+15,3
Trade	84,3	11,6	+12,4
Public services	84,8	11,6	+10,5
Other services	106,5	14,6	+ 9,9
Contributions for value added tax	54,2	7,4	
	728,7	100,0	+11,4

CONSUMER PRICES INDEX

rate of increase in %	1977	1978 estimated
against the preceding year	5,5	4,5

AUSTRIA'S MAIN TRADING PARTNERS (geographical structure) 1976

	Imports: in 1.000 mill. AS	Imports: %	Imports: variations in % against 1975	Exports: in 1.000 mill. AS	Exports: %	Exports: variations in % against 1975
Europe	174,3	84,6	+25,1	125,4	82,4	+14,6
EEC	130,6	63,4	+28,4	71,0	46,7	+22,8
EFTA	20,1	9,8	+15,7	22,0	14,5	+10.0
Eastern Europe	19,6	9,5	+17,8	23,0	15,1	+ 3,2
Rest of Europe	3,9	1,9	+13,1	9,4	6,1	+ 1,1
Overseas	31,8	15,4	+31,9	26,7	17,5	+24,4
Asia	15,2	7,4	+31,4	10,9	7,2	+27,1
Africa	4,9	2,4	+24,3	6,6	4,3	+24,3
North America	7,0	3,4	+28,2	5,1	3,3	+21,0
Latin America	4,1	2,0	+49,2	3,5	2,3	+29,6
Australia and Oceania	0,6	0,2	+58,3	0,6	0,4	– 8,0
World total	206,1	100,0	+26,1	152,1	100,0	+16,2

For world imports Austria occupies the 16th place, for world exports the 17th place.

BALANCE OF PAYMENTS

in 1.000 mill. AS	1976	1977
Balance of trade	–53,236	–71,442
Service balance	+25,195	+22,200
thereof tourism 1976: +26,351 1977: +24,635		
Balance of transfer	– 0,948	+ 0,132
	–27,093	–49,110
Changes in monetary reserves	–21,865	–20,795

THE FEDERAL BUDGET

Projected budget in 1.000 mill. AS	1978	1977
Expenses	267,5	240,8
Receipts	227,1	197,2
Deficit	40,4	43,6

PRODUCTIVITY

Industrial production in 1.000 mill. AS	1975	1976
	318,9	359,3
Industrial production showing the percentual share of the main groups in total production		
Foodstuffs	14,2	13,9
Chemicals	12,5	12,4
Steel construction and engineering	10,1	10,0
Electrical industry	7,2	7,1
Iron and metal goods	7,2	7,1
Textiles	6,2	6,1
Petroleum	5,8	6,4
Paper	5,2	4,9
Metallurgy	4,8	5,6
Stone and ceramics	4,2	4,1

POWER 1976

		variations in % against 1975
Power consumption (1976 in 1.000 tons of coal)	28.732	+6,5
Home production	10.327	–8,9
Total power production (home and imported) as % of basic fuels:		
Solid fuels	19,2	
Oil products	51,7	
Natural gas	19,1	
Hydro-electric energy	10,1	

FOREIGN TRADE 1977 in 1.000 mill. AS

Imports	234,841
Exports	161,781
Balance	73,060

FOREIGN TRADE analysed according to major groups of goods

Imports 1976	in 1.000 mill. AS	variations in % against 1975
Machines	24,2	+21,8
Vehicles	23,3	+50,0
Electrical equipment	17,3	+31,1
Textiles	11,2	+17,3
Various finished goods	9,0	+ 29,6
Clothing	7,4	+32,0
Iron and steel	6,6	+10,4
Metal goods	6,4	+28,9
Raw materials and alloys	6,0	+18,6
Synthetic products and resins	5,5	+32,6
Non-ferrous metals	4,3	+21,4
Exports 1976		
Machines	21,8	+13,7
Iron and steel	15,8	+ 2,1
Electrical equipment	13,7	+18,6
Various finished goods	10,6	+18,4
Textiles	10,1	+14,8
Paper and cardboard	8,7	+11,4
Timber and cork	8,1	+50,5
Metal goods	7,2	+20,3
Non-metal. mineral products	5,0	– 4,0
Raw materials and alloys	4,0	–15,6

TOURISM 1977

		variations in % against 1976
Foreign visitors registered (arrivals)	11,800 mill.	+ 1,3
Balance of foreign exchange from tourism 1977	in 1.000 mill. AS	
Revenue	+54,906	+ 7,4
Expenditure	–30,271	+22,2
Cover of Balance of Trade through tourism		33,7%

STANDARD OF LIVING

Consumer durables in use:	
Private cars	1,828.050
Motor cycles	515.815
Telephone	1,623.449
Radiolicences	2,185.034
Television licences	1,968.935

SEMPERIT TYRE

Top Quality Products from Austria

THE SEMPERIT group is the fourth largest private enterprise in Austria. Turnover amounts to some 8,200 million Austrian schillings, and production in 1977 topped 165 thousand tons of finished products. The group produces more than 4,000 different rubber and plastic products. The marketing programme includes all kinds of tyres for motor vehicles and bicycles, industrial and surface rubber ware, consumer and household articles, expanded plastic products, footwear articles for recreation and sports. It has also granted manufacturing licences in 20 countries and provides all know-how for production. More than 50% of Semperit's turnover is made in 138 countries of the world, chiefly in those countries in which the group has subsidiary companies, in West Germany, Switzerland, Great Britain, Sweden, Greece and the United States.

An enterprise of international standing

Semperit is an enterprise of international standing. The group has 13,500 employees and is thus the largest employer in the Austrian chemical industry. The group has many subsidiaries and factories in Austria, a factory in Germany and a tyre factory in Dublin. Research and development are priority considerations, and as one result Semperit was the first European company to offer a 50,000 kilometre guarantee on a steel belted motor tyre. Semperit also was one of the first European enterprises producing full steel cord STC radial tyres.

Although Semperit was not the first to come up with the idea of the full steel tyre, they have improved the technology considerably and made great advances with the system.

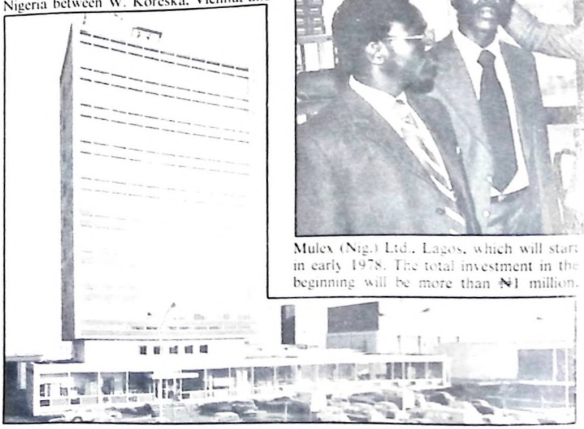
Particularly, this tyre had made many friends in Nigeria within a very s Its reliability ensures not only the man and load but also guarantee delivery, as well as punctual ke schedules and therefore utmost re The excellent service connected purchase of these tyres is cert additional good reason why many contractors and forwarders pr oose Semperit. □

This special supplement has been realised by Progress Documentations (Ska Gesellschaft m. b. H. & Co. KG, A-1191 Vienna, Muthg 2, Tel: 36 52 50-304/305, Telex: 7/5406 or7/4110 in collaboration with the Federa Economic Chamber of Austria.

TIXO (NIGERIA) LTD.

AUSTRIAN QUALITY PRODUCED IN NIGERIA

Another step in Nigerian-Austrian co-operation is the realization of the joint venture project for stationery production in Nigeria between W. Koreska, Vienna, and



Mulex (Nig.) Ltd., Lagos, which will start in early 1978. The total investment in the beginning will be more than ₦1 million.

The picture shows the Nigerian Co... for Trade and Industry, D... Adeleye (right side of the picture) ... members of his delegation discussin... project with Mr. Peter Koreska, Chai... of W. Koreska, Vienna.

W. Koreska, founded in Vienna ... years ago now enjoys co-operation ... factories spread across the world — a ... stant reminder to millions of TIXO-KORES quality products. □

CREATIVITY, QUALITY AND READINESS TO TAKE CHANCES

STRIA is quite different ... the ...dard cliché generally asso... with ...untry. The Viennese Boys' ..., the ...zaner horses, "Wiener ...tzel", ...e gardens and apple stru... only ...part — but inventivenes... feeling ...quality are even more pa... Austria. ...se qualities make it ...ible for ...rian industry to prod... thorough, ...d work. For example:

- One Austrian firm is one of the world's leading manufacturers of amateur film cameras and exports to around 130 countries. This firm is also the world's biggest producer of sound projectors. Ever since the first narrow film projector was made in 1931, Austria has always been in the forefront of new pioneer work and developments in this field. Today their range includes laser equipment, video-observation installations, and top-class hi-fi cassette recorders.
- Austrian cable-cars bring tourists up the highest mountains in safety and comfort — in Switzerland, the Federal Republic of Germany, Portugal, Yugoslavia, Italy, the USA, Canada and even Brazil.
- International aviation depends on Austrian know-how, a Lower-Austrian firm develops and builds testing apparatus for the construction and servicing of aeroplanes. With this equipment the electrical and hydraulic components of the aeroplane, the revolution counter and the navigation systems can be controlled with a maximum of precison.
- Austria even has a role to play in space: an Austrian firm has been commissioned to make the front window for the space laboratory "Spacelab". The "nose segment" will be of Austrian origin.
- Back from space to solid earth: all Swiss telephones are equipped with dials made to Austrian principles of construction. So whoever dials a number in Switzerland, chooses an Austrian "number"?
- The Swiss postmen are also equipped

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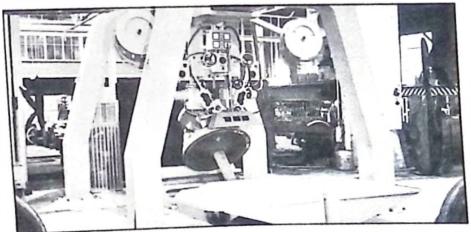
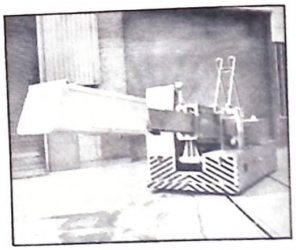


ELIN'S automatic wheel flange welder helps to get considerably more mileage out of wheel flanges of rail vehicles.

Continued

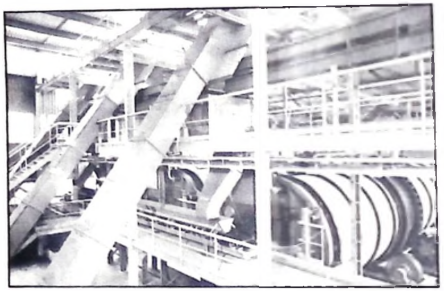
with Austrian goods: their mopeds, which help considerably to speed up deliveries, come from Austria.

- Austria has already won a victory at the 1980 Olympic games in spite of keen international competition. Austrian technicians have been commissioned to supply the connecting system for the world TV.
- Austrian know-how is held in high esteem by the demanding US automobile industry: two Austrian firms have signed a licence agreement with the Ford concern, where the method of priming the car bodywork will be changed to the system developed in Austria.
- Whoever uses a rubber stamp, may well use an Austrian one: an Austrian firm is the biggest manufacturer of rubber



Box charging machine for feeding electric steel furnaces. Ruthner has developed a whole range of these machines for various uses in iron and steel works, ferro-alloy plants and chemical industries. The company makes machines with interchangeable boxes, push-boxes and shanks and ladles. They are available with electric or diesel drive.

The historical LD experiment in Linz in 1[illegible] was the starting point for the [illegible] development of the world's steel [illegible] and was an Austrian invention. The [illegible] great Siemens Martin open hearth [illegible] could only produce a maximum of 40 [illegible] of steel an hour in 1953, there are LD [illegible] ties today with a capacity of 500 [illegible] hr. And 52% of the raw steel produc[illegible] world in 1977 was with the LD process



Garbage and sewage sludge decomposition systems based on the Ruthner MSA process help to solve a difficult environmental problem: not only can garbage and sewage sludge be treated together without harmful side effects, but the wastes are converted into a non-polluting, economical soil-improving agent.

[illegible]amps in Europe, and supplies [illegible] amps, for example, in 40 [illegible] languages.

Austrian track tamping machi[illegible] supply two-thirds of world demand. [illegible]e can find examples for Aust[illegible] creativity, quality and readiness to [illegible] as in early all branches of [illegible] engineering, precision mechanics, electr[illegible] engineering, film technology, [illegible] electronics, metallurgy, the chem[illegible] industry, nuclear physics and techn[illegible] computer science, winter sports a[illegible] toys, arts and crafts, textiles and fin[illegible] and last but not least tourism. □

EXPORT TO AFRICA CHARACTERIZED BY LARGE-SCALE PROJECTS

ONE OF Austria's most promising overseas trade partner is Africa. The scope offered is extremely diverse and differentiated ranging from cattle for breeding to embroidery products and nuclear reactors. In this respect, Austria's export is strongly characterized by large-scale projects in the construction sector. It is this field that offers the best opportunities for future export developments.

Nigeria is the most important buyer of Austrian products in Africa, ranking third on the list of Austria's overseas markets. Among the most significant events within the scope of our trade partnership with Nigeria may be counted the erection of a Steyr lorry and tractor plant.

The figures reflecting our export to Zaire are also increasing. During the last year, there has been a certain shift in products traditionally exported to this area. Besides deliveries of large-scale projects, as, for instance, a yeast factory and supplies for a power plant, consumer goods have gained significance.

Our foreign trade with Zaire too, is characterized by project deliveries. The major part of Austrian exports consists of supplies for the petroleum refinery in Pointe Noire. Here, too, the future of Austrian export is based on orders for complete installations.

The Ivory Coast, a partner reliable in political as well as in economic respect, buys above all paper and cardboard in great quantities. Here the best opportunities are in the investment sector and in the delivery of complete plant.

Our export to Kenya shows a strong increase. The scope of offers is far-reaching, covering products from chemical elements to machines for specialized industries. A number of medium- and large-scale projects, as., e.g., the equipment for a fertilizer plant, two plants for the production of plastic goods, and the erection of a tannery contributed most to this considerable increase.

A turn-key cellulose plant for the Cameroon is just being constructed in a joint venture by East- and West-European companies, the venture being headed by VOEST-Alpine AG. The plant, which will have an annual capacity of 122.000 tons bleached sulphate cellulose, will use exclusively tropical foliage trees and will start operation by 1980.

In the face of international competition

Alpine Miner 100

[illegible] the company Rudolf Bauer KG [illegible] succeeded in securing an order [illegible] and installation of sprinkling [illegible] amounting to 800 million AS for [illegible] Coast. The two large pump stations [illegible] equipment — constituting th[illegible] Austrian large-scale project in th[illegible] Coast — will be delivered by Au[illegible] subterranean pipelines by Durit-K[illegible]

A modern dry-decortification [illegible] the cellulose factory Cellulam is [illegible] roon was also delivered by the [illegible] engineering works. This plant will [illegible] bark from 173 round-metres [illegible] tropical foliage trees per hour.

Elin-Union is supplying a [illegible] electric outfit for this lorry plant in [illegible] its value amounting to 115 million [illegible] crucial points of the order are the [illegible] installation of the electric equipm[illegible] the erection of a diesel gener[illegible] independent power supply.

AUSTRIAN TRADE MISSION IN NIGERIA

27. 11. — 5. 12. 1978

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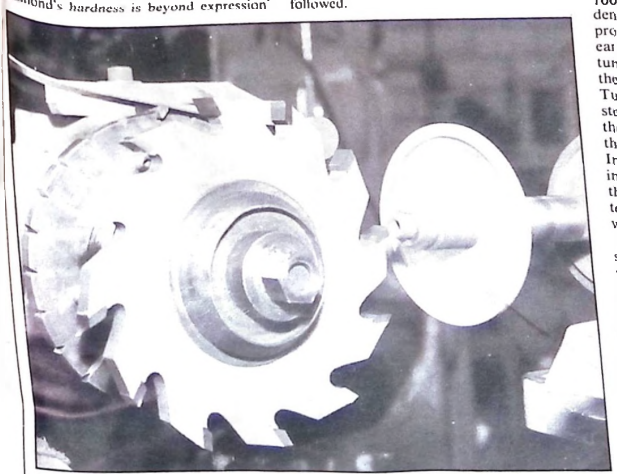
Diamonds are industry's best friend

De Beers CDA55N — a metal coated diamond abrasive used in resin bond grinding wheels for grinding tungsten carbide.

IS still less than 40 years since industrial iamonds were almost universally ejected but the outbreak of war in 1939 ought about a rapid reverse and gem iamonds, for all their beauty, had to ccept second place to the less prepossess- ng industrial diamond. In a foreword to the brilliant Armament' by Reginald armor published in December 1941, A. E. Lee, Assistant Secretary Ministry of Supply, wrote, 'the stones...demonstrate day by day in grinding, turning, wire drawing and other countless engineering operations with adamantine durability which will lead us to victory.' But for thousands of years, diamonds had been used periodically for purposes other than adornment. It is nearly 2,000 years since the Roman writer, Pliny, declared that 'the diamond's hardness is beyond expression' and expanded on how diamonds could be crushed to a fine grit and that 'these particles are much in demand by engravers who enclose them in iron and are thus able to cut hard substances!' On reflection it is perhaps remarkable that it was not until the nineteenth century that diamonds began to be used again for what are now known as industrial applications; although Pliny's 'Natural History', produced around AD77 did run to 37 volumes of which only the last dealt with precious stones.

The polishing of gem diamonds and other precious stones with diamond powder continued to be the main application of industrial diamonds in the centuries that followed.



One of the main areas of industrial diamond application continues to be the re-grinding, or sharpening, of tungsten carbide tipped tools. The resin bonded wheel on the right contains fine diamond grit.

The first real instance of the manufacture of a diamond drill is recorded in the encyclopaedia of Diderot published in 1751 in Paris in which a miner is described as drilling a hole to be filled with gunpowder for blasting for which he used an iron bar tipped with diamond octahedra; the tool was alternately raised or dropped while being rotated. This process was updated in 1862 by R. Leschot of Switzerland who developed a more sophisticated rotary rock drill. Other early developments included the first use of diamond as a lathe cutting tool in 1877 and the patenting in the UK of a diamond die for drawing wire in 1819. It is more than 100 years since diamonds were first used in dentist drills. But it was not until the mass production era, especially of motor cars, earlier this century and the development of tungsten carbide that diamonds achieved their first real sustained use in industry. Tungsten carbide was used to machine steel and it was found that diamond was the most effective agent capable of grinding this new and extremely hard substance. Indeed it has been recorded that 'without industrial diamonds' capacity for grinding the new cutting tools, mass production techniques we take for granted today would not be possible.'

This was the beginning of diamond's sustained contribution to industry but it was only during World War II when the uses and applications for industrial purposes accelerated at such a rate that a permanent future role was ensured for the industrial diamond.

Current and estimated future production of natural and synthetic diamonds

As can be seen from the accompanying chart, total annual consumption of industrial diamonds increased about five-

Continued

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- Output 800/1000[illegible] Per Day
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- Price so low tha[illegible]e written off in a short period

- *Suitable for contractors and lighter industrial use*

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- Price so low that can be written off in a short period

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INTER 100

- Output 3500/4000 blocks per day
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- Reliable Hydraulic/Electric Power
- Feeding by Barrow or Special Hydraulic Dumper

- *Suitable for continuous production use*

Note: Standard Moulds are for Hollow Block Sizes 40 × 20 × 20 cm, 40 × 20 × 15 cm and 40 × 20 × 10 cm though other sizes ava[illegible]
Outputs based on Moulds of 40 × 20 × 20 cm and are higher for smaller sizes.

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...m 1939 to 1945 and today annual ...ption of natural and synthetic ...al diamonds is well in excess of 100 ... carats and throughout this century ... down a remarkably steady annual ... rate of about 9% per annum — ... ting disruptions caused by reces- ... and war economies.

For nearly 100 years De Beers has ... a unique position in the supply of ...al diamonds, both gem and industrial. ... the total natural diamond production ... 80% is of industrial quality which ...ounts to approximately 39 million ...ats a year, including the USSR whose ...ustrial output is almost certainly con- ...ned internally, and it has to be ...phasised that no diamond mine can be ...rked economically on industrial produc- ...on alone. This means that the primary ...rpose in operating existing mines and ...eveloping new ones is the recovery of the ...m content which in effect is subsidising ...e production of industrial diamonds.

Prolific mine

The most prolific and important producer of natural industrial diamonds is the Miba mine at Mbuji-Maije in Zaire which provides the boart used for the production of an extensive range of natural diamond abrasive products. Excluding the USSR, the Orapa mine in Botswana is second in terms of industrial output. It is the second largest-known kimberlite pipe in the world and will still be producing well into the next century. Of its current total annual output of around 2.4 million carats, about 85% of Orapa's production is of industrial quality and plans are well advanced to nearly double its mining capacity in 1979 to an annual rate of 4.5 million carats.

Also in Botswana, a new mine at Letlhakane was opened in 1977 and a further large deposit has been discovered at Jwaneng which, it is estimated, will reach commercial capacity at an annual rate of 3.5 million carats in 1982 rising to 6.0 million carats by the mid 1980's. Also in 1977, De Beers opened another mine — Letseng-la-Terai — in Lesotho. Collectively, De Beers' substantial plans to progressively increase the production capacity from its own mines could result in a further 6.5 million carats of industrial diamonds being produced per annum within the next few years.

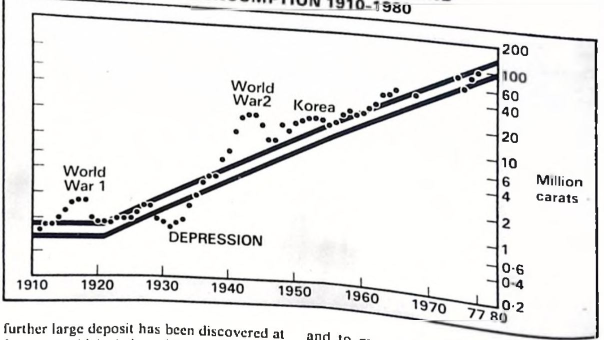
The largest producer of industrial diamonds in West Africa is Ghana where total annual production is currently around 2.25 million carats of which some 85% to 90% are of industrial quality.

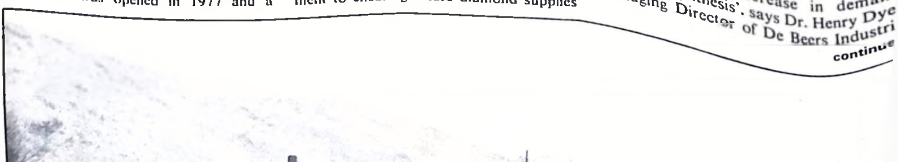
The capital costs today of bringing a new diamond mine into production ranges from around $40 million or $50 million to over $200 million for a large operation. To emphasise the extent of De Beers' commitment to ensuring future diamond supplies and to meet growing demand, the capital expenditure required on increasing its diamond mining capacity from 11.8 million carats in 1977 to an estimated 15.8 million by the end of 1979 (based upon the current rate of production), nearly 20.0 million in the early 1980's and some 22.0 million carats by the middle of the next decade, will be in the region of $600 million. To this must be added the very high cost of prospecting and research required in the exploitation of each new diamond deposit.

There is a logical division between natural and synthetic diamonds used in industry and where for reasons of supply the natural products has been unable to meet demand, synthetics have proved to have sufficient adaptability to be able to fill the gap. Synthetics were first produced in the mid 1950's and since then, they have largely met the increase in demand. 'Diamond synthesis', says Dr. Henry Dye, Managing Director of De Beers Industri...

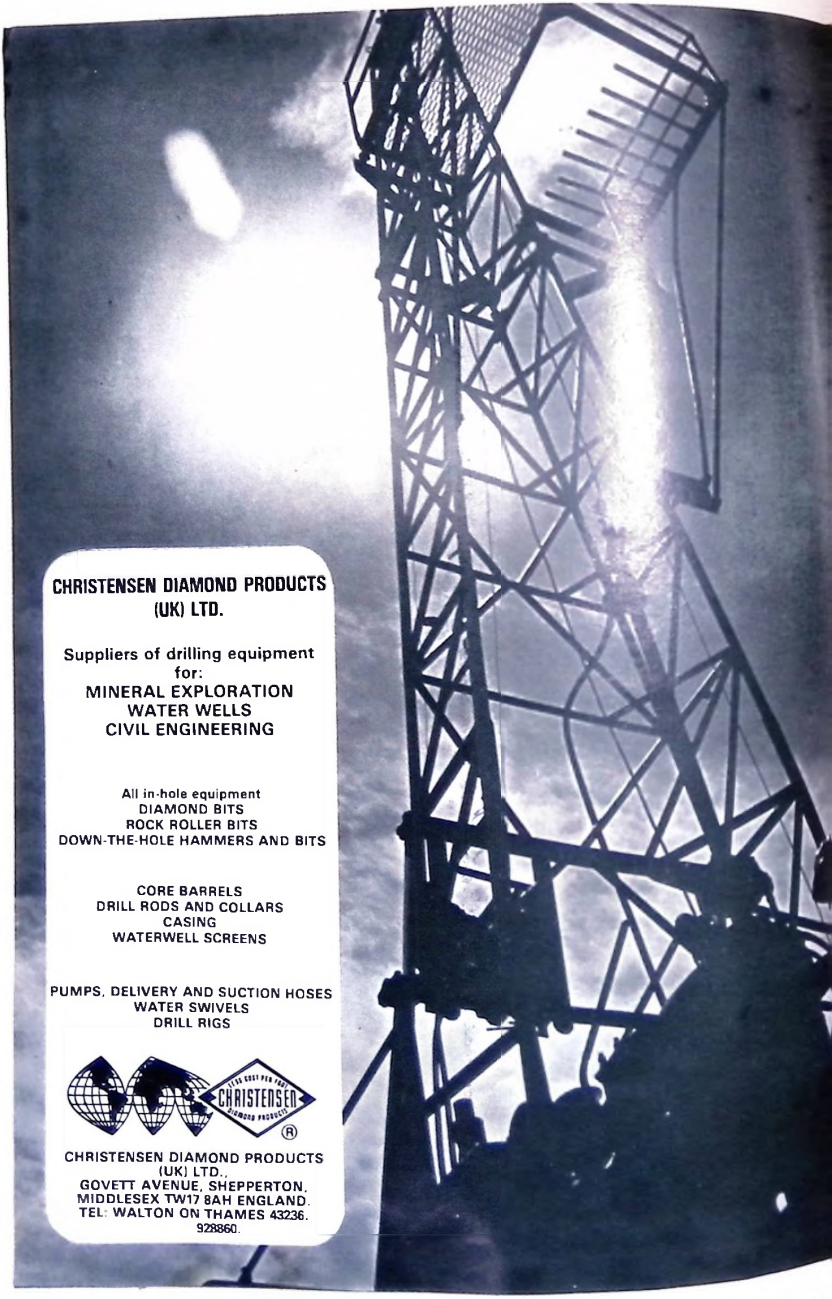
continue...

ESTIMATED INDUSTRIAL DIAMOND CONSUMPTION 1910-1980





Grinding 'bumpy' concrete road surfaces flat and true, and generating anti-skid grooves in surfaces which have worn dan... smooth. This operation is carried out by special machines fitted with diamond blades. Mammoth 22,000 lb machine in the fo... is fitted with 265 diamond cutting blades. Behind the machine is a water tanker for cleaning the road surface.



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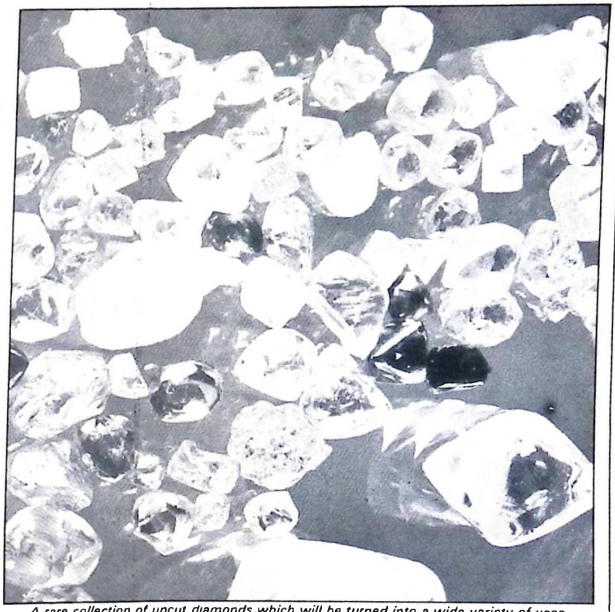
...ond Division, 'is like diamond ...ining, ...intensive, and while the lead time ...sion of production is not ...long it ...significant. This require...that the ...ble supplier of synthetic ...iamond ...plan production expans... well in ...ce of requirements in o... to have ...talled capacity at the ti... when it is ...ed. As a counter-effect... ...gument, ...mond synthesis technolo... ...ing very ..., is advancing very ra... and thus ...e installed too genero... ahead of ...mand may well be obsole... fore carry-...out its useful product... life. In this ...ect it is interesting to ...e that of the ...presses originally instal... at Ultra High ...ssure Units, Springs, as... which went on ...eam in June, 1961, not ...e is now being ...ed for diamond or cubic boron nitride ...thesis.

Possible disruption

To meet future demand, we in De Beers have taken the view that the risk of obsolescence is the lesser, and we are engaged in a continuous programme of planned expansion and up-grading of existing facilities. This programme is designed to handle a very large growth in demand, which we believe is the true potential of the industrial diamond industry.

"We have also been concerned, lest, in these disturbed times, concentration of all manufacturing in one location — desirable though it may be for many reasons —

Continued



A rare collection of uncut diamonds which will be turned into a wide variety of uses. Research is continuing into new uses for industrial diamonds and their applications in industry are growing at a fast pace.

NITECO recommends LOEWE-WATER-PUMPS, an universal programme.

LOEWE produces water pumps for several fields of application. For cold and warm, clear and dirty water. For private and professional use. The high wear resistance, long-life, silent operation and the excellent reliability of LOEWE-Pumps is guaranteed by our experience gathered in more than half a century of pump production. Millions of pumps have been exported throughout the world. There is no better proof for the high reputation of LOEWE-Products.

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Application: Water supply for one- and more family houses, pressure boosting unit.

Design: Complete unit ready for connection to wall. Complete with horizontal pressure tank, safety valve, beltguard and pressure gauge.

Performance: Capacity - up to 2500 l/h
Head - up to 35 m
Suction lift - up to 7,5 m vacuummetric

POMONA

Application: Handling of dirty water, colour, oil, wood-protection solution.

Design: Selfpriming centrifugal pump, handles impurities, with electric three-phase motor, petrol or Diesel engine, mounted on carrying frame, base frame or carriage.

Performance: Capacity - up to 130 m^3/h
Head - up to 49 m

CENTRIMULTA HN

Application: Pressure boosting in high-rise buildings and industry.

Design: High-pressure centrifugal pump, horizontal, non-self-priming.

Performance: Capacity - up to 120 m^3/h
Heads - up to 300 m

CENTRIMONA/FD

Application: Wide field of application in the industrial and agricultural sector.

Design: Centrifugal volute pump of solid construction, non-selfpriming.

Performance CENTRIMONA: Capacity - up to 200 m^3/h
Heads - up to 85 m

Performance FD: Capacity - up to 600 m^3/h
Heads - up to 80 m

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...to an interruption in supply. All ...manufacturing operations today ...are, be aware of the dangers of ...unrest, apart from other disrup-

...people I am sure know that today ...diamond synthesis plants at ...in North Sweden, Shannon in ...and Springs in South Africa. This ...of our manufacturing capabilities ...insurance against disruption of ... De beers is currently using the process ...its synthetic diamond production ...capacity from all three of its plants. ...ting on these plans De Beers said: ...sion of our synthetic facilities has ...planned for a long time ever since the ...factory went into production in 1961. ...expect that it will continued in order to ...pace with the growing demand for ...etic diamond and related products.'

Varied applications

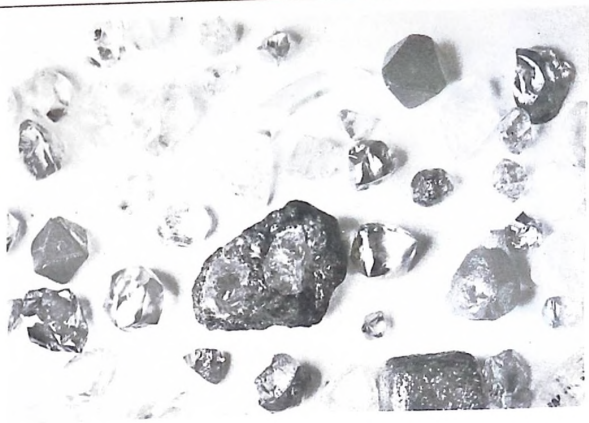
The uses and applications of diamond ...th the natural and the synthetic produc ...industry are many and varied from drill ...g holes deep into the earth to shaping tin ...astic contact lenses. But the five mai... ...pplications are in metalworking, civil ...gineering or stone and concrete, ...eramics, glass and plastics and the 'non-...cutting' uses. Taking each of these in turn: ...n metalworking diamond is established as ...a means of achieving high production rates ...and very fine finishes. The major applica-...tions are drawing fine wire, turning and ...boring soft metals, dressing and profiling ...abrasive wheels, grinding hard metals, cast ...iron, steels and other ductile metals, ...honing, sawing, filing, lapping and ...polishing.

There are three main fields of diamond ...application in civil engineering. Rock is ...drilled to explore the earth's geology and to ...trace mineral deposits, or to lay explosive ...charges in mining; concrete and masonry ...are sawn and drilled for laying pipes and ...cables, to obtain samples for structural and ...quality investigations, for making ...structural alterations, and to cut joints in or ...to level concrete or asphalt highways and ...airport runways; stone is sawn, ground and ...polished during quarrying and in subse-...quent production of stone used in building.

Technology

Modern technology is turning increas-...ingly towards ceramics in its quest for ...materials that will withstand new ...operational extremes in space, electronic ...and power applications. Ceramics can, of ...course, be accurately moulded, but for very ...close precision work as in the manufacture ...of electronic and aerospace parts, final pre-...cision machining is necessary. Diamond ...grinding wheels, saws, drill bits and ...polishing powders are used.

Diamond will cut or grind glass ...economically and at high speed, and ...diamond tools have become the basis for ...extensive automation in the glass industry ...for cutting, sawing and grinding a wide ...variety of products, including the fast and ...economical mass production of everyday ...items such as electric light bulbs, motor car ...windows, glass shopfronts and tableware. ...Glass-reinforced plastics are extremely ...abrasive and call for exceptionally hard-...wearing diamond saws and trimmers. ...Diamonds are used for machining resilient ...heat-sensitive plastics because diamond's ...low coefficient of friction reduce distortion ...and heating of the part during machining.



De Beers is the only company in the world able to supply a full range of both natural and synthetic diamond abrasives for every industrial application. Selection of the most suitable diamond grit type is very important for efficient operation of a diamond tool. This selection is based on the size, shape, and surface characteristics and strength of the individual diamond crystals.

Developments

The development of non-cutting uses is because diamond has lower coefficients of thermal expansion and friction than any other material; it is an excellent electrical insulator; it will not corrode; and has the highest refractive index of all materials. Science and industry take advantage of these properties by using diamonds in styli, bearings, indenters, heat sinks, thermistors, distance stops, burnishing tools and injection nozzles for central heating systems, and as windows, lenses and prisms.

Diamonds, apart from dentists drills, play a part in modern medical science; complicated eye surgery is carried out with wafer thin diamond scalpels thus enabling the surgeon to see what is happening on both sides of the incision simultaneously. For some twenty years, it has been known that about one diamond in 1000 has very special electronic characteristics but now it is possible to diagnose that diamond in 1,000 and this knowledge has been utilised by the Westminster Hospital in London to monitor the amount of radiation absorbed during the treatment of cancer by radiotherapy.

Research

Research into future applications and uses for industrial diamonds is continuing and as technology advances, undoubtedly diamonds will enter into new and currently unexplored fields where products like De Beers SYNDITE will be increasingly used in exploratory drilling for oils and other minerals, possibly replacing the natural drill stones in some cases for economic reasons. Further developments in the field of what is currently known as 'diamond composites' where natural diamonds of the poorest quality are crushed and rebonded is certain. So far work in this area has been limited but millions of dollars are being spent on research and development — even before the advent of President Carter's energy bill.

Should anyone still consider diamonds to be useless and only pandering to human vanity, let them consider that even though the industrial diamond has come a long way in 40 years, the natural product is subsidised by its more valuable gem counterpart. Diamonds therefore, make a considerable contribution to improving the quality of our lives in many, often hidden, ways and so human technology has learned to supplement one of nature's most valu-able gifts to man. □

FOLDABLE TANKS

FOR STORAGE OF WATER - FUELS - CRUDE OIL - GASOLINE - DIESEL OIL - PETROL AND INDUSTRIAL LIQUIDS IN GENERAL

Mod. "R" - for storage
Capacity: from 3 to 300 cu. meters

Pillow shaped CLOSED Tank of great capacity, for the storage of water in building yards, etc. It is made of particularly formulated PVC coated Nylon fabric, resisting to aging. Being closed, the water cannot evaporate and get polluted by dust or extraneaus particles.
The same model, Mod. "R2", is made of polyester fabric coated on the inside face with acrylonitrilic rubbers resisting to fuels, gasoline, naphta and others acids and on the outside face with chlorinprenic rubbers resisting to aging.

Mod. "R3" - for transport

This model is made of poliester fabric coated on the inside face with acrylonitrilic rubbers resiting to fuels, gasoline naphta and others acids, and on the outside face with chloroneprenic rubbers resiting to aging. This type of transport tank, when emptied from the contained liquid, it may be folded so as to take up very little volume, and to allow the use of the lorry for the loading of further goods. The SOCAP foldables tanks may be filled and emptied either by fall or by pump. The food stuffs liquids type keep unalterated the qualities of the product during the transport.

"SOCAP" Pneumatic Forms

Employed for the on-the-place construction of concrete ducts for any use are constituted of special forms made of strongly rubberized Nylon canvas, with hermetically closed ends. The **Pneumatic Forms** represent, after having been inflated, the cylindrical body around which the concrete casting takes place, delimited by an external wooden boxing, after having previously established both the necessary thickness and the proper cement batching for the concrete duct to be constructed. At a distance of abt. 12 hours the concrete is setted, the **Pneumatic Form** deflated and easily drawn from the finished duct.

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Inflatable Elastic Mini-Moulds

With dias up to 150 mm. They are used where the extraction of normal type PNEUMATIC FORMS would pre serious difficulties. Their dia - when deflated - is abt. 40% inferior to the dia when inflated; such difference makes their extraction extremely easy. They are used fo the execution of precast elements, canalizations for telegraph & telephone tables, holes for the tie-rods of precompressed concrete, etc.

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A high investment pump station.

THE PRODUCTIVITY OF IRRIGATION SCHEMES

Not all of West Africa favours irrigation development; this article by Dr. J. Meadley of Minster Agriculture discusses what priority should be attached to the development of irrigated agriculture and whether the considerable investment necessary is always justified.

HISTORICALLY, the development of irrigation in West Africa is a relatively recent phenomenon. Traditional forms of irrigation, primarily the use of the shaduf to lift water from rivers and the practise of drawdown agriculture in river valley bottoms, have been carried on for centuries but only on a very limited scale. The development of modern irrigation dates from the 1930's. The main thrust in irrigation in the region has occurred since about 1960.

The potential

In general terms conditions in West Africa are not particularly favourable for irrigation development. Over large parts of the region soils suitable for irrigation are found only in very limited and fragmented areas. Surface water resources are frequently costly to develop due to high variations in seasonal flow rates. Streams in the upper catchment areas commonly run dry for 6 months of the year (normally the very period when irrigation is most beneficial) and larger rivers are reduced to a relative trickle compared with their large flood discharges in the wet season. Nor is the region particularly well endowed with ground water resources which, although frequently widespread, are limited in quantity and in recharge.

The extent of irrigated land is consequently considerably less in West Africa than in other parts of the world. It has been estimated, for example, that in 1975 less than 1% of the total area cultivated in West Africa was irrigated. In the Middle East and North West Africa, by comparison, over 33% of the land is irrigated.

A question therefore which must be posed is "What priority should be attached to the development of irrigated agriculture in West Africa?" The investment required to develop irrigation is considerable, frequently in the range 600-4,000 US dollars per hectare. Is this investment justified? Or should the funds be applied to the development of dryland farming from which the great majority of the population derive their livelihood?

Certainly, in the short term, investment in dryland farming — in improved seed, fertilizer supplies, selection mechanisation and better extension services — can generate extremely favourable benefit/cost ratios. The key to this question, however, probably lies in understanding the relationship between dryland and irrigated cropping within the farming system. Where an irrigation scheme is formed by government or by a management organisation, it

Continued

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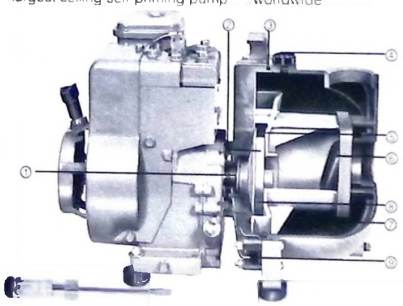

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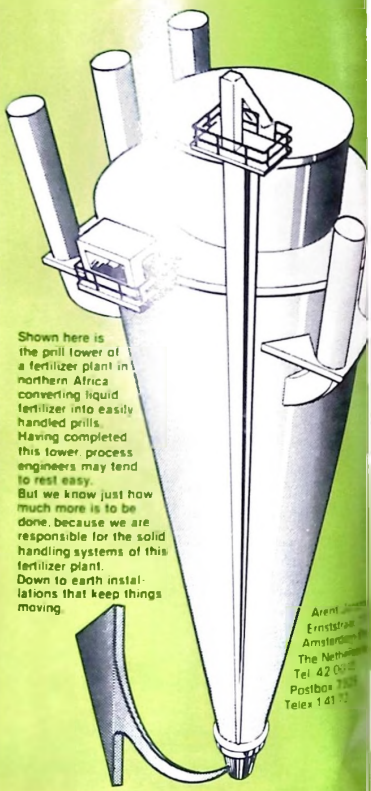

Shown here is the prill tower of a fertilizer plant in northern Africa converting liquid fertilizer into easily handled prills. Having completed this tower, process engineers may tend to rest easy. But we know just how much more is to be done, because we are responsible for the solid handling systems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

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a self-contained entity. However, ... scheme involves small-holders, ...ularly those who have found the ...ure development of the scheme, ...usually a complex interaction ...irrigated and dry farming areas. ...raction has been commonly mis-...ood by irrigation planners and has ...ly been ignored altogether. The ...has been that many irrigation ...ments in West Africa have failed to ...e their production target

Pumps suited for village level investment.

...ming skills

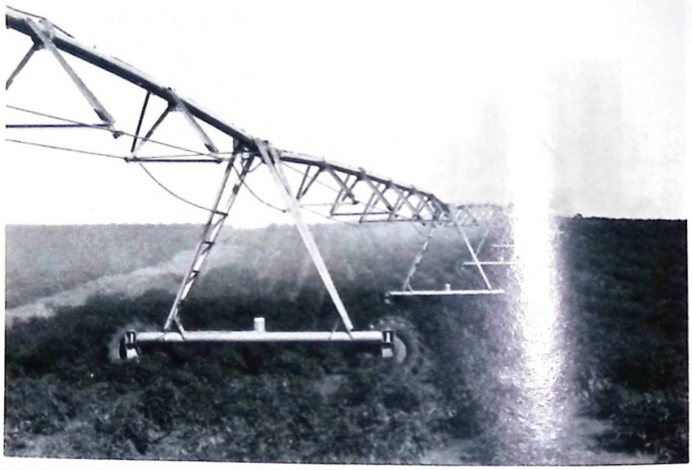
...far the majority of farmers in West ...a are subsistence farmers, hopefully ...ucing in most years small marketable ...luses and small quantities of cash ...s. A major motivating factor for such ...ers is the minimisation of risk. In the ...ural absence of social security schemes ...ld easily available low cost credit, the far-...r's primary concern is to ensure enough ...d is produced to feed his family. This ...monly overrides the profit motive of ...chanisation which is more normal in ...eveloped agricultural societies. ...ditionally West African farmers have ...wn their food crops on rainfed land. ...rigation agriculture is new to them and ...ey lack general experience of this type of ...oduction. Not unnaturally, therefore, far-...ers tend to continue to grow food crops ...n dryland areas. When they have access ...irrigated land they use it to grow cash ...ops. This is not itself a problem since the traditional grains and roots grown as food crops do not respond particularly well to irrigation. Certainly they respond less well than rice, sugar, cane, vegetables and wheat which are the most usual irrigated cash crops. The problem arises from the fact that farmers give priority to their food crops and will only attend to the irrigated cash crops when work on the food crops is completed. As a result, irrigated cash crops are frequently planted well after the optimum time of planting. Late planting is a notorious cause of reduced yield and a further result may be the farmer's unwillingness to apply fertilizer. Late planting reduces the yield response and the benefits realised may not exceed the cost of the fertilizer. On many projects later planting makes it impossible to double crop with an immediate 50% reduction in project output. Clearly, the planning of irrigation projects involving smallholders cannot at present be confined solely to the irrigated area. Cropping plans, particularly with respect to labour availability, must be developed for the whole area which participants will be farming. Eventually, farmers specialising in irrigation, who do not cultivate dryland areas, will emerge in West Africa. This will only occur, however, when farmers gain much more experience of irrigated crop production and some form of crop insurance or credit for working capital is developed.

Investment levels

The extent of investment to be put into irrigation development and the type of developments which are most suitable can be evaluated under three main headings:—

Continued

Brossette. Taming water.



Taming water.
Water is everywhere. But, in order to make it really useful, it has to be tamed. Taming water is one of the key factors necessary to the agricultural independence of Africa.
For this reason, over several years Brossette has largely developed its irrigation department. The stakes are high because, when they are well irrigated, African soils are the most fertile for all kinds of crops.

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4000 Acres for 24.000 animals.
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21/2 Acres in 4 days.
Besides carrying out very large projects like the irrigation for the Kan Valley in the Ivory Coast, Brossette also pays particular attention to studying the development of small farms. This has resulted in the kit 2000 which enables an average sprinkling of 2 1/2 Acres in 4 days. Sold complete with the motorpump, pipes and sprinklers, it constitutes a solution within the reach of small farmers.

From the research stage to maintenance, Brossette is present.
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**Benin 1976 - Carried out by Brossette

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Irrigation Departme

We have the means to ac your ambitions.

American technology transferred to Upper Volta.

1) The additional production generated by the project.
2) The return on investment generated by the project.
3) The improvement in farmers' incomes resulting from the project.

The relative priorities attached to these criteria will depend, in individual cases, upon local social and political considerations.

1) Additional Production Generated by a Project

It is commonly assumed that the development of irrigation will result in substantial increases in crop production. The type of claim made is that upland rice grown under rainfed conditions may yield up to 2 tonnes per hectare. In the same area full water control can raise the yield to 5 tonnes per hectare for each of two crops. However it is important to realise that these are potential yields. Experience to date in West Africa indicates that these yield levels are rarely achieved in practice. The optimisation of water supply to the plant through irrigation will remove one restriction on realisable yield. To achieve the full potential yield, however, requires the use of improved crop varieties, optimum fertilizer regimes, crop protection chemicals and high standards of husbandry. The necessary inputs must be available to farmers and available at the correct time. This is frequently not the case in practice.

In general terms, irrigation projects in West Africa do result in additional crop output. However if scarce investment resources are to be utilised to maximum benefit, a much more realistic view of what the increased production will be, must be taken in future. Evaluation of potential projects must take into account all the constraints farmers will face and limit projected yields to those which farmers can be reasonably expected to actually realise.

2) Return on Investment

The fact that an irrigation project generates significantly less production than was projected may be disappointing but it does not necessarily mean the project is a failure. This depends much more upon the level of investment put into development of the project and the effect of less than optimum yields on the benefit/cost ratio.

It was observed earlier that irrigation project investment commonly falls in the range 600-4,000 US dollars per hectare. For West Africa development costs appear to group into 3 ranges — below 1,000 dollars per hectare, from 1,000-2,000 dollars per hectare, and 2,000 + dollars per hectare. Studies made on the return on investment for these ranges show some interesting conclusions. The return on investment for projects in the lowest range (less than 1,000 dollars per hectare) is almost 2½ times greater than that for the middle range (1,000-2,000 dollars per hectare). The highest range (2,000 + dollars per hectare) shows an even lower return on investment and in many cases these projects fail to generate a positive return on investment (many projects in the middle range also fail to show a profit).

Farmers at Wurno in Northern Nigeria find small scale onion production more profitable than large scale wheat growing.

The lowest range of investment represents village level projects. These may be small pump schemes designed to irrigate vegetables in the dry season or they may involve improvements in water control in areas where drawdown agriculture is traditional practice. A major characteristic of this type of project is that it does not require a major change in farming techniques on the part of the farmer. It is on such projects with relatively low investment that less than optimum yields will still result in significant project benefits. This type of project clearly merits high priority in irrigation development planning. Not only are such projects profitable, but they enable farmers to gain valuable experience of irrigated farming thus enabling them to participate more profitably in more intensive projects in the future.

Most of the projects in the higher investment ranges involve expensive storage dams and extensive land farming. The level of investment required relates primarily to the suitability of the project site for development rather than to any improvements in water provision to plants. Obviously, the higher the level of investment, the greater the returns required to produce a positive return on investment. Many authorities are now coming round to the view that the level of investment in irrigation projects involving smallholders must be limited. Higher investment projects must be run by a central management authority which should have the capability of producing higher crop yields than smallholders.

3) Farm Incomes and Income Distribution

Just as the level of investment in irrigation projects is a major factor in determining the return on investment on a project, so it will affect the income of participating farmers. This can of course be adjusted according to whether farmers are charged realistic costs for the water they are provided with or whether these charges are nominal. The general evidence from projects in West Africa is that the type of project, i.e. level of investment, does not significantly affect the level of production achieved by farmers. If anything, farmers on smaller, low investment projects tend to be more "involved" in their projects and productivity is slightly higher. The overall conclusion must therefore be that the village level projects have the most beneficial effects on farm incomes, particularly if realistic water charges are made. Clearly a low level of investment per hectare means that a larger number of hectares can be developed with fixed financial resources. A greater number of farmers can participate and income distribution is improved in the rural community.

The case for irrigation

Taken overall, there is a clear case for matching the level of investment in irrigation and the type of project to the capabilities and experience of farmers. If a West African farmer was set down in the middle of the San Joaquin Valley in California, few people would expect him to compete effectively with US irrigation farmers. There is equally no reason to suppose that by transferring the irrigation technology of California to West Africa the results will be any different. Complex large scale irrigation projects can only be effectively managed in West Africa at present by central management authorities. Village level projects will produce better returns on investment, better farm incomes and distribute wealth more widely throughout the rural population. They will also enable farmers to gain the experience of irrigation farming which will enable them to participate successfully in future more intensive developments. This type of project can in most cases be justified against alternative investments in dryland agriculture. But the farming system at the village level must be considered as a whole if success is to be achieved, and planners must be realistic in projecting the productivity of irrigation schemes. □

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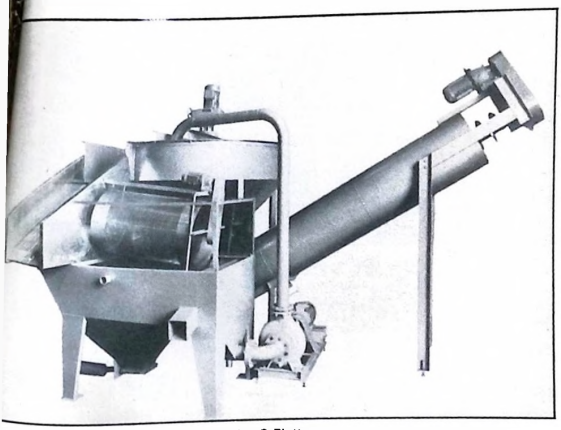
FOOD PROCESSING MACHINES

Preliminary Washing and Cleaning Machines

In this series of articles it is intended to deal with machinery used at the various stages of the processing of food materials. This first article deals with machines for the all-important operation of thoroughly cleaning the product or material from the farm — essential to ensure that it is acceptable to the eye and — even more important — that it is free from material and organisms that might impair health.



Washing and destoning machine from Mather & Platt.

E TYPES of materials and products t are used in the preparation, processing l marketing of foods vary so much in ir shape, size and general nature that aning machines of a considerable nber of types and operating on different nciples are produced to cover all plications. The possibilities of the use of certain type for a given product or terial may become evident as the ious types are considered.

It will be realised that to clean a product material to chemical or clinical ndards would be practically and nomically impossible and — in fact — seldom necessary. But nevertheless the portance of thorough cleaning is such at it imposes a number of essential quirements on cleaning machines. The pes of contaminants that must be moved and disposed of vary widely and clude: soil, stones and grit; leaves, twigs, talks and husks; animal excretia, hairs, ody parts and insect eggs; chemical naterials such as spray residues and ertilizers; and — by no means least in mportance — organisms and their products.

It is essential that not only should all ch contaminants be removed but that the cleaned surfaces of the product must remain in an undamaged, unblemished and acceptable condition.

It follows, then, that the cleaning plant must be very carefully designed and constructed, using suitable non-absorbent materials such as stainless steel and employing the proper principles of hygiene. An essential requirement is that every part of the machines themselves should be easily accessible for thorough cleaning. Additionally, the machines should be sufficiently adaptable to deal with different sizes and types of products, varying throughputs and different contaminating materials.

Dry and Wet Cleaning Operations

Cleaning plant falls into two groups; that employing dry cleaning methods such as screening and pneumatic methods; and that using wet cleaning methods including soaking, spraying, flotation and vortex methods. Both systems have their points of attraction and also their disadvantages. Dry cleaning may not yield as clean a product as wet cleaning and there may be a risk of re-contamination of the product as a result of the spread of dust. Also the production of dust clouds may give rise to a hazard that can be very serious but in view of the apparently innocuous materials being handled is not always realised — a serious fire or explosion. Just a spark due to friction, static electricity or an electrical fault in a fine dust cloud can cause an explosion that can wreck a building. Consequently efficient control and removal of dust in all dry-cleaning operations is of the greatest importance. When wet-cleaning — that is, washing — methods are used it is essential that the water supply is adequate and of high quality, and is uncontaminated in every way; but in view of its possible

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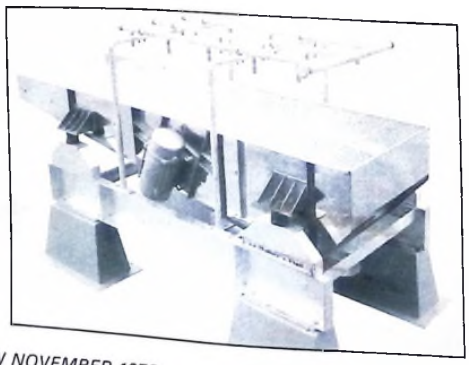

A typical vibratory flat bed washer.

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BISCO

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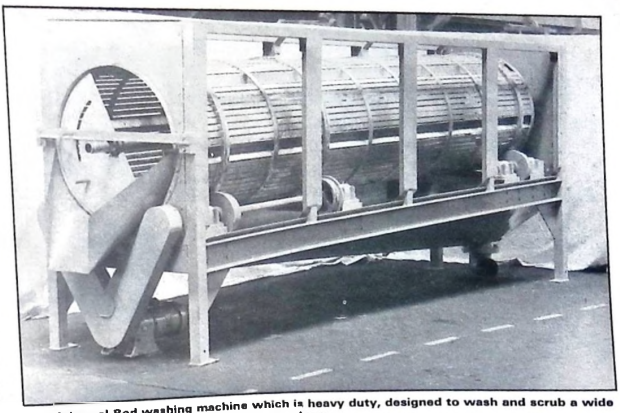
and high cost as little as possible
be used commensurate with the
washing of the product, and thought
given to the treatment and disposal
ed and contaminated water. Also it
be remembered that wet products
more rapidly than dry ones so that
washing a final de-watering stage may
ired before storing, processing or
ing.

Cleaning Machines

cleaning methods use or employ
ing machines, of which there are
l types and are widely used.

Rotary drum cleaners are frequently
loyed, the material to be cleaned being
d in a hopper at the bottom of which
es a rotating worm or belt conveyor
conveys the material to the screening
partment and on to the rotating screen.
the material is tumbled on the
drical rotating screen of perforated
al which is fitted to the shaft driven by
electric motor. The machine can be
anged so that the debris such as soil,
dust and weed seeds and so on fall
ough and are disposed of and the
ned product is retained on the screen.
rnatively, if the product is in the form
powder or granules, it will fall through
screen and the larger, unwanted
terial such as hair and string will remain
the screen. Screens of this type which
an the product continuously have the
vantage that they can be incorporated
o a continuous processing line.



The Universal Rod washing machine which is heavy duty, designed to wash and scrub a wide range of vegetables handling up to 6 tons per hour.

Flat-bed screen washers, on the other hand, are essentially batch-type machines. They consist, in general, of one or a number of screen decks fitted in a dust-tight casing, the assembly being shaken by one or more vibratory devices. Measures are taken to prevent the filling up of the apertures in the screen. This type of machine is excellent for cleaning fine materials such as flour and ground spices, since they will not easily fill up the apertures. The repeated impacts and abrasion may damage sensitive or soft-surfaced products.

Pneumatic cleaners — as the term implies — operate by means of the use of air pressure or a stream or streams of air. The operation depends on there being a difference in weight or buoyancy in air between the product and the heavier debris. In some cases two streams of air flowing at

Continued

The big Leyland range gives you a wide choice of 26 to 100 hp tractors that can handle any job on the land.

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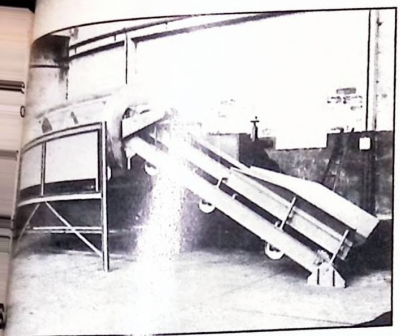


A rotary dry cleaning drum, used primarily for fresh food preparation.

cent speeds are necessary to remove the lighter debris such as husks, leaves, ...s and hairs.

In a typical pneumatic separator, the product is fed downwards on to a stainless ... grille set at an angle. A forced-draught ... produces a powerful stream of air ...ch passes upwards through the grill and ...gitates the product as it passes ...wnwards. During this agitation the light ...aste is separated and carried away by the ...rstream and settles out in the expansion ...chamber for discharge. The product passes ...out of this section and down a discharge ...chute to a shaker discharge unit, consisting ...of two perforated screen mounted in an ...scillatory tray which is eccentrically ...riven and through which any very fine ...waste passes.

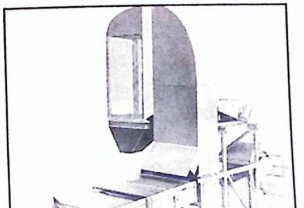
Washing Machines

Soaking in water in tanks is often a preliminary stage in the cleaning of root vegetables and other products to which quantities of soil and other debris may be adhering. This is readily removed and passes through gridded outlets in the bottom of the tank to waste, light debris passing through side outlets. The thoroughness of soaking is increased by imparting movements to the water relative to the product by means of caged propeller-stirrers or by moving the product slowly by steadily-revolving paddles. Alternatively the product may be fed into a horizontal perforated drum which rotates whilst partially submerged in the water tank. For delicate products compressed air can be used as a means of agitation and can be bubbled through the water from nozzles or perforated pipes in the bottom.

Spray Washers

Many washers incorporate water sprays in their operation, and various means are adopted to move the products under the sprays so that all the surfaces are exposed. The efficiency of all types of washing machines in which sprays are incorporated depends on various factors, including the water pressure, the volume of water used, the temperature of the water, the distance of the products from the nozzle, the time of exposure to the action of the sprays and the number of nozzles used. In general, a small volume of water at a higher pressure is likely to be more effective than a larger quantity at a lower pressure, but the pressure must never be so high that the products are damaged.

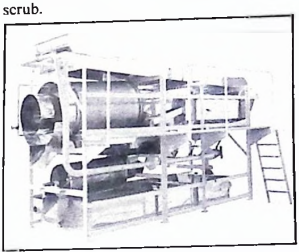
Spray drum washers consist of an open drum formed by an assembly of metal rods, bars or slats arranged longitudinally and welded to large-diameter steel rings, the whole assembly slowly rotating on an axis inclined to the horizontal. The distance apart of the rods or slats depends on the type of product and must be sufficient to permit the product to be retained on the drum for a time while the debris is washed through. In most models the spray emerges under pressure from a central perforated pipe fitted with nozzles. Angles or scrolls fitted inside the rotating drum imparts to the product a vigorous tumbling action and the speed of rotation and angle of inclination of the drum determines the duration of the washing cycle.



A 10 ton/hour pneumatic separator. Light waste is separated out and carried away by the air stream.

Spray belt conveyors have perforated belts on which the product is carried beneath the banks of water sprays. For use with roughly spherical products washing may be improved by using roller conveyors which cause the material to spin beneath the sprays and so to present all their surface to the action of the sprays. For smaller products, movement under the sprays may be produced by using a vibratory conveyor.

Brush washers also incorporate a spray action to impinge on the product. The machine consists usually of eight or ten rotary brush units mounted in 'U' formation extending along the length of the tank. The product is subjected to the continuous pressurised water spray and at the same time the roller-like brush units impart to them a turning and tumbling action so that the bristles of the brushes scrub them from every angle. By varying the speed of the brushes and the depth of the product in the tank, a considerably varied washing action can be achieved — a light wash or a hard scrub.



A high capacity flotation washer.

Flotation washers work on the principle that the product is lighter in weight than heavy debris but heavier than the lighter debris. After leaving the feed hopper the product together with the contaminants meet an upward flow of water which conveys the product and lighter debris forward but allows stones, grit and soil to sink into an automatic ejector. The flow then passes across a flotation section where the product has time to sink but where the lighter trash passes over a weir to waste.

Batch type washing machines usually may be automatically controlled and interlocked with other equipment to form part of a continuous processing line. The washer may be fed from any suitable conveyor, elevator or vibrator and consists of a vertical open cylindrical vessel of stainless steel. Water is sprayed on the material from a pipe at the top of the vessel. To apply movement to the material there is at the base of the vessel a rotating disc with four raised sections and to produce further turbulance there are two smoothly curved projections on the side walls. The small clearance between the rotating disc and the side allows sand and heavy waste to pass through into a drainage section. The charging and discharging operations of the washer are controlled automatically according to a pre-determined time sequence.

Discuss individual requirements with the manufacturer

The foregoing descriptions of cleaning machines in wide use may have indicated the possibilities of a type for a given application. But discussions with a manufacturer may suggest modifications in design and the incorporation of features that will make the final machine completely suitable for its application and highly efficient during long-term service. □

Tractors or Travellers

Hercules can take them almost anywhere.

Here at last is a transport aircraft that truly can be two planes in one.

It's the Lockheed L-100-30 Hercules. It can become the L-100-30C, a convertible passenger plane or airlifter – a short runway expert, able to use remote, unimproved airfields closed to jetliners.

As a passenger craft, it carries up to 106 persons in first-rate style. In wide, comfortable seats. In a quiet, pressurised, air-conditioned cabin. With all standard conveniences: lavatories, galley, and ample baggage stowage.

The plane can change roles rapidly. Palletised seats and convenience sections are rolled over the low rear ramp. Now, Hercules is an all-cargo hauler, ready to carry up to 43,707 lb. (19,825 kg). bulky freight as long as 55 ft. (16.6 m).

Chosen by 43 nations, it can haul fully assembled bulldozers, tractors, trucks . . . all manner of oversize cargo. It can use runways of earth, sand, gravel, or even snow. And it can use short runways of only 4,000 ft. (1,220 m) or less.

Not only does Hercules go where the jets can't go, it goes quieter and cheaper as well. The four turboprop engines, which comply with all international noise regulations, are big fuel savers compared with fanjet engines. And today, that's important anywhere.

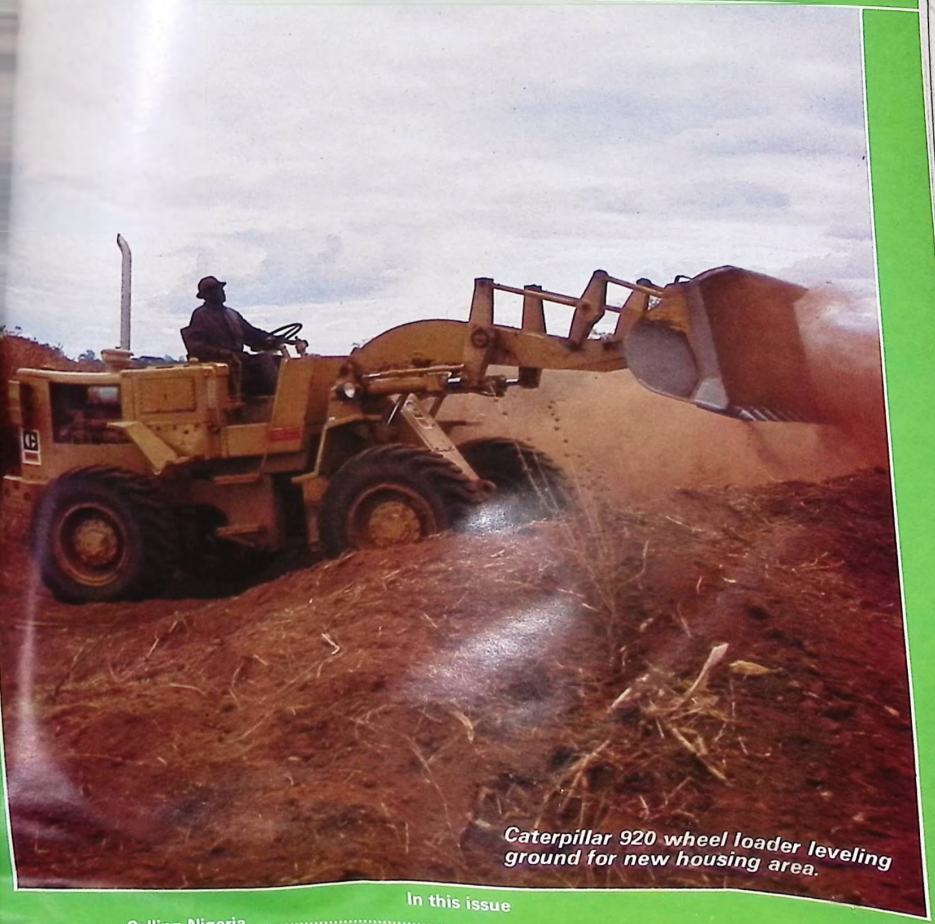
If the need is for both a passenger plane and a cargo hauler that can be used in remote airfields quickly, quietly, and economically . . . the Hercules L-100-30C is the aircraft.

Lockheed Hercules

West African
CONSTRUCTION

Magazine within the Magazine

November 1978



Caterpillar 920 wheel loader leveling ground for new housing area.

In this issue

Calling Nigeria 93
Wheeled and tracked loaders 97
Concrete pumps 107
Road planers 115
Basic excavator principles 123
Plus construction news and digests

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...p rise in demand for ...ding materials

...p rise has been recorded in ... con... of some building materials ... Nigeria according to ... recently ...ed report from the Central Bank. At ... of 1975 Nigeria consumed 3.3 m. ... tonnes of cement which ... risen to ... metric tonnes in 1977. ... the total ...ed in 1977 domestic production ...ented 1.3 m. tonnes or ... per cent. ... sheet consumption increased from ... m tonnes in 1976 to 5... .7 m. tonnes ... 1977. Domestic production in 1977 ...sented 28.6 per cent of the total. ...s and allied products also rose from ... m. tonnes in 1976 to 43.2 m. tonnes in ... As far as these items are concerned ...ia is moving towards self-sufficiency, ... domestic production standing at 70.1 ... cent of total consumption.

Komatsu strengthen marketing operations in Nigeria

Komatsu Ltd. of Japan, a strong contender for world dominance in the construction machinery industry has been studying and working in the African market for the past several years. To date, Komatsu has shipped more than 10,000 machines to Africa.

In line with this, Komatsu has sold several hundred machines in Nigeria through RUTAM, but that was only a spearhead activity to get to know the Nigerian market.

To strengthen its position in Nigeria, Komatsu has designated the following two companies as its distributors: CAMPLANT Engineering Sales & Service Ltd. and John Holt (Nigeria) Ltd.

CAMPLANT, which used to operate with RUTAM, Komatsu's former distributors in Nigeria, will control 6 States (Lagos, Ogun, Oyo, Ondo, Bendel, Kwara). And John Holt (Nigeria) Ltd. will designate its subsidiary, Holt Engineering, to control sales outlets in another 13 States plus Lagos State.

Chief Ibru (left), discussing business operations in Nigeria with a Komatsu engineer.

...oad network grows by ...400 km. in 1977

...eria's road network underwent con...erable expansion during 1977. The ...ederal Government constructed 1,900 ...metres of roads during this period while ...e State Government-built roads totalled ...00 kilometres. According to the Central Bank's annual report the overlaying of ...phalt on the Ibadan-Oyo-Ilorin road and the rehabilitation of the Ibadan-Abeokuta road was completed. The last 100 km. of Gwoza and Little Gambi road and the extension from Gwoza to Bama was overlaid with asphalt.

Several projects have been commissioned including the Mwrala Muhammed Airport Road to Ikorodu Road artery, the Idi-Oro flyover and Maryland underpass, a stretch of the Lagos Inner Ring Road and bridges on the Konni, Daura, Katsina Ala, Jimeta and Qua Iboe rivers.

International road opens

A new international road between Nigeria and the Republic of Benin has been officially opened. The 43.5 km. road, which substantially cuts the distance between the two countries, has been financed by the Nigerian Government at a cost of ₦40m. Completion has reduced the distance to 100 km. The road attests to the Nigerian Governments policy to link up with all neighbours in order to facilitate the movement of people and economic goods.

Guest house for legislators

The ₦23m. guest house for Federal Legislators at present under construction along the Badagry Express road, Lagos, is to be completed by December, 1978. This was announced by the American construction company D. C. Savage Ltd. The multi-storey complex occupying 198 acres commenced in 1977 as a necessary provision for the legislators in the civilian government. Facilities include a shopping plaza, swimming pool, electric sub-station, bars and restaurants.

Nigerian nails

Nores Industries Ltd. is to start production of nails in Bendel State. The factory is to produce 8 tonnes of various types of nails a day. The total project is estimated to cost ₦1.5m and will employ 50 Nigerians and two expatriates at the take-off.

Consultancy services agreement

An agreement for consultancy services in connection with the projected Bauchi Hotel was signed in the Bauchi State Capital by the State government and approved consultants. The design for the hotel which is estimated to cost ₦12.8m has been completed and approved. The hotel will have 210 bedroom units and facilities for three hundred guests. The project is expected to take two years to complete.

CONSTRUCTION EQUIPMENT
Nigerian imports from the UK Jan–July 1978

A breakdown is given in the following table of various items of construction equipment imported by Nigeria from the UK for the month of July 1978 and for the seven months ending July 1978. Earth moving equipment, namely bulldozers, angledozers and levellers still remain the top of the import list followed by mechanical shovels and excavators.

	Metric tons	July 1978 ₦,000	Metric tons	7 months ending July 1978 ₦,000
Road rollers	3	31,200	264	882
Bulldozers Angledozers Levellers	80	128	2,565	7,027
Mechanical shovels Excavators self-propelled	45	107	1,576	3,721
Boring & sinking machines not self-propelled	39	386	229	1,219
Machines & Mechanical Appliances for Public Works & Buildings	26	70	316	1,019
Pile Drivers not self-propelled	9	40	15	70

New cement factory for Abidjan

With a consumption of cement exceeding 1 million tons a year in the Ivory Coast, the two factories in Abidjan cannot cover this need. A third cement factory, capable of a production of 300 to 400,000 tons a year will be built in San Pedro, the shareholding has been found amongst the private and public Ivorian sector and the S.C.A. (Société des Ciments d-Abidjan).

Brick factory to start production

The Lagos State Government brick factory at Igbogbo, Ikorodu division will start production early next year. 60,000 various sizes of bricks will be baked per day at costs varying from 17 kobo to 45 kobo per piece.

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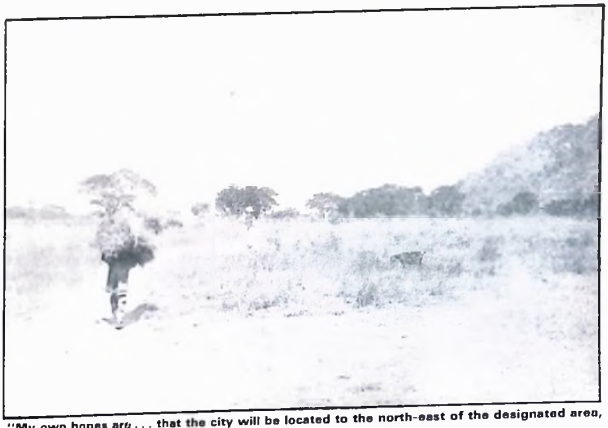
...ed by all Nigeria's planners as a ... planning unit and their plans ... be based on them. He called ... family unit, kinship group and ... Chief or Native Authority. I ... go along with that and point to ... success of the resettlement of ... and townspeople after the ... of the giant hydro electric dam ... lake at Kainji on the River Niger. ... the layouts of the new villages and ... echo those of the old ones, but ... walls and thatched roofs have ... way to walls of ... laterite ... and conical roofs of asbestos ... The architects claim a 95% acceptance by the local people.

You have probably heard that the Nigerian Federal Military Government has designated an area near Abuja, in the centre of Nigeria, as the site for the new Federal Capital City. As a town planner what do you consider, briefly, is the merit of this move? Mr. Moffett, most Nigerians, while anticipating the completion of their new city, are simultaneously anticipating a NIGERIAN city and not a carbon copy of an American, British, Brazilian or Indian one. As a town planner do you think this hope can be fulfilled?

A I think the idea of the new city is a splendid one and what a marvellous opportunity for the Government to create a focal point for the activities of Nigeria's nineteen states and to forge a living symbol of nationhood. Brazil did it — successfully on the whole — so why not Nigeria. I believe the master plan, which is being prepared in Los Angeles by American planners in close liaison with Lagos, is being published this month. We are all looking forward to seeing what its main proposals will be. My own hopes are these: first, that the city will be located to the north-east of the designated area, among the mountain foot-hills where the climate is ideal and shelter is provided from the desert winds; and second, that it will be no more than a skeleton plan, providing the city with an infrastructure of roads and services and enabling it to grow in its own way, as time passes, in a truly Nigerian way, as you rightly suggest, and with the full co-operation of the people at every stage.



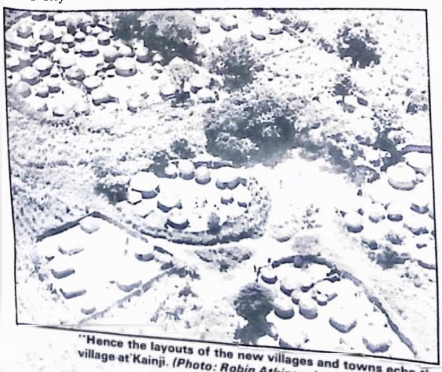
"My own hopes are . . . that the city will be located to the north-east of the designated area, among the mountain foothills."

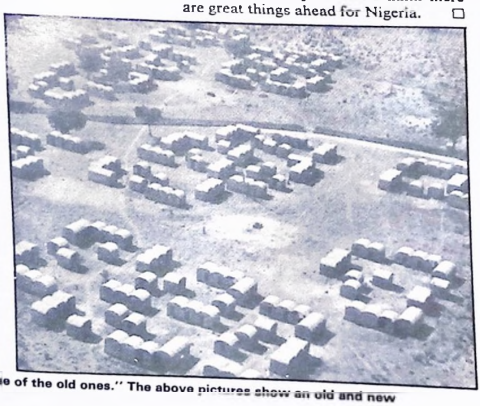
Here too the mistakes of the past can be recognised and avoided: the mistake the British made when they built New Delhi in a grand, totalitarian manner, unrelated to the Indian way of life; the mistake the Australians made when they tried to superimpose a formal layout of geometric axes and great straight, wide avenues, which looked splendid on paper but was simply incapable of translation on to an informal, irregular site of hills, valleys and lakes.

Yes I think the hope of creating a truly Nigerian city can be fulfilled. But I think a prerequisite of this is that a full, frank and open discussion should take place now, at the early stages of planning, with the people who will live and work in the city, before any major decisions are taken. I feel sure your Government will ensure that this is done and the full co-operation of the people obtained.

Q Mr. Moffett, nation building is a long and difficult task to which Nigerians have now set themselves, especially in connection with decision-making on the Nigerian environment. Most of our well-meaning friends in other countries have their own ideas, one way or the other, as to how we should start and what we should do. Right now Nigerian architects, town planners, builders and contractors, carpenters, bricklayers and plumbers and a host of other technicians and craftsmen are bursting with zeal, energy and national pride in this exciting process of laying the foundations of a dynamic Nigerian nation. Have you a very short message to them?

A Yes, of course I have. Keep it up. Don't let the impetus flag. The opportunities are tremendous. Work out your own salvation in your own Nigerian way, but try to avoid the mistakes we and others made. The building of the new federal capital city is probably the biggest single opportunity. It could act as a catalyst for everyone's enthusiasms and energies. I wish you well. I think there are great things ahead for Nigeria. □





"Hence the layouts of the new villages and towns echo those of the old ones." The above pictures show an old and new village at Kainji. *(Photo: Robin Atkinson).*

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A Massey Ferguson MF44C wheel loader.

WHEELED AND TRACKED LOADERS

The loader, either tracked or wheeled, is one of the most widely used and versatile pieces of contractors plant. This article takes a look at the loader from a number of angles and illustrates a few of the dozens of machines now available in West Africa.

THE VERY first loaders, which first appeared in the 1920's, were agricultural tractors with bucket attachments, winch operated and usually with a faceshovel action.

They were truly loaders although it was many years later before the first purpose-built loader was produced — designed from the axles up to do a loading job and nothing else. Now, of course, machines are called loaders when they are not loaders, when they are using attachments which bulldoze, scrape and grab. But they are also called 'shovels' which is even worse.

To be pedantic a machine should only be called a loader when its primary function is to load into another vehicle or into a hopper.

The ubiquitous loader

Twenty years ago most construction sites had bulldozers in operation, dig-and-pushing. A considerable controversy raged between the old school and the new school which recommended dig-and-carry with the then relatively recent innovation — the 4-wheel drive loader. Of course, the dig-and-carry school won and the bulldozer became a specialist tool while the loader became the maid-of-allwork. There is still controversy but this largely relates to what type of wheel loader to use — the choice is varied and often difficult.

West African CONSTRUCTION

The wheel loader is still evolving and there may be many successful and unsuccessful configurations to come. The inexperienced loader buyer, and this particularly applies in African countries newly expanding their heavy industry, would be better choosing established designs of loaders which have had every chance to be proven in the commercial cut and thrust of European quarries or American construction sites. Let the more unusual designs settle down in their home countries close to the place of manufacture.

The purpose designed four wheel drive loader only began to sell in quantity in the mid-1950s. Before that the loader was often an adapted agricultural tractor with a bucket attachment — and there were some very curious ones including an overhead loader which could dig at the front, pass the bucket over the tractor and load at the rear — no turning required.

The 1950's saw many innovations and, by 1960 the big four wheel drive loader was replacing the old traditional loading techniques on construction sites and in quarries all over the world. The crawler loader was no longer a bulldozer with the blade

Continued

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...and a bucket and lift group added ...purpose-built from the tracks up. ...early 1970's most loaders over 3 ...articulated chassis. Torque con... ...with power shift transmissions were ...as standard.

...ices in design — ...heel loaders

...choice of wheel loaders is ... enor... ...They are available wit... ...tandard ...capacities ranging ... under ...to over 11 m³. There are ...ers with ...frames and two-wheel ...ve, front ...steer or two-wheel d... and rear ...steer. Or you can have ... wheel drive ...ated pivot steer or ... wheel drive ...frame with 4-wheel ...steer. With ...ated loaders you can choose mid-...pivots or have the pivot forward of ...wheelbase centre. You can have the ...rator in the front section or the rear ...on. The choice is enormous — and ...using. Cost can obviously narrow the ...ice, availability and delivery narrow it ...ther.

The job application should help in ...sing a choice. For example, in buying a ...aller rigid frame loader it is often better ...o choose a rear wheel drive design if the ...pplication involves more digging than ...rrying. Front wheel drive should give ...etter traction when carrying a full bucket ...ut reduced traction when digging.

West African CONSTRUCTION

With an articulated loader the ...manufacturers placing the pivot at the ...centre point claim that this reduces rolling ...resistance and tyre wear because it gives ...perfect tracking and both front and rear ...tyres rotate at the same speed. On the other ...hand, salesmen offering off-centre pivots ...claim better traction because the tyres ...track individually in turning — a soft spot hit by the front set can be avoided by the rear set.

There are similar dichotomies in choosing between having the driver in the front or the rear section of an articulated loader. With a basic principle like this you can often follow the majority although innovation must not be ignored. The majority place the driver in the rear half because they say he gets a smoother ride and maintains his natural sense of direction when steering the bucket. Also he is not distracted or fatigued by the constant motion of booms and bucket so close to him. Manufacturers placing the driver at the front say he gets a better view of the work and never has to look sideways at his bucket.

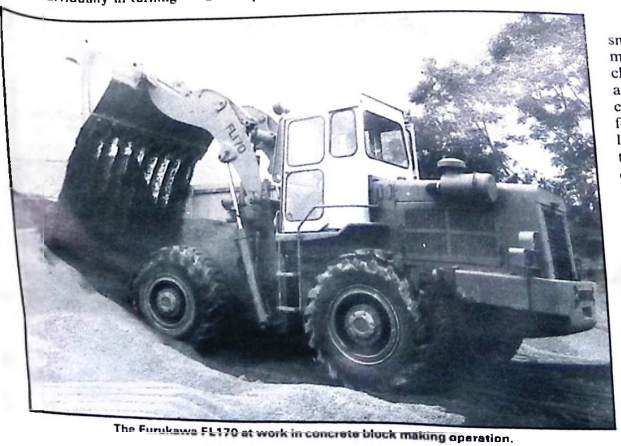
The degree of articulation is another design option. One major manufacturer (Caterpillar) offering 35° articulation to each side says that it's enough for normal manoeuvrability and that any more might decrease stability under load. Another major manufacturer offers a loader with as much as 45° to each side and sells it on faster cycle times (Fiat-Allis).

The Case 740 and 730 four wheel drive loaders

Tracked loaders

The choice here is smaller. The basic configuration has changed little since the last war when the purpose-designed tracked loader became widely accepted. You have the engine at the front with power transmitted to the final drives at the rear. The operator at the rear looks over the engine casing and between the lift arms to the bucket. Yes, — there have been breakaways, like the Hydrostatic machine with the engine at the rear and the driver in the centre (JCB) but these have been few. There may not be many more major surprises on crawlers (although Caterpillar have raised some eyebrows with the elevated drives on their dozer machines).

The Caterpillar 951C track-type loader.



The Furukawa FL170 at work in concrete block making operation.

The size range, as well as the choice is smaller — tracked loaders come not much larger than 4.5 m³. However, the choice of refinement is considerable and the answer here, as in so many other areas of contractors plant — you get what you pay for and, if you pay more for a tracked loader you should get a more advanced transmission system and more automatic controls — You should also get more productivity, less down-time and a higher re-sale value — but these depend on people and the more you spend on plant the more you should spend on training people to operate it and maintain it properly.

Although there are difficulties in choice, at least there should be little difficulty in deciding between a tracked loader and a wheeled loader. But there is an area of overlap where a snap decision may be the wrong one. Obviously a wheeled loader pays off when it is loading and not excavating. It would be wasteful to use tracks on a firm level floor loading loose materials from a stockpile. Similarly it would be

Continued

The Komatsu D155S loading 35 ton dump truck.

The Terex 72-61 wheel loader.

wasteful to use wheels on a soft floor to excavate and load from a compacted bank. The only way to decide in the grey areas where it is neither firm nor soft, neither rough excavating nor easy loading is by calculation — by proper production estimating using all possible variables including:—

- Bucket rating
- Material density
- Material swell
- Carry factors
- Co-efficients of traction factors
- Grade correction factors
- Cycle times.

The obvious advantages are that, with tracks you have better manoeuvrability, better traction in soft going and improved stability. With wheels you have better mobility, faster speeds and easier road travel.

Types of wheels

Successful and economic wheeled loader operation is often related to the correct choice of tyre or wheel. Specialist advice is most important if you have any application which is unusual or you are hauling across unusual terrain.

West African CONSTRUCTION

Obviously you should use rock tyres for hard operating surfaces including gravel and sand. When operating on earth surfaces where penetration of the surface is possible — use traction tyres. When working on light materials it can be preferable to use smooth or ribbed tyres.

Continued

The Fiat-Allis 6051 wheel loader.

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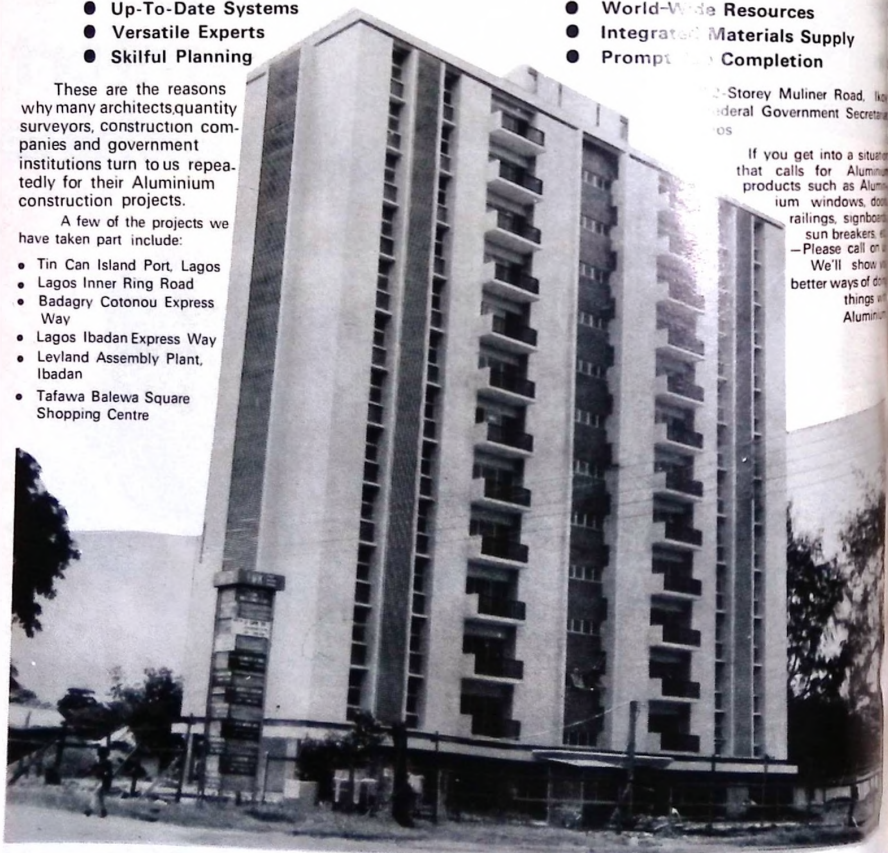

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A John Deere JD544B four wheel drive loader with a rock-bucket attachment.

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in the raising cycle.
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and 'V' formed cutting edge or
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As a normal loader
As a dozer, using the back section
only
As a scraper
As a grab or clam.

lump buckers
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ucket.

buckets
or shot rock handling. Allows smaller
rs to be combed through.

Other types of buckets include:
Hot slag buckets
Drainage buckets
Skeleton rock buckets
Demolition buckets.

In fact buckets are available for almost every loader application — and, if you need a special bucket badly enough, there are specialist companies to make it for you.

Quick couplers are available which enable an operator to change buckets without leaving his (or her?) seat.

Special attachments

If the choice of bucket is wide then the choice of other attachments must be infinite. It would not be surprising to hear that a nut cracking attachment is available!

Here are some of the items you can have fitted to a loader — (but not all at once):—

Tree shears; log forks; cane grapples; log grapples; pipe grapples; rock grapples; refuse rakes; fork lifts; rear mounted excavators; scarifiers; dozer blades; cranes for pipe laying; winches and C.C.U.'s; road sweepers; etc.

Using a loader

Many of today's loaders are complicated fast operating and expensive machines. To use these without proper operator training is wasteful and often dangerous.

The idea is for the operator to attend a suitable course on the machine he is to drive. At lease he should be instructed by the manufacturer or competant distributor on the type of application to which the equipment is to be primarily applied. Manufacturers operating literature differs widely. The best is excellent and can be profitably studied. The worst is appalling and hopelessly inadequate.

It is not just a question of operating the controls of the loader and becoming familiar with its performance. It is also essential to learn general loading techniques which improve cycle times and make the most economical use of the plant investment. General techniques which should be familiar to all loader drivers include:—

Loading
'V' loading
Cross drive loading
Double loading (using two trucks)
Spot loading.
Excavating
Backfilling
Stripping
Grading
Pipe laying
Scrub clearing.

Safety and maintenance are two other areas of loader use which should be taught thoroughly and formally. Too often these subjects are skimped and too often with dire consequences either in injury to the operator and site personnel or in damage and premature wear to the machine. □

The Volvo 1641 wheel loader, the most powerful in the BM range with a tipping load capacity of 10.7 tons.

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  WT 76000kg (167, 550 lb)
  (with ripper)

- **D355A**
  FH 410HP
  WT 44700kg (98,550 lb) I

- **D155A**
  FH 320HP
  WT 33800kg (74,510 lb))

- **D150A**
  FH 300HP
  WT 33800kg (74,510 lb))

- **D85A**
  FH 180HP
  WT 22230kg (48,570 lb))

- **D85E**

- **D80A**
  FH 180HP
  WT 21930kg

- **D80E**
  FH 180HP
  WT 22840kg

- **D65A**
  FH 140HP
  WT 15730kg

- **D65E**
  FH 155HP
  WT 16410kg

- **D60A**
  FH 140HP
  WT 15530kg

- **D60E**
  FH 155HP

What you want is what we've got.

- **D53A**
  FH 110HP
  WT 12170kg (26,830 lb)

- **D50A**
  FH 110HP
  WT 11860kg (26,190 lb)

- **D45A**
  FH 90HP
  WT 9550kg (21,050 lb)

- **D40A**
  FH 80HP
  WT 9320kg (20,550 lb)

- **D31A**
  FH 63HP
  WT 6350kg (14,000 lb)

- **D21A**
  FH 37HP
  WT 3430kg (7,560 lb)

- **D20A**
  FH 35HP
  WT 3330kg (7,340 lb)

FH : Flywheel Horsepower
WT : Operating Weight

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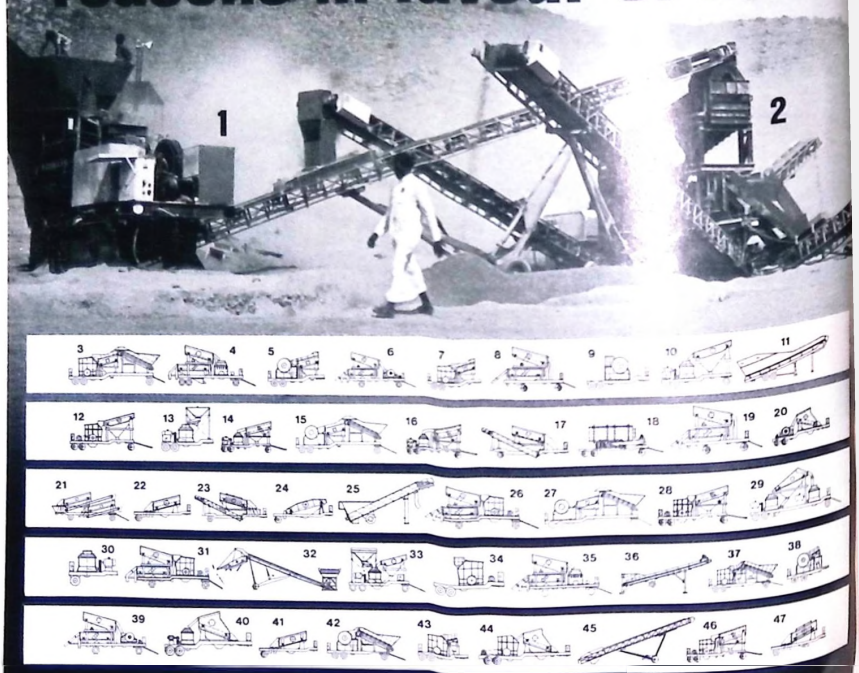

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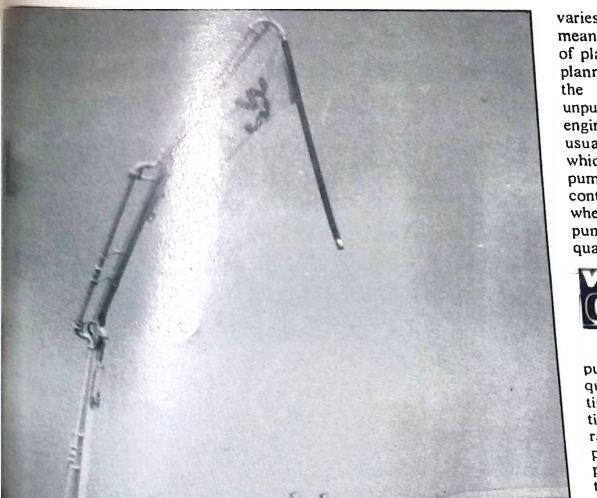


A view of concrete pumping equipment on display at the Lagos Trade Fair, showing equipment on the Stetter, Schwing and Wiedemann & Walters stands.

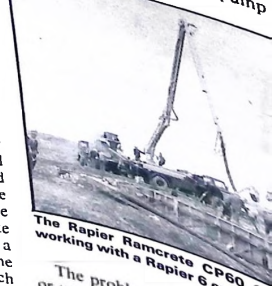
PUMPING CONCRETE

Pumping concrete in both horizontal and vertical planes is an essential function in construction. This article takes a look at the techniques of pumping concrete, the equipment used and the methods of placement.

WHEN ONE looks at the heavy mass of concrete pouring from a mixer, the very idea of feeding it into a machine which will satisfactorily push it through a system of steel pipes to the point at which it has to be laid, seems almost ludicrous. Yet the pumping of concrete is a firmly established practice.

For concrete pumping to be successful, the close co-operation of everyone concerned with the programme is absolutely essential, because timing, mix control and specification and the delivery height and distance, must be co-ordinated to ensure that the requirements are kept within the capabilities of the equipment. Concrete suitable for pumping must be made to a closely controlled specification because the pumps will not handle any concrete which is unduly harsh, inadequately mixed, or varies in its consistancy. This does not mean that the use of pumping as a means of placement should be disregarded in the planning stage of a contract just because the original specification calls for an unpumpable concrete. Consultation with the engineers and concrete technicians, will usually result in a compromise solution which will enable the superior finish of pumped concrete to be fully exploited. The control of mix quality is very much easier when it is placed by pumps because the pumping equipment is very sensitive to the quality of the concrete passing through it.

This means that as a bonus to the use of pumps, a certain amount of automatic quality control will be taking place all the time the pump is running and a deterioration of quality, incorrect water: cement ratio, or incomplete mixing will result in pumping difficulties which will spotlight the problem before it becomes too serious so that timely remedial action can be taken. As a general guide to pumpable concrete, it should be a well graded material of medium workability with a slump of between 5 and 100 mm., as anything much lower higher is generally unacceptable. Aggrega sizes above 20 mm. ($\frac{3}{4}$") when a 100 m (4") pumping line is being used. Genera the cement content will be between 280 a 500 kg./m³. The pump is its own qua controller and will block on a mix tha not correctly graded, cohesive, or of right degree of workability. Where conc pumps are used in conjunction deliveries from a ready mixed contra the batching controller must be to advance that the concrete is to be plac pumping, so that exactly the right p tions are adhered to and the mix c strictly controlled. It is absolutely es that concrete is remixed after delivered by truck mixer, to be certa any segregation caused in tra corrected. Almost all concrete incorporate a re-mix mechanism their feed hoppers to eliminate this and make certain that partially se concrete does not enter the pump cohesive state.



The Rapier Ramcrete CP60 Co working with a Rapier 6 ca

The problem caused or unpumpable c

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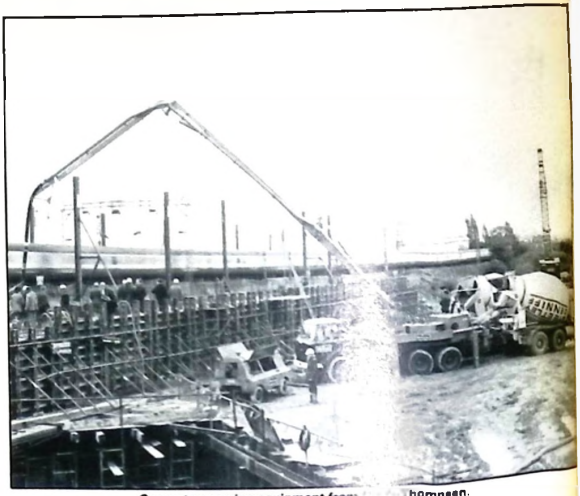

Concrete pumping equipment from [illegible] Thompsen.

of its type. With a built in mixer, the machine is designed to mix and spray mortar or plaster onto walls using a mechanically operated pump and is capable of applying between 300 and 400 m² hour of prime plaster, or between 60 and 100 m² h. of rough undercoat.

The Mechanics of Pumping Concrete

Almost all of the modern concrete pumps are operated by a hydraulic power transfer mechanism, although a few of the smaller ones still use a mechanical linkage in the form of a crankshaft and a connecting rod to the piston. The advantages of a hydra[illegible]ystem are in the absence moving wearable parts and the in- action of the hydraulic rams which make much more compact unit. A concrete pump consists essentially of a prime mover, diesel engine or electric motor, coupled to reciprocating piston which, in conjunction with a suitable valve mechanism, allows the concrete to be drawn into a cylinder and then pushed into the delivery pipework as the piston moves forward. This simplified description applies to all concrete pumps although the detailed mechanism will vary slightly from make to make. When a hydraulic power transfer system is used the pump pistons are connected to two [illegible]

Continued

Maker.	Model.	Output m³/h	Horizontal Delivery metres.	Vertical Delivery metres.
Ackpump.	P25	25	230	75
Putzmeister.	BRF1406	60	250	80
"	BRF1408	80	400	130
"	BRF2112	120	400	130
SEM.	——	20	150	60
Ransomes	CP60	50	300	61
Rotacrete	20-36hp	20	300	62
"	40-36sp	40	300	80
"	40-36hp	40	440	100
"	60-54hp	60	400	80
"	60-45msp	60	300	100
"	80-54hp	80	400	45
Winget.	350	32	180	45
"	600	55	180	80
Schwing.	BPA200E	21	250	80
"	BPA250E	27	300	80
"	BP350E	38	300	100+
"	BP400Hdd	118	400+	70
Ritemixer	20 T & S	26	250	30
"	30 T. S & M	40	250	65
Mark-Thompsen.	830	50	250	100
" "	P40	47	400	75
" "	P60	68	350	75
" "	P95	95	350	80
Stetter.	BP605	60	200	61
Supercrete.	S30	23	214	86
"	T75H	57	336	38
Rob-Roy.	Conpump.	18	185	100
Worthington.	——	50	500	

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Stothert & Pitt Ltd.,

The "Turbosol" concrete spraying machines with built in mixer to mix and spray mortar or plaster onto walls.

hydraulic rams. Hydraulic pressure applied alternately to the full bore side of the ram pistons, produces the necessary reciprocal motion to the pump pistons and a valve uncovers the inlet to the pumping cylinders in turn as the pistons are retracted and thereby draws the concrete into the pumping chamber. As each piston is driven forward under the action of its hydraulic ram, the concrete being pushed is valved into the delivery system. A quite unique system is used in the SEM pumps which produce a constant flow by means of compressed air. Concrete is loaded into a specially designed hopper and air is introduced in such a way that a vortex is created which has the effect of 'screwing' the concrete into the delivery pipe. The almost total absence of moving parts in the SEM pump results in a machine which is both inexpensive to buy or run. Although this pump is a little limited in the height to which it can lift the concrete, being limited to something between 15 and 20 metres, it

"Elephant Trunk" to describe the appearance of their placement pipework and a very apt description it is too. So much so in fact, that many users have adopted the term to describe the delivery pipe system on all concrete pumping plants. The delivery pipes are often fastened to a system of articulated booms which are moved by hydraulic rams and made to fold one upon the other, with the whole assembly fastened to a fully rotatable base. In this way a very large working area can be covered from one working point and by means of a flexible pipe on the end of the steel ones, very accurate placing can be easily achieved. The hydraulically powered booms make it a simple matter to gain access to formwork which may be obstructed by scaffolding or other supports and this is one of the major attractions to pumping as opposed to any other form of placement. Placing booms are a highly specialised product and many companies will supply such equipment even without

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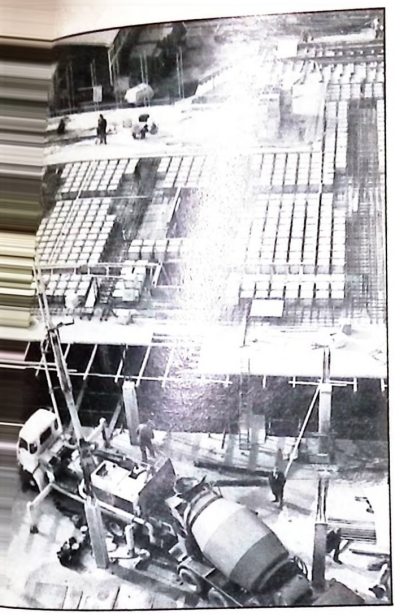

Placing concrete using an "Elephant Trunk" this method achieves highly accurate results.

upervision must be carried out to a igh degree. There are occasions he pump and boom operator may able to see the actual placing point w the work is progressing. On these ns the work has to be controlled by understood hand signals from the crew supervisor. This situation can dily understood when it is remem- he very great heights to which the pumps can deliver. An example of anced technology of pumping con- can be obtained by recalling the ic achievement when a Putzmeister e was used to place the concrete for ilding of the Frankfurt Post Office in West Germany. A world record umed for a maximum delivery height 0 metres. The exercise proved the ages of pumping concrete beyond ubt when, even at a height of 200 pump was delivering 20 m³/h. into mbing formwork. At the maximum the pump was working against a pre- of 194 kg./cm². A very notable ement indeed, and one which shows ncrete pump is capable of a perfor- advantageously comparable with ther form of placement including high hoists. It is interesting to speculate e possible methods of communication working 'blind' and in both the areas ncrete pumping or lifting with cranes would appear to be a need to examine ossibilities of remote control and short radio communication. Radio control been suggested as a possibility, but the gers occasioned by stray transmissions n a passing taxi, ambulance or the ce, introduce an unacceptable level of ger especially in urban areas, where the easing use of V.H.F. transmissions has d to overcrowded wavebands.

Pumpable Concrete

It has already been mentioned that concrete for pumping needs certain characteristics to ensure success, and the importance of this fact cannot be overemphasised. All types of concrete are not suitable for use in pumps and the designer has first to consider the requirements of the mix in a set and hardened condition and then incorporate the features that permit it to be pumped into position and still retain those necessary structural features. The pump creates pressure and transfers it to the concrete. The design of the pump determines how efficiently this is carried out but it is the structure and construction of the mix that determines the distance and height to which it can be pumped. Any combination of solids and liquids has a pressure limit at which it will separate and the objective of the designer is to produce a concrete with a segregation pressure higher than the pressure required to pass it through the pump.

Pumping equipment from Ritemixer Ltd.

The effect of poor or incomplete mixing will be to produce a completely unpumpable concrete even though the specification and quantities have been correctly determined in the first place. As the concrete is drawn into the pump, a degree of vacuum occurs and the concrete must be able to withstand this vacuum without the water or fine grout being separated and allowing a plug of almost dry aggregate to enter the pumping cyclinders. The mix then comes under pressure from the pistons and it is at this point that the concrete is subjected to the highest pressure and must be able to withstand this pressure and remain in a pliable and workable condition. Since, for design reasons, the pumping cylinder is greater in diameter than the pipeline, once the mix has passed satisfactorily through the pump, it is highly unlikely to segregate in the delivery pipes themselves. It follows therefore, that failures along the pipeline can normally be attributed to changes in the mix that occurred during the time that it was passing through the pump. The resistance to flow of the concrete in the pipeline is a function of the drag created between the concrete and the walls of the pipes and the lubrication at this interface has a direct bearing on the pressure required to force it through. If a layer of liquid or thin grout can be formed along the walls of the pipe, this will provide all the lubrication that is necessary.

An SEM pump from Crow Hamilton Ltd. producing constant flow by means of compressed air.

The objective of the mix designer therefore, is to produce a specification that will allow a certain amount of bleeding to take place so that a lubricating layer is built up and maintained along the walls of the pipes. A balance is required which will allow sufficient segregation to occure without it becoming too pronounced and causing an unsaturated and consequently unpumpable mix to form in the pipes. There have been many attempts to perfect a simple test to determine the pumpability of concrete but it is extremely difficult to simulate the different forces encountered. Messrs. Taylor Woodrow, at their research laboratories, have developed a promising answer to the problem with an apparatus that indicates the behaviour of the mix under known pressures and, when backed by data and experience, will give a fair indication of expected behaviour in any particular pumping equipment. The ultimate criteria when designing concrete for pumping will always be a complete understanding of the principles involved and a knowledge of the characteristics of the local aggregates so that the correct permutation of ingredients can be determined.

□

The author wishes to sincerely thank the British Concrete Pumping Association for their kind assistance in compiling this article. The B.C.P.As. handbook "The Manual of Pumped Concrete Practice," can be obtained from their address:— 7-10 Stray Court, Prince's Villa Road. Harrogate, Yorkshire, HG1 5RJ, England.

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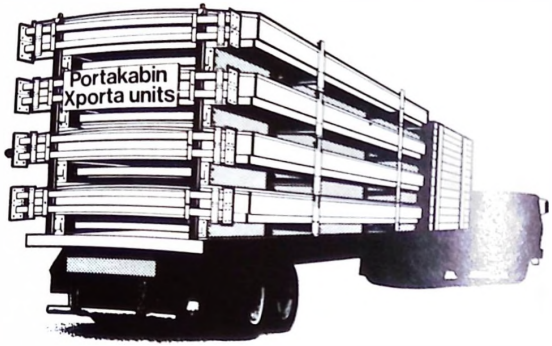

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ROAD PLANERS

Cold planing makes road re-cycling both technically accepted as well as economically viable. This article looks at some of the machines on the market, their applications and advantages.

Putzmeister's road planer SW3.

THE INTRODUCTION of cold planing machines may rightly be regarded as one of the most important developments in recent years in the design of roadmaking machinery and, indeed, in the economics of blacktop road resurfacing. Although the capital cost of a cold planer is currently about twice that of a comparable propane-fuelled hot planing machine, the overall operating advantages of the former could easily outweight its initial cost disadvantage.

The main advantage of the cold planer is that for the first time it makes road recycling — in which both the bitumen and the aggregate contained in a blacktop road are re-used — a technically acceptable as well as an economically viable proposition, a prospect which must inevitably hold great appeal for the countries of West Africa, where the slogan 'Waste not — want not' is very much the order of the day.

Principle of cold planing not new

The principle of cold planing is not particularly new. The early machines, however were all based upon upward-cutting rotary mills. Such machines followed the orthodox view that it was cheaper and quicker to break the road surface to the line of least resistance, namely on the upward movement of the rotating picks. From a strictly design viewpoint this made sense, for upward-cutting mills require less power and less weight and therefore cost less to manufacture and operate than down-milling machines.

Against this, however upward milling machines have a comparatively shallow depth of cut and produce a ragged, uneven surface that is unacceptable to the majority of road engineers. Hence upward milling cold planers were not a commercial success.

The principle of producing a carbide-tipped, down mill rotary cutting drum was pioneered by the Tarmac Group, one of the world's leading authorities on road construction and a company which has a big stake in the West African construction industry. The Tarmac interest in down-mill planers goes back as far as 1968 and the first down-milling planer produced was to a basic Tarmac design.

The down-mill compresses the material as it cuts. Hence it leaves a smooth, even, mechanically keyed surface that forms an ideal base on which to bond the new layer of bitumen. Protagonists of cold planing techniques claim that the superior bonding means that there is less chance of the two bonded layers losing cohesion in very hot climates. Moreover, unlike hot planing machines, coldplaners can work quite satisfactorily in wet weather — a bull point in West Africa!

Today's machines even cut concrete

The machines currently on the market will cut any type of road surface including concrete. They will cut, in a single pass, between 60 mm and 100 mm in bitumen surfaces and up to 40 mm in concrete. They will do so without in any way polluting the environment. There is absolutely no smoke, flame, noxious fumes or dust, for even this is damped down.

The leading UK manufacturer of cold planing machines, and the company which produced the first prototype to a Tarmac design in 1969, is British Jeffrey Diamond, which now produces three standard models. The BJD Master planer, the largest machine in the range, is intended primarily for cutting large areas of concrete and asphalt, such as expressways and airport runways. It is powered by a 274 hp diesel, weighs 25,400 kg, is equipped with a 2 m wide x 650mm. diameter drum carrying 419 carbide-tipped picks, and has a very fast cutting speed of 4.1 m/min. The maximum depth of cut on a single pass is 100 mm.

The BJD Medium planer, designed for work on the average road or runway, is considerably smaller and lighter in weight. Powered by an 88 hp motor, it weighs 15,000 kg., has a 800 mm wide x 650 mm diameter drum equipped with 127 carbide-tipped picks, and has a cutting speed of 18.3 m/min, with a maximum single-pass cutting depth of 50 mm. Its small brother, the BJD Miniplaner, is intended for road patching, joint cutting and similar small scale duties. Weighing only 2,700 kg and powered by a 64 hp Ford diesel, it is fitted with a 314 mm long x 490 mm diameter drum with 39 carbide-tipped picks, giving a maximum cutting speed of 6.1m/min.

West African CONSTRUCTION

The British Jeffrey Diamond Corporation is an American-owned organisation, for it is the Americans who are making the running in the design and manufacture of cold planers. There are now five American machines on the market, with one of the latest coming from Concrete Machinery Industries. This is an advanced, technically sophisticated machine that has as one of its main features a hydraulically powered sensory device which keeps the cutting drum on an accurate plane when cutting undulating surfaces. The sensor is strictly mechanical — the intense vibrations generated by the machine would rapidly shake electronic equipment to pieces — and enables the cutting drum to follow the contours of the road whilst maintaining a depth of cut accurate to within 3 mm.

The sensor also enables the machine to cut to a camber. The percentage of the camber is dialled into the sensor, which then automatically keeps the drum in the correct plane.

Continued

Continued

The milled waste-material is fed onto an elevating conveyor and is loaded directly into a following truck. It may then be used as infill or, more economically, taken to a specially adapted asphalt plant and recycled. The Barber-Greene organisation has recently introduced an integrated series of equipment and processes to recycle reclaimed road materials. In essence the system consists of a Barber-Greene cold planer — although virtually any of the larger cold planing machines could be used at this stage of the process — and either a batch or drum mix plant from the company's standard range, specially adapted to process reclaimed material. This does not necessarily have to be new equipment. Existing plants can be adapted using a Barber-Greene field conversion kit. Moreover, the conversion does not affect the equipment's ability to process virgin mixes — it can process virgin or reclaimed materials with equal ease.

The reclaimed mix produced by the Barber-Greene system can be varied to meet exact road specifications. In short, it turns waste material into a perfectly acceptable road engineering material that is correctly sized and uniformly blended. For all practical purposes it is indistinguishable from virgin mixes — except that it costs substantially less to produce. The usual reclaimed mix consists of 70% virgin material and 30% reclaimed waste, although the ratio can readily be changed to meet any desired specification.

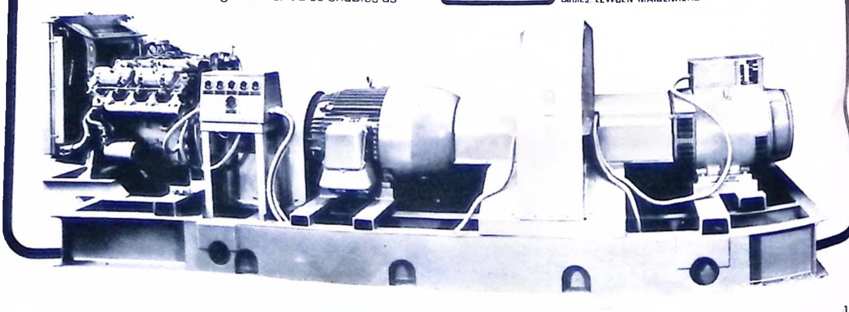
The Barber-Greene Dynaplane is a full-lane machine with an optional cutting width of either 3175 mm or 3784 mm. Weighing some 34,927 kg in working order, and powered by a Cat 750 hp diesel, it has operating speeds of up to 38 m/min and can cut to a depth of 190 mm on a single pass. Honeywell proportional grade and slope controls ensure that the machine will cut to the precise profile and slope of the road. Both the pick-up conveyor and the rear truck-loading conveyor — which gives the machine an overall working length of 14.6 m — are powered through hydrostatic drives, and the loading conveyor can be swung through 80° enabling the truck to be sited alongside the machine.

Road Razer Mark III is the latest infra-red road [illegible] from Millers Machinery Ltd. Its performance [illegible] is more than double that of the previous models.

The Barber Greene recycling system can cope with virtually any grade of 'waste' aggregate and bitumen binder, and is therefore the most versatile system. Its only disadvantage is that the reclaimed material is double handled, from site to asphalt plant, and from plant back to site.

A system recently developed by the West German-backed Colas organisation recycles the material in-situ. Basically the Colas machine is a highly sophisticated planer-paver that is fitted with extremely

Continued



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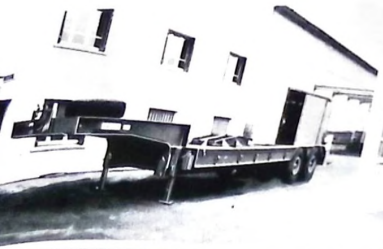

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...thermal controls. The road ... first heated by the propane ... to a precisely controlled ...re that will plasticise the bitumen ... will not burn it or allow it to ...chilled.

...machine then mills the road to the ...depth, scarifying the aggregate ... a new, unpolished facet to the ... Additional binder and aggregate ... added at this stage to replace ... worn away or to build up the ...ness of the mat. Whether or not new ...gates are added — the addition ... by ...s a necessary part of the process ... mix is automatically relayed and ... ready for compaction and surface ... in the usual way.

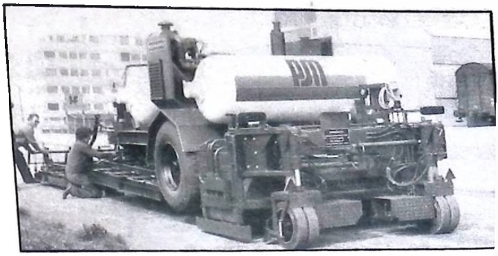
...ed on suitable road surfaces, the mat ...uced by the Colas system is indist...guishable in both appearance and ...ing properties from a comparable mat ...duced entirely from virgin materials. ...Colas system works best with a mat ...taining crushed stone which has many ...rp facets, but cannot be used ...cessfully on mats consisting mainly of ...er-borne aggregate where the surfaces ... uniformly smooth and rounded.

Some problems may be encountered, too ...the road specifications vary considerably ...r comparatively short distances, which ...often the case in urban areas. For recycl...ing and relaying long stretches of single-...specification, quarry-aggregate roads, however the Colas system is well nigh ideal ... terms of performance, quality and not ...least, price — the cost savings of in-situ recycling can be very high indeed.

In situ re-cycling popular

In-situ recycling, which was originally developed in America, will undoubtedly hold great appeal for many West African States. Quite apart from saving time, money and materials, road recycling also saves those countries which have no oil of their own the foreign currency that would normally be spent importing expensive crude bitumen.

For general road and runway repair work, one of the most versatile planing machines currently on the world market is the West German produced Putzmeister Roadwolf universal hot/cold planer. For milling asphalt surfaces in the orthodox way, the Putzmeister has propane gas heaters which can heat the surface to controlled temperatures in a range up to 200°C. The degree of heat control is such that, as with the Colas system, the bitumen and aggregate can be recycled if required — although not in-situ. The heating precision also reduces smoke, noxious fumes and soot to an absolute minimum. Indeed, there is very little enviromental pollution with the Putzmeister system.

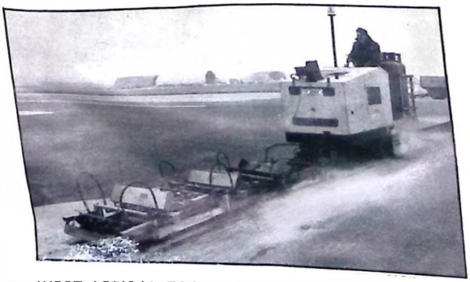


Putzmeister's road planer SW4 — a very popular model.

The asphalt is milled by a rotary drum of up to 4.2 m maximum width, cutting up to 100 mm deep on a single pass, to an accuracy of 2 mm at speeds of up to 9 m/min. Although cutting performance will obviously vary according to the road surface, as a general rule the machine will plane about 1,500 square metres per hour using the 4.2 m drum and operating at a steady pace of approximately 6 m/min. The drum is fitted with hard metal cutting picks which can be used for up to 150 hours before regrinding becomes necessary. They can be reground two, or possibly three, times before being replaced.

By changing the cutters the Roadwolf becomes a cold planer, and can be used for planing virtually any material, including concrete. Replacing the cutters is a simple operation which should take an experienced operator no more than an hour or so.

The Roadwolf usually works in association with the Putzmeister Hamster scraper-conveyor. This is a self-propelled machine which scrapes up the waste material milled by the planer, and lifts it by an elevated conveyor into a following truck. When not used in conjunction with the planer, the Hamster can be employed elsewhere on the site — removing excavated spoil, for example.



Joad's Superplane cuts asphalt to a depth of 50mm. in a single pass.

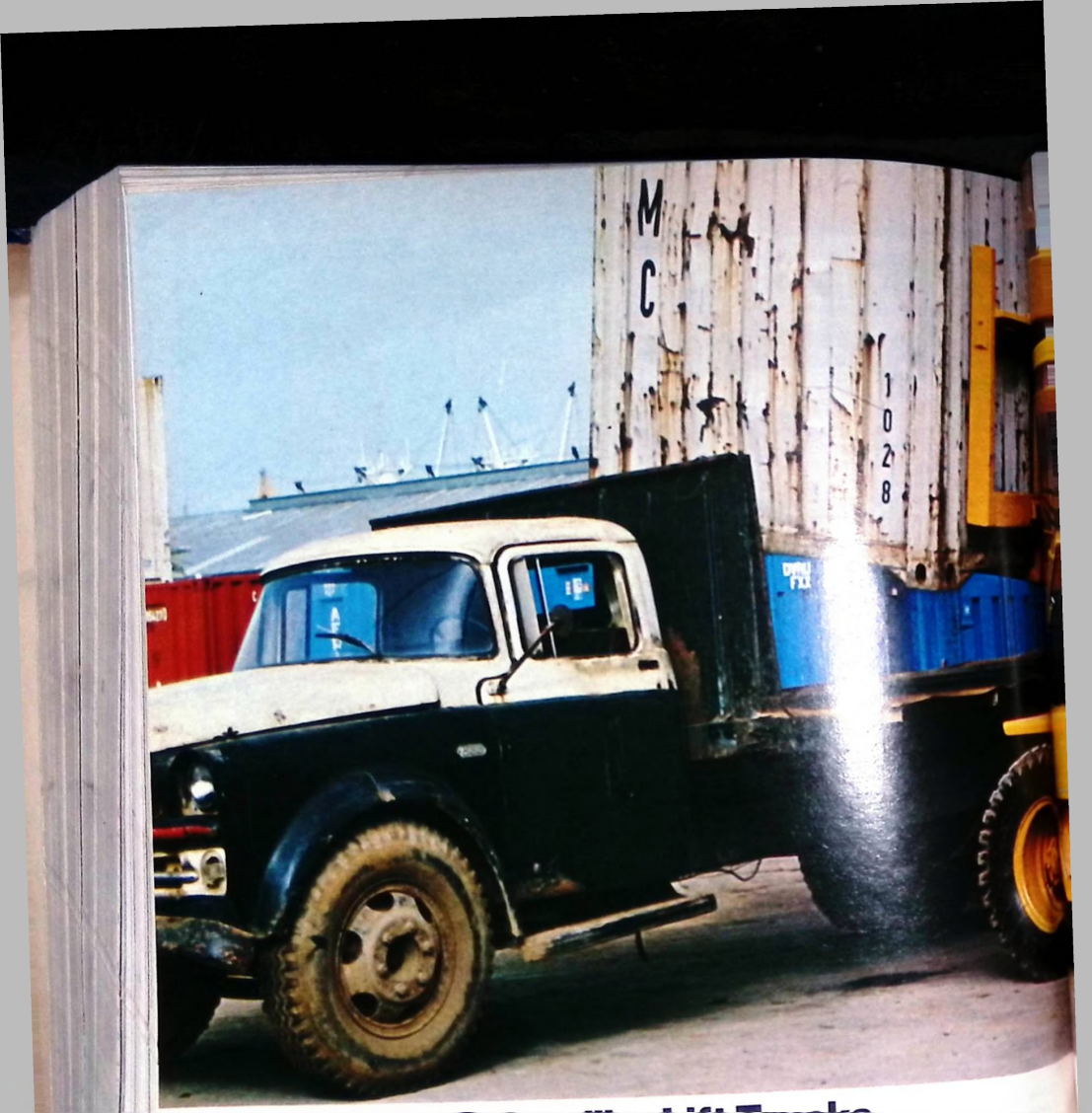
The smaller version of the Roadwolf, t... Putzmeister SW42 planer, can also be us... for hot and cold planing simply by chan...ging the cutters. The SW42 will heat t... surface to a temperature of up to 120... has a planing width of 2.2 m and will ... up to 50 mm on a single pass.

Some of the smallest planing machi... currently available, and which are ideal ... small road repair jobs and for work... places such as car parks, factory ser... roads and sports centres or for providi... key for permanent traffic markings, ... manufactured by Joad Engineering Lt... the UK. The smallest machine in the ... range is the miniscule MkII Con... Plane, a pedestrian-controlled planer t... powered by a 9 hp diesel and can col... concrete and asphalt surfaces ... maximum depth of 38 mm and to a ... of 254 mm in "a number of pa... Weighing just 160 kg all in, and mea... only 1520 mm long x 660 mm wide, ... fully self-contained unit which can e... fitted with a water spray for dust s...sion.

Joad also manufacture a rer... compact medium-capacity, self ... universal hot/cold planer that in ... size is comparable with an Austin ... VW Beetle motor car. Know... Superplane it is only 1100 mm ... mm long (without heater) and ... high. It weighs just 2500kg. B... milling width of 762 mm and ... asphalt to a depth of 50 mm ... pass at the rate of up to 1000 s... hour day. It will mill concrete t... 30 mm in a single pass, whe... fitted with full water-spray d... sion equipment.

For planing asphalt the S... fitted with a 3000 mm propane ... and with a drum equippe... tungsten-carbide tipped cutter... 285 rpm. For planing concre... is, of course, removed — whi... machine superbly manoeuvr... fined areas, and relatively ir... The cutting drum is replaced ... type action drum containing ... carbide multi-tipped cutters. ... ings cold-milled by the Supe... recycled in any of the mo... plants.

Recycling is clearly the ke... of universal planing machine...



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t done. They're designed with a minimum
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ssible for quick access. Saves you money in
ıe long term.

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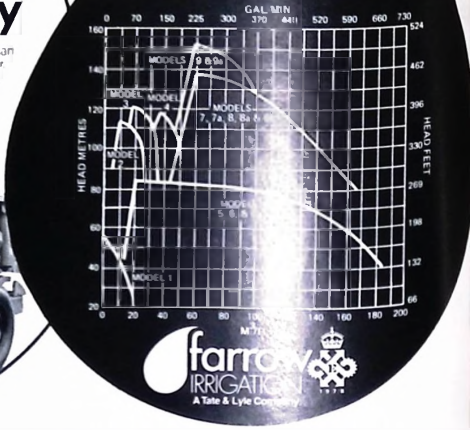
Model	Reference	Cyls
1	Pr ND5	1
2	L2-CM50/3	2
3	L3-CM50/3	3
4	F4-CM63/3	3
5	L4-CA4/80	3
6	F4-CA4/80	4
6(a)	P4-CA4/80	4
7	F4-CM80/2	4
7(a)	P4-CM80/2	4
*8	F6-CM80/2	6
8(a)	P6-CM80/2	6
8(b)	F1-CM80/2	6
9	F6-CM80/3	6
9(a)	P6-CM80/3	6

*Unit with 150 litre nominal capacity chassis fuel tank, canopy roof and sheet steel covers over exposed engine ancillary equipment for added weather protection.



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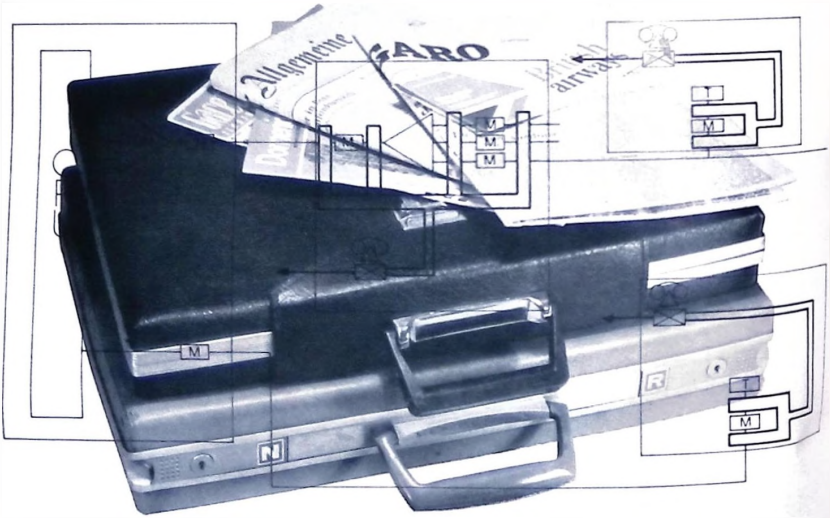

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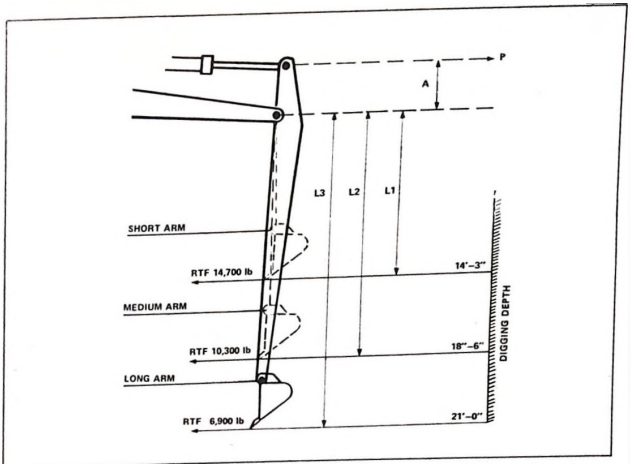
ntages

ntages of the modern hydraulic
are summarized as follows:—
articulated bucket provides eco-
e control of the angle of attack,
hydraulic ram which turns the
ket, is an additional source of
ting power. The fixed position
ket on the rope machine has an
e of movement which is totally
pendent on the geometry of the
om and bucket arm.

Much more of the weight of a hydraulic machine can be brought to bear on the bucket cutting edge, as the boom and arm are rigidly connected by hydraulic rams acting as struts, to the upper-structure. On the other hand the maximum downward pressure on the cutting edge of a rope operated machines bucket is a function of the weight of the front end equipment only, and any force in excess of this weight will only cause the suspending ropes to sag without doing any useful work.

A hydraulic excavator bucket can be emptied at almost any point on the arc of operation because it is articulated. The rope operated machines bucket has to be raised by the boom to the maximum possible height before the bucket arm can be raised until the discharge angle of the bucket is reached.



An example of three dipper arm lengths on a Hymac 590C showing radial tooth force due to dipper cylinder pressure.

Forward shovels

The hydraulic counterpart of the forward crowd shovel also eliminates the short-comings of the older rope operated machines. The advantages which apply to the hydraulic backacter equally apply to the forward shovel. These are the positive connection at all points between power source and bucket. The advantage of an articulated bucket is that it fills more easily and with far less shock, as the angle of attack, which is the angle at which it can be presented to the face, is always under the control of the operator. The digging action of moving the bucket up the face by means of the dipper arm is augmented by the prying action of the turning bucket, conse-

Continued

there is a reduction in overall ... and an increase in output.

...ward shovel buckets which are ...al to as 'dippers' in American ter... empty through the bottom, ...rs of a hinged door closed ...ring the ...g cycle by means of a la... which is ...wn by a separate rope ...med the ...pe. Hydraulic machine... may have ...ucket emptied either ... bottom ...r operated by indepen... hydraulic ...s which give a controlled ... charge rate ...n consequence is muc... ...der to the ...cles being loaded. In t... ...se of very ...e pieces of stone wh... will not go ...gh the bucket, they ... discharged by ...ing the bucket for... ...d until the ...erial drops out. This ... a useful feature ...quarries where large ...ntities of over... material are encountered as they can ...placed on one side ready for secondary ...aking.

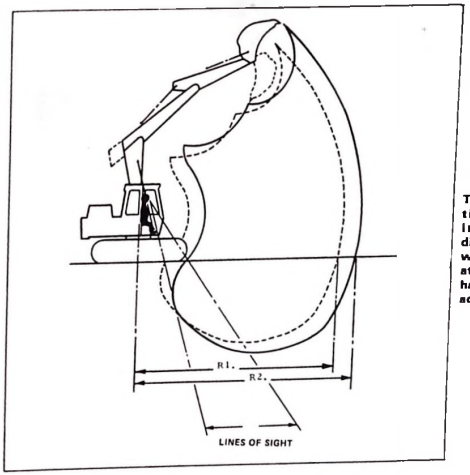
Design limitations

The modern hydraulic excavator has been designed with such a tremendous versatility of reach, depth and dump height, that it can be abused.

The actual size or capacity of an excavator is still considered by many to be the capacity of the bucket. This method of gauging size was quite relevant and meaningful with the older rope operated machines where the front end geometry was incapable of being changed and a bucket was fitted which was as large as possible compatible with machine stability. The hydraulic excavator however, often fitted with two piece sliding booms which can extend the operating radius, and having available a variety of dipper arms lengths must have the bucket capacity matched to the lifting capability of the machine as a whole.

Every excavator is designed to have an inherent stability and indeed in many countries the stability is a figure specified by legislation, both to the front and to the rear of the machine. If we think of the excavator as a simple lever with the fulcrum at the most forward point of the machine in contact with the ground, stability becomes a function of the weight of the front end equipment itself, plus the bucket and its contents, and the radius at which it is being carried, opposed to the dead weight behind the fulcrum. In theory, if this dead weight is increased, the amount of material which can then be carried in the bucket, or the radius at which it can be carried can also be increased, but stability has to be maintained both forwards and backwards and rearward stability becomes very important when the bucket is empty, just as forward stability is important in terms of how much load the bucket is carrying.

There is a limit to the weight and counterweight which can be accommodated by a machine of a specific size ...ght. Since it is impossible in this ... ...mething f... ...ng, if the ... ex... ... is designed to dig ... ...ing the dipper arm, which also means an automatic increase in operating radius, then obviously something has to be sacrificed if stability is to be maintained and this means reducing the cubic capacity of the bucket itself so that the machine will not be overloaded.



The elimination of the 'blind' spot important in difficult conditions where the angle of attack of the bucket has to be carefully adjusted.

The ease with which the operating arcs of an hydraulic excavator Front End Equipment can be changed, demands another sacrifice in terms of digging power at the bucket cutting edge which is the dipper arm ram. The problem again is one of simple levers and if the effort and the distance through which it is being applied remains constant, then, as the length on the other side of the fulcrum is increased, the available force will be proportionally reduced. This is not a factor which is generally appreciated by many users of excavators, and machines tend to be bought in the mistaken belief that to buy the maximum in terms of digging depth and outreach will give the best value for money as the maximum number of jobs can be undertaken.

Whilst this is true in principle, the sacrifice which has to be made in other directions to achieve these very wide arcs of movement will lead to an inferior performance, and may even lead to machine damage. For example, an excavator fitted with a long dipper arm, which works for the majority of its time in comparatively shallow holes, will be subjecting the boom head to massive loads, the reason for this is simple to see. The angle made between the boom and the dipper arm will be so accute, that much of the force of the dipper arm ram will be reacting against the boom head structure, rather than the cutting edge of the bucket.

Equally, the digging power obtained from the bucket with this very disproportionate lever, may be as little as one half of what could be obtained with a more suitable length of dipper arm.

Matching machine to job

The requirements of any particular excavation are peculiar to the job and this is why the modern hydraulic excavator is designed with massive variations of arcs of movement and combinations of digging force and operating speed.

Very simply two results are obtained by changing the Front End geometry.

1. A short arc machine with a limited reach and depth but with a very high digging force and lifting capabilities.
2. A wide arc machine with greater depth and reach but with a lower digging force and less lifting capacity.

In part, these very different requirements can be made compatible by arranging even greater versatility by splitting the boom top section and making the top slide in and out.

This has the effect of reducing the operating radius allowing larger buckets to be used with shorter dipper arms. A further benefit obtained from two piece boom, is the better balanced geometry allowing the operator to match dipper arm and boom in such a way that the bucket can be kept close to the machine with the result that better versatility and an increase in stability is achieved.

This elimination of the 'blind' spot, is particularly important in difficult conditions where the angle of attack of the bucket has to be carefully and continuously adjusted.

By the use of more sophisticated hydraulic systems, certain characteristics can be designed into a machine to increase its versatility.

Pumps having a variable delivery can be used to give an increase in digging power by sacrificing the speed at which the machine will work and many manufacturers are turning to this type of equipment. Although these complex hydraulic systems offer definite advantages, it is still, the geometry and design of the Front End Equipment which dictates the digging performance. □

...oom ...ne ...r crane

...powering of all ...istinguish a 150-tonn... crane, developed b... and Rapier Ltd. ... foreseeable requi... the construction ... action industries.

...n as the Rapier-N... ...s HC 150, it is equip... ...ven hydraulic pump... for ...sting and lowering, pre... swing control to place ... accurately, and ...endent hydraulic travel ... its maximum combined ... length of 96 m., the ...er can quickly be con... to dragline or grab-crane ...ation.

Four hydraulic pumps are directly driven from the main diesel engine which develops 250kW. at 2100 rev./min. Included is a reversible variable displacement type — driven from the front of the engine for swing operations — which includes a booster for closed-circuit powering.

Indirectly driven through a gearbox at the rear of the engine are two further variable displacement pumps and a fixed-displacement pump. The former power the left-hand track or front hoist drum and the right-hand track or rear hoist drum respectively; and the third drives the boom hoist motor or an optionally fitted third hoist drum motor if it may be used to supplement the two variable-displacement pumps to achieve maximum load-hoist drum speeds. All three pumps are equipped with a safety governor control to limit their combined ...

...circuit operation; fail-safe ...es are fitted to all hydraulic ...tions.

...obile ...rilling system

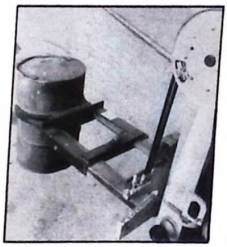
A self-contained mobile drilling system, in which a hydraulic drill capable of boring to a depth of 2,000 m. is mounted on a *Scania* six-wheel drive cross-country truck, has been developed by **Svensk Djupborrning AB** of Sweden. Designed with mobility and reliability particularly in mind, it can travel at normal speeds on conventional roads, and then switch to a special low range of automatic gears in order to travel across roadless terrain to the desired drilling site. This makes it extremely suitable for use in African countries where distances between operating-sites are often great, where roads are relatively few, and where there is a great variety of difficult terrain.

The hydraulic drill itself is a Model B-O manufactured by *Wirth* of Germany, suitable for many different drilling operations. These include deep-drilling of wells, relatively shallow augering for foundations or post-holes, and extraction of samples of earth, rock and minerals from depths as great as 2,000 m. The unit is powerful enough to drill through 15 m. of granite in one hour, and can be inclined at various angles to reach water sources or mineral deposits not directly below the drilling-site. Rotation speeds of 0-650 rev./min. or 0-1,100 rev./min. can be selected, and borehole diameter is adjustable between 86 mm. and 250 mm.

Drum handling attachments

A range of mechanical drum handling attachments is now available through lift truck attachment manufacturers, **Hercules Hydraulic Limited.**

Available for either fork or carriage mounting, the attachments are quickly fitted to any type of lift truck for handling 25 gallon and 45 gallon capacity drums.



An advantage of the fork mounted models is the ease and speed of fitting. The unit is simply clamped on to the forks and with the additional reach possible, enables drums to be loaded or unloaded from one side of a vehicle — important where space or operating time are restricted.

Being easily fitted or removed from the forks, the fork mounted attachment is ideal for intermittent handling. The carriage mounted unit, used for continuous handling applications, is permanently secured by brackets designed to fit lift truck carriage plates.

561 series D pipelayer

Caterpillar ammounces the 105 flywheel horsepower (78kW.) Cat 561 Series D Pipelayer, replacing the former model in the 18 tonne lifting capacity range. Improvements include many of the features found in the larger pipelayers of the Caterpillar line, such as a planetary power shift transmission, "live power" draw works and oil-cooled steering clutches and brakes.

The 3-range, forward and reverse powershift arrangement simplifies and reduced the number of shift controls. A single lever controls all direction and shift changes, eliminating the former forward-reverse lever and clutch lever. This feature enables the operator to manoeuvre more easily while concentrating on other pipelayer controls.

A "live power" design allows independent operation of the draw works and the pipelayer's transmission for greater flexibility. Power to the draw works transmission comes directly from the engine instead of a transmission PTO shaft. Formerly located low on the pipelayer's bevel gearcase at rear centre, the draw works clutch and drive is now fender mounted on the rear right side. This positioning allows mounting a towing winch or other rear-mounted implements on the 561D for added versatility. This location also permits short, direct linkage from the hand lever controls to the draw works, reducing hand lever effort for easier operation. For further information contact **T & E (Division of UAC Nigeria Ltd.),** Lagos.

30 tonne dump truck easy to operate

A 30 tonne off-highway dump truck has been introduced by **Heathfield Engineering Ltd** as the first of a range built to metric standards. The H30M was designed to be as simple as possible. Its operation can easily be understood by mechanics anywhere and there are few parts to go wrong.

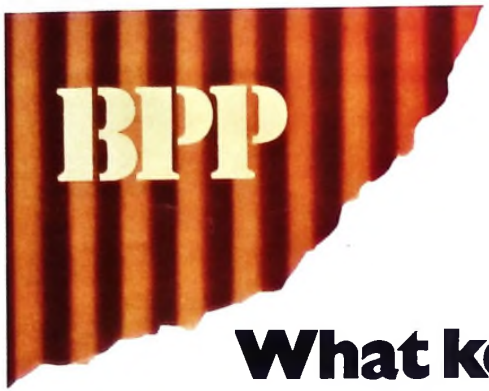
The engine is the Cummins NTA-855-C360, 270 kW unit, coupled with a GM Allison CLBT750 fully automatic transmission which is particularly suitable for off-highway applications.

Rubber is used throughout the suspension system which is virtually maintenance free and is fail-safe in operation. It can also be easily and quickly replaced. Front and rear suspension use sandwich rubber units loaded in sheer and compression. In addition bump and rebound rubbers control the limits of movement.

A purpose built rear axle is rated to withstand arduous site condition, with ratios giving low propshaft speeds and consequently low transmissions wear. For ease of servicing, the unit can be lowered from the chasses.

dig

...may be obtained on any item by using the Form facing page 178.



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(A Division of UAC of Nigeria Limited)

single screw compressor

Single Screw portable air compressor introduced toward end of last year by the Consolidated **Pneumatic** T... Ltd., is now also being manufactured in standard silenced versions. Both ... and 185 cfm models are ... and are being supplied ... quarries, highways and ... remote locations where environmental considerations ... not demand the very low decibel ratings of the silenced machines.

The CP Single Screw compresses air by a screw rotating between two seals. Unlike twin screw compressors, where pressure build-up on the mating surfaces causes axial and radial wear on the bearings, the single screw principle provides simultaneous compression on both sides, giving a balanced performance and neutralising harmful forces.

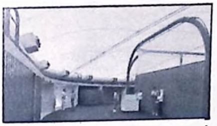
The design minimises the number of working components ... no drive gears or oil pump ... required, thus eliminating unnecessary wear. The air end ... of course, covered by the CP three year warranty.

The main design components of the compressors are the same in both standard and silenced versions, allowing fleet owners to have interchangeability of spare parts, where operating both versions. For further information contact **Bewac Ltd.**, Apapa.

Architectural fabrics

Permanent fabric structures built in climates as different as Alaska and Saudi Arabia are described and illustrated in a new **Du Pont** brochure for architects, contractors, consultants and others in the construction industry.

While the use of fabric for large structures is not new, it has been restricted in the past to temporary installations. Acceptance of fabric as an alternative to conventional, permanent building materials has come about only recently, with the introduction of a fabric that will withstand long-term exposure to sun, wind and weather.



The 16-page 'Architectural Fabric Structures' brochure provides up-to-date information on numerous installations where glass-fibre fabric coated with Du Pont's "Teflon" PTFE fluorocarbon resin was selected because it offered the greatest design flexibility and use of available space at least expense. An added benefit was that the natural light passing through the translucent material enabled saving to be made on electricity for illumination.

For a free copy of the brochure (available in English, French and German), write on company letterhead to Room CS 614/609, Du Pont de Nemours International SA., PO Box, CH-1211 Geneva 24, Switzerland.

Trailer-mounted mobile workshop

A fully equipped trailer-mounted workshop, designed for the maintenance of vehicle fleets operating far from their base servicing facilities, is offered by **Scottorn Trailers Ltd.** Apart from its use for vehicles, the unit provides a valuable facility for the maintenance of plant and equipment on remote sites, such as construction, drilling and exploration sites.

The workshop can be towed by any commercial vehicle of five tonnes gross vehicle weight and upwards. Being trailer-mounted it only requires a vehicle to tow it to site, thereafter leaving the towing vehicle free for other duties.

This is a more practical and economical arrangement compared with the conventional type of vehicle-mounted mobile workshop where the vehicle — apart from initially costing more than a trailer unit — cannot be put to other uses since it forms an integral part of the workshop.

Measuring 6.70 m. long x 2.40 m. wide x 2 m. high, the workshop is laid out to provide maximum space utilisation and ease of access to items of equipment. It carries a comprehensive range of lubrication equipment and other facilities include a 12.5 kVA. generator, welding equipment, a one tonne capacity hydraulic crane and tool kits for electricians, engineers, blacksmiths, pipefitters and carpenters.

Jones 971 HLB mobile crane

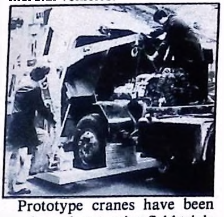
The **Jones** 971 HLB mobile crane is designed to handle two full standards of timber — wieghing around 6 tons — at 60 ft. (18.2 m.) radius. Its design was based on the results of a market research programme conducted among port authorities throughout the world. This revealed a considerable demand for a fully mobile, fast operating quayside crane that could handle double standards of timber from vessels with up to 30 ft. (9.1 m.) freeboard above the quay, and which could also handle bulk cargoes — such as coal, sand and fertilizers — and ISO containers.

Ideally, port authorities required a general utility mobile crane that had the speed, outreach and capacity to load or off-load some 75 standards of timber an hour from vessels up to 50 ft. (15.2 m.) in the beam. The Jones 971 HLB meets this requirement.

The crane can be fitted with boom lengths up to 90 ft. (27.4 m.) and will lift 3 tons at 90 ft. (27.4 m.) radius, working at mean line speeds up to 215 ft./min. (65.5 m./min.). It can be equipped with double rope grabs up to 125 cu. ft. (3.5 cu. m.) capacity for handling bulk cargoes — and it will lift 16 tons at 30 ft. (9.1 m.) radius, a capacity well in excess of the 11 tons average weight of a standard 20 ft. (6.1 m.) containers. For further information contact **Blackwood Hodge (Nigeria)**, Apapa.

New crane from Epco

A new $2\frac{1}{2}$ ton crane suitable for heavy vehicle servicing work is being manufactured by **Epco Limited.** The $2\frac{1}{2}$ ton crane (designated TC 2550) replaces Epco's 2 ton crane and has been developed to meet the greater reach and height requirements of the operators of large commercial vehicles.



Prototype cranes have been put through extensive field trials where their design and robust construction have proven to be consistently reliable. Epco believes that the $2\frac{1}{2}$ ton model is now the best British-made crane available for very heavy duty work, where length and height of reach are as critical to effective operation as the actual load-bearing capacity.

Waterproofing roofs in hot climates

Lupdine Ltd., specialists in protective coatings has developed a highly flexible, non-solvent waterproofing compound for roofs that will not run, sag or crack in hot climates or strong direct sunlight. The coating is, of course, equally suitable for temperate and cold regions.

Lupguard is a flame-retardant, non-toxic, polymeric liquid that reflects sunlight and does not suffer ultra-violet degradation. It is applied by brush or standard pot spray equipment.

Two coats usually suffice and, when applied at a rate of 1 litre to 1-3 m², will give a 0.2-0.6 mm. thick covering. Three coats may be needed on exceptionally rough surfaces or where extensive abrasion is likely. Brushes and spray equipment can be cleaned in water.

A glass fibre or cotton membrane may be incorporated during application of the compound to bridge large gaps or form flashings. The compound is offered in red, green, light grey, slate grey or white.

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ARISTON

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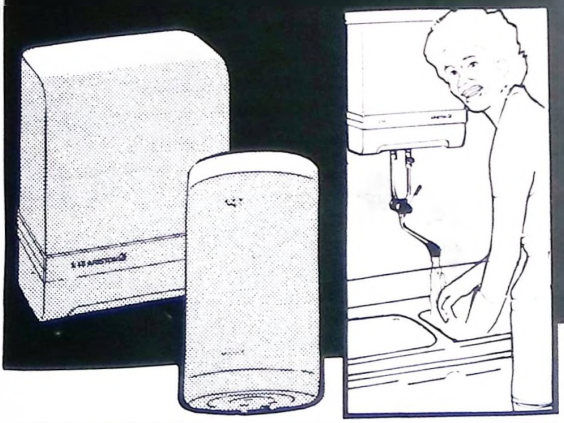

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...nfort, safety and ea... ...ration characterise a d... ...of advanced design fit... by ...ac Ltd. to their lat... 23 ...e crawler excavato... as a ...lt, the Type 890 excavator ... complies with the most ...ere environmental, ...nomic and safety regula... ...s in the world.

...oof window, twin wipers, ...ric screen washers, interior ... heater/demister, opening ...screen and sound-insulated ...s, roof and doors are ...porated in the 900mm ... cab. Noise levels have ... reduced to 78 db at 7m. ...digging functions are con... ...d by light, precise, power... ...ated hand controls built ... the seat's armrests. Pedals ...rol the slew holding brake ... the auxiliary, which is piped ... the dipper arm for de... ...ng when no attachments ...ted.

...e suspension seat can be ...ted for fore and aft posi... ... back rest angle, height ...ushion angle. The instru... ... console carries fuel and ... temperature gauges, hour ..., and pilot system pre... ... alternator and engine oil ...ng lights. A plug lead ... and switches for beacon, ... screen washers, screen ..., heater fan and horn are ...tted. For further informa... ... contact **Conveyancer** ...**ia) Ltd.,** Apapa and ...**a Enterprises,** Accra.

...4B 'total ...ign' ...avator

... breed of "total design" ...tor — the 3984B — ... for maximum perfor... ..., comfort, versatility and ...ility in the 7/8-1 cubic ...rd class is now available from **International Harvester Co.**

The all new 3984B swing system incorporates the latest design concepts in an independent swing system. A new high speed 40 hp swing motor converts hydraulic power to mechanical power through a double reduction planetary swing reducer for smooth, precise swing controls.

IH spokesmen say the independent swing system of the 3984B gives the operator full flow control at all times for faster cycle time, excellent performance and productivity. Whatever operations are undertaken — travelling, digging, lifting — the swing is always "live" and ready to provide smooth, precise rotation of the [illegible].

The 3984B is propelled by new high speed piston motors with automatic disc brakes. These motors deliver an additional 10 per cent drawbar pull of 16.5 metric tons with a maximum travel speed of 2.5 km/h (1.55 mph) and maximum continuous gradability of 70 per cent. For further information contact **Tecmat,** Apapa.

New portable crushing plant

A new, compact portable crushing and screening plant has been introduced by **Iowa Manufacturing Company.** Called the Cedarapids [illegible], the new plant performs like separate primary and secondary crushing units, will work in either rock or gravel and can produce up to three sizes of finished product.

Primary crushing is handled by a jaw crusher, while a 3-roll crusher provides two stages of reduction. The 3-roll crusher has rubber-tire drive for quiet, smooth, low-maintenance operation.

A Cedarapids double-deck horizontal vibrating screen gives accurate sizing for maximum performance, while an undercrusher conveyor elevating wheel and overhead screen feed conveyor close the circuit.

Conveyors can be placed on both sides of the plant to deliver fine, medium or coarse product.

New reflective solar-control glass

Pilkington has produced its first monolithic solar-control glass with a highly reflective coating. Called Reflecafloat 33/52 (Silver), the new glass is suitable for single or double glazing, and now gives a complete range of environmental-control glasses including tinted, coated, laminated, single-glazed and double-glazed products.

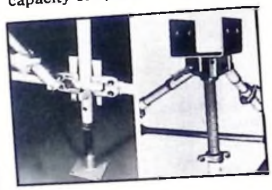
Coated on-line in the float-glass manufacturing process, Reflectafloat which is silver in reflection and bronze in transmission, has a light-reflectance of 43 per cent, which makes it one of the most highly reflective solar-control glasses currently available. Suitable for use in all climates, Reflectafloat also has a high reflectivity and low absorptivity for solar radiant heat, which reduces the risk of breakage through thermal stressing. This makes it suitable for glazing the whole facade of a building, including cladding-panels.

As a solar-control glass, Reflectafloat reduces solar-heat gain by 48 per cent and light-transmittance by 67 per cent, alleviating problems of over-heating in buildings and reducing sky and reflected glare. Reflectafloat has a shading coefficient of 0.60. For further information contact **Pilkington Glass (Nigeria) L...**

Shoring system for heavy-duty scaffolding

High load-bearing capacity coupled with flexibility, safety and economy are among the advantages claimed for a shoring system developed by **Kwikform Ltd.,** for use with its standard range of scaffolding units.

The Kwikstage shoring system enables scaffolding units to support heavy structures, such as concrete beams, floor slabs and bridge decks, without the need for a separate heavy-duty support system. It gives each upright unit a load-bearing capacity of 5,590 kg.

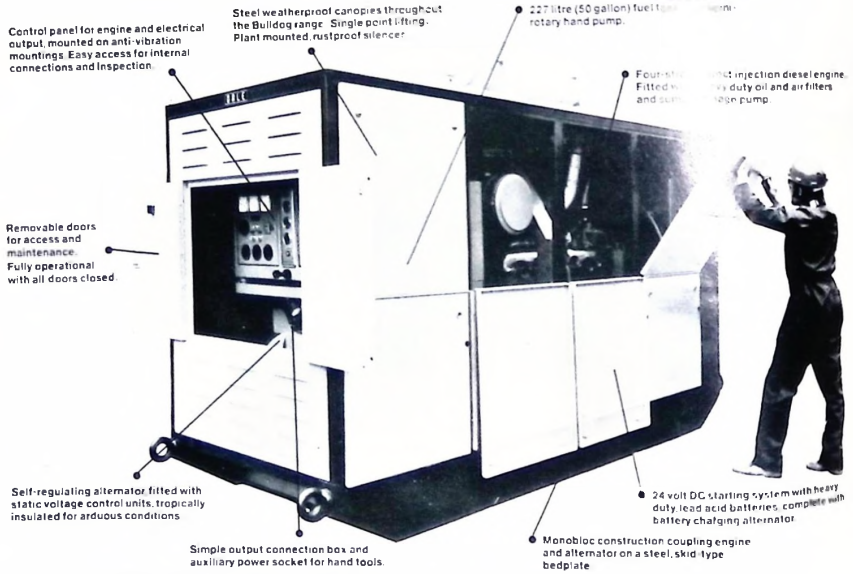


Based on grid dimensions of 1.2 m. and 1.8 m. or a combination of the two, the system comprises four basic components designed to eliminate the time-consuming and laborious conventional method of fixing lateral and diagonal support units to upright units, reducing the number of components involved by one third, the makers say.

Lateral bracing is provided by a shoring tie which is quickly and easily connected at both ends to upright units by means of a series of wedge-type fixing points welded on to the uprights. Upright units are supplied in standard lengths of 2 m. and 3 m. with node points at 495 mm. intervals. For diagonal shoring between node points a trigger brace is supplied; this incorporates a fixing spigot and a spring-loaded trigger at either end for quick and easy attachment to shoring ties. The spigot passes through a locating hole in the end fitting of the shoring tie and the trigger then makes the connection captive. The fixing technique for shoring ties and trigger braces enables four-way lateral and eight-way diagonal shoring to be effected from any mode point, providing maximum flexibili...

Dale Bulldog.

The purpose-built, on site gen. set



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LOWER THE TONE and Protect Your Hearing

a very noisy environment to work in safety

e prevention of injury of hearing is of major importance in factories. this article, Michael Lawrence of Racal Safety Ltd., looks at some of he hearing protectors available on the market and their advantages.

CREASING AWARENESS that osure of high levels of noise can cause upational deafness has resulted in slation being introduced in many ntries to combat the industrial environ- tal noises of the modern world.

ndeed, noise-induced hearing loss has n prescribed as an industrial injury, and fore the prevention of injury of hearing f major importance in factories and r work places where the processes can lt in continuous exposure to steady ids of 90dBA, or more, in an 8-hour od, or equivalent energy levels over ter periods.

w to reduce ise exposure

oise exposure can be reduced by (a) rolling the amount of noise produced ource, the amount transmitted through air or building structures and/or by ewing operational procedures and (b) personal protection (the wearing of ring protectors), but none of these asures reveal the *actual* effect on the aring acuity of noise-exposed personnel, ecially bearing in mind that the susceptibility of individuals to occupational hearing loss varies considerably. The effectiveness of any methods of control of noise on individuals, and the early detection of any changes in hearing acuity, can be revealed only by routine audiometry. Indeed, the measurement of hearing ability is the most important part of a hearing conservation programme.

In industrial audiometry one is concer- only with the simple types of instru- which measures the pure tone, air duction threshold of hearing by present- a range of frequencies to the subject through earphones. Such audiometers may manual or automatic.

In the manual audiometer, the frequency and intensity parameters are set up by the operator who presents the test signals to the subject by operation of a switch. The automatic audiometer is programmed with a pre-determined sequence of frequencies, the intensity levels being controlled by the subject at his threshold while the results are plotted automatically upon a chart.

The choice of manual or automatic audiometry is determined usually by the numbers of employees that have to be checked. Both systems give reliable

Audiometry can be performed in a quiet room, but in industrial environments noise-excluding earphone shells are recommended, and sometimes it is necessary to have the subject seated in a silent cabin, with the audiometer outside. In such cases, the headphones (and the handswitch in the case of automatic audiometry) are taken through the cabin wall by means of a suitable connecting panel.

The questions may well be asked "How do we know we need a hearing conservation programme?" or "What are the indications that our employees are likely to suffer occupational deafness?" The danger signals are easily stated.

Action must be considered whenever persons have:

1. Difficulty communicating by speech while they are in the noise, *or*
2. Head noises or "ringing" in the ears after working in the noise for several hours, *or*
3. A temporary loss of hearing that has the effect of muffling speech and certain other sounds after several hours of exposure to the noise.

Noise-induced hearing loss first affects the human hearing of sounds higher than those essential for communication by speech. Therefore, most early noise-induced losses pass unnoticed unless they are detected by suitable hearing tests. As occupational deafness is irreversible, it must be detected well before it reaches the stage of interference with speech communication. That is a measure of the importance of industrial audiometry.

If, as the result of audiometry, early hearing loss is diagnosed, it is possible to remove a worker or take more adequate steps to protect his hearing, before the loss becomes serious.

Variety of different hearing protectors available

There are a variety of different hearing protectors available on the market today, and the most important advice one can give, which may initially appear to be trite, is that "the best hearing protector is the one that is worn". This advice is not so casual as it might first appear because valuable work has been done in demonstrating that even if hearing protectors are left off for very short

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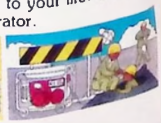


HONDA

TESTING TRUCKS FOR ROUGH CONDITIONS

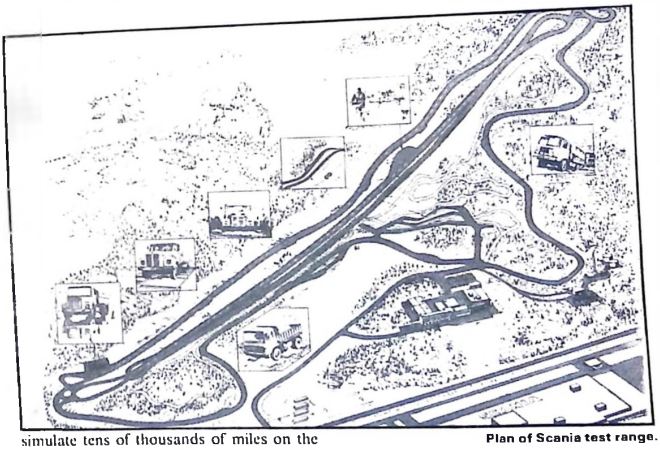
To operate in parts of the world where there are poor roads, few servicing facilities and frequently bad weather conditions, trucks must be reliable, easy to maintain and ruggedly built. All materials, components and systems of the truck must be thoroughly tested in the laboratory and on the road during the development stage, and every vehicle should be carefully inspected during and after assembly.

In this article, Sven Nylin of Scania describes the Scania laboratory and track testing programme, and explains how it helps to ensure that the trucks can withstand arduous operating conditions.

SCANIA GENERALLY spends five or six years on development and testing before introducing a new truck. At the company's central laboratory in Södertälje, 200 people are employed in this work. Next to the laboratory is the test range where trucks can be intensively tested under any road conditions occurring in practice.

In the chassis laboratory, the service life of components is evaluated in special rigs which can simulate the effects of severely [illegible] roads. Any [illegible] can be [illegible] design [illegible] the stresses on [illegible] testing brakes can [illegible] equipment of one axle [illegible] the same time. Pads are tested for performance and wear in accordance with automatic programmes run 24 hours a day. Drums are checked for heating and distortion. The rig is particularly useful in examining fade, which tends to occur after repeated heavy applications of the brakes.

A large universal rig is used to study the entire power transmission system, including the gearbox, clutch and propeller shaft. The stresses occurring during practical [illegible] operation are recorded on tape and the data transferred to the test equipment. Particular stresses can be isolated and made the subject of repeated tests to [illegible] even results [illegible]



Plan of Scania test range.

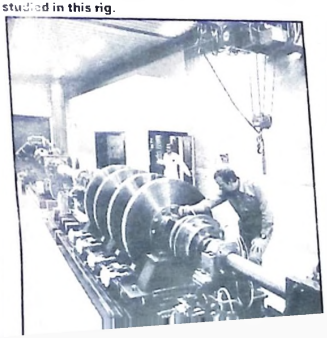
Fully automated

Much of the engine testing has been fully automated, with computers to supervise the operation and print out the results. Long-term tests simulate any combinations of urban traffic, long-distance haulage and starting and stopping, under all climatic conditions. Engines are checked for wear, fatigue and ageing of materials, and for fouling and deposits. Functional tests are conducted to determine the output, torque, fuel consumption and exhaust gas smoke, to assist in the development of cooling and lubrication systems, and to study vibration and noise.

In the materials and strength laboratory, components are tested to failure by breaking, pulling, pressing and shaking them. The test equipment makes it possible to simulate tens of thousands of miles on the road in a few hours. An electron microscope with a magnification of up to 90,000 times is used to study the fracture surfaces. It has great depth of field, allowing the jagged edges to be photographed. By discovering how different materials fracture, the most suitable ones can be chosen for each component.

Chemists analyse the way lubricating oil deteriorates under various operating conditions. Wear of the metal components can also be revealed by studying the particles worn away and taken up by the oil. As new oils are developed, this work allows service intervals to be adjusted for optimum economy.

Engine power transmission systems are studied in this rig.



Test range

The test range is used mainly for experimental and development work on engines, transmission units and complete trucks. It is 9 km long and consists of five different interconnected sections — a 1,7-km two-land highway, a 1-km high-speed section, an inner circuit with steep gradients, a vibration track and a forest track. There is also a 4-km long cross-country track.

Test programmes are designed to simulate the stresses and strains occurring under particular operating conditions, such as construction-site work or long-distance transport. Each programme specifies the section of track to be used, the duration of the test, the speed of the vehicle and the load the vehicle must carry. The tests [illegible] be repeated [illegible]

Nigerian pipedream come true

Kwalipipe of Tate and Lyle and Hepworth Plastics from U. K. joined forces to produce the most comprehensive range of uPVC pipe systems.

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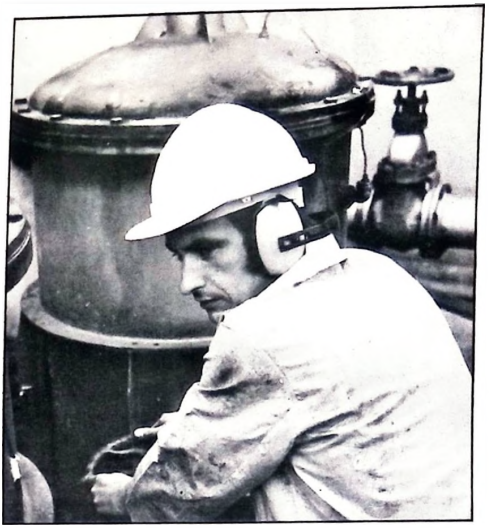
...roadly speaking, hearing p...ectors are ...ded into two basic type...namely the ...muff or headband typ...nd insert ...ring protectors. In an id...situation, a ...ring protector would ...lected by ...lying the degree of atte...n provided ...the different protect...ailable. The ...l selection should th...the protector ...ch will adequately ...e the sound ...s to below the 90d...vel for each of ...frequencies encou...d in the noisy ...ironment. This o...rse means that ...e a hearing prot...r is selected, sound ...readings are t...n at a point where ...operator would ...ormally work. Great ...should be tak...that the sound level ...ings are taken individually for each of ...frequencies which are contributing ...rds the noise. These readings are then ...pared to the attenuation charts, ...ided by hearing protector manu...rers, to ensure that at each of the ...encies the subject experiences not ...than 90dBA of sound. This proce..., however, is often impracticable for ...ler manufacturers who may not have ...ss to sound level meters or the ...rience of noise measurement. It is of ...se possible to call in experts; noise ...sultants, who can carry out this work, it can be a very costly business to ...duce these sound level readings for ...y machine and every operator at a ...t...plant. It must be stressed ...ever... ...only way to be ... ...particular hearing ...te... ...quately protect the ...ker ...

...mfort and ...pearance normally ...ken into account

...practical terms, hearing protectors ...to be selected by other factors, that is ...fort, appearance etc., but it is very ...rtant that some reference is made to ...oise levels encountered and the degree ...rotection provided by a particular ...ector.

...ost manufacturers offer three grades ...circumaural protectors providing ...ent degrees of attenuation or noise ...ction. Most commonly used are

...chanic, wearing a "Sonoguard" hearing ...ctor is seen making adjustments to an engine — hearing protection is impera... in high noise areas such as this.



A pipe line maintenance engineer wearing an Ultramuff hearing protector with an industrial safety helmet.

hearing protectors in the low cost end of the market which provide attenuations of approximately 8-15dB in the low frequencies, and up to 35-40dB in the high frequencies. These protectors are normally quite adequate for use in sound levels of 105-110dB of noise, provided that that noise is not all in the low frequencies. Hearing protectors provide better attenuation in the mid and high frequencies than they do in the low frequencies.

On the other end of the scale, most manufacturers provide high performance hearing protectors for workers exposed to very high noise levels of sound, and where the cost of the hearing protector is secondary. The high degree of noise protection is possible by using a high density material for the earshells, a liquid seal for the cushions and, generally speaking, a higher headband pressure which clamps the protector more tightly on the head. This variety of factors involves higher manufacturing costs and the hearing protector is generally very much more expensive. These protectors provide noise reduction of approximately 20-25dB in the low frequencies and up to 45dB in the high frequencies. They are normally perfectly adequate for noise levels of up to 120-125dBA provided, again, that at the extreme low frequencies the sound levels ...greater than 110dB.

Most manufacturers provide a mid range protector which is ...able for noise levels ...to 120d...gram with the proviso ...that the noise is not all in the low fre...encies.

Insert earplugs often chosen...

Insert earplugs are often chosen where, for one reason or another, a subject cannot or will not wear the external type earmuff. The typical kind of applications for i...

already wearing other safety devices such as hoods, respirators, sometimes industrial safety helmets, where it is not convenient or possible for hearing protectors to be added. Also, in textile manufacture for instance, areas of high humidity are encountered and the wearing of protectors tends to cause perspiration around the ear. The other larger application for insert plugs is for women who do not like to upset their hairstyles by wearing external protectors.

...but external muffs offer better protection

In general, insert plugs do not provide as good protection as external muffs but there are some exceptions to this, and one plug in particular will provide a better degree of protection in the low frequencies than most external earmuffs. There are a variety of internal plugs available, ranging from plugs which are available in different sizes and require to be fitted individually to ensure a good seal, to others of universal type fittings; and there is also the completely disposable type of plug — the controlled expansion type such as E-A-R plugs.

Another approach to insert plugs are those which are custom moulded, that is an impression is taken of the operator's ears and a plug is moulded in a variety of different materials for that individual. Each of these type of insert plugs have certain advantages and disadvantages. In short, the same rules apply to the selection of insert plugs as to external earmuffs, that is the plug should be chosen on the basis of the study of the attenuation at each of the frequencies provided by an individual plug.

Finally, having provided protection the employer cannot relax. A continuing campaign of education, together with regular monitoring of workers hearing, must be maintained in order f...

see it in action!

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...going long-term testing are run on the ... 24 hours a day to determine the ... lives of the various components and ... quickly. Other tests are performed to ... acceleration and braking performance, rolling resistance, fuel consumption ... to measure temperatures and noise ...

High stresses

Certain sections of the test range show ... the trucks stand up to difficult road ...ditions. High stresses are induced by ... vibration track, which has four ...rugated sections, each 100 m in length, ...n increasing amplitude in the direction ...ravel. The forst track consists of curves ...arying radii, long gradients and rough

...cania trucks descending a 50% incline.

...ions, and is designed so that vehicles ...g it must alternately brake, accelerate ... change gear frequently. This places ...y demands on the engine, transmission ... brakes. Intensive hill testing is perfor... on the inner circuit, where there are ...lients of up to 50%.

...ests on these three sections can be ...plemented by driving the vehicle round ... cross-country track, which includes ...ps, very steep hills, difficult passages ... sections with loose surfaces and ...shy soil.

...ddy conditions

...uck operation in muddy conditions ...es special demands on chassis cons...

Checking that bearings and other chassis components are water tight.

Vibration strip imposes high stresses.

truction and components. An extra loop on the test track contains a mud pit with a thick layer of mud and sand which is automatically kept damp by water sprayed from nozzles. Alternatively, it can be filled with up to 50 cm of water. The pit is used to make fouling and tightness tests on bearing and other chassis components. In addition Scania trucks are well protected from corrosion. All sheet metal components are thoroughly cleaned before the multi-stage priming process, and the paint is subsequently applied by dipping as well as spraying.

Truck design

The chassis frame, axle equipment and engine of each model of truck are designed to meet specific operating requirements. Powered by an 8-litre engine developing up to 151 kW, the Scania 81 has a relatively light frame and axle, and is intended primarily for short-haul distribution work. The Scania 86 has a more robust frame and studier axle equipment, making it additionally suitable for off-road operation.

A larger robust-chassis model, the Scania 111, can be fitted with either of two versions of the 11-litre engine. One is intended for long-haul transport and similar duties where high average speeds are particularly important. It has an output of 224 kW at 2200 rev/min, and a low fuel consumption of 209 g/kWh. The second version has high torque (1110 Nm at 1300 rev/min) and is well suited for dumper duties and short-haul heavy transport.

The largest and most rugged Scania model, the [illegible] suitable for the transport of [illegible] bulky goods including excavators, [illegible] machinery and materials such as ore, stone and concrete. The gross vehicle weight is 30,000 kg and the truck has tandem-axle drive. The 14-litre V8 engine develops 275 kW at 2000 rev/min and has exceptionally high torque. A special version of the LT146 has the advantage of a torque converter incorporated in the power transmission system.

This roughly doubles the torque developed by the engine at low speed, making it easier to start the vehicle from rest, even when carrying the heaviest of loads. The torque converter includes an oil filter to ensure reliability and long life, and the hydraulic pump can be dismantled from the outside.

Several other Scania trucks are powered by the 14-litre engine, including the LBT141, which has a four-spring bogie designed specifically for long-distance highway transport. Each rear axle is mounted in two separate springs, and a linkage distributes the forces between the two driving axles when the truck is being driven on an uneven surface.

Quality maintained

Truck chassis from Scania are supplied to 60 markets throughout the world, and to meet different needs it manufactures cab-over-engine as well as bonnet-type models. Stocking of spares is simplified by standardisation of components, which wherever possible, are interchangeable between trucks of different sizes and between old and new models.

To ensure that each truck manufactured meets the standards established during the development stage, each chassis leaving the assembly line receives a final inspection. First, it is warmed up by a test run, during which the performance of steering, brakes, clutch and gearbox are tested, and any noise or vibration is noted. It is then driven through an automatic washing plant on to a rolling highway, where the speedometer, working temperature, engine output, oil pressure, engine speed and tachometer are checked. Any oil, water or fuel leakage is discovered during the subsequent inspection, and the conditions of paintwork, electrical equipment and other items are checked. The footbrake and handbrake are tested and any necessary adjustment ma...

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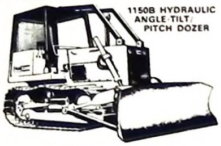

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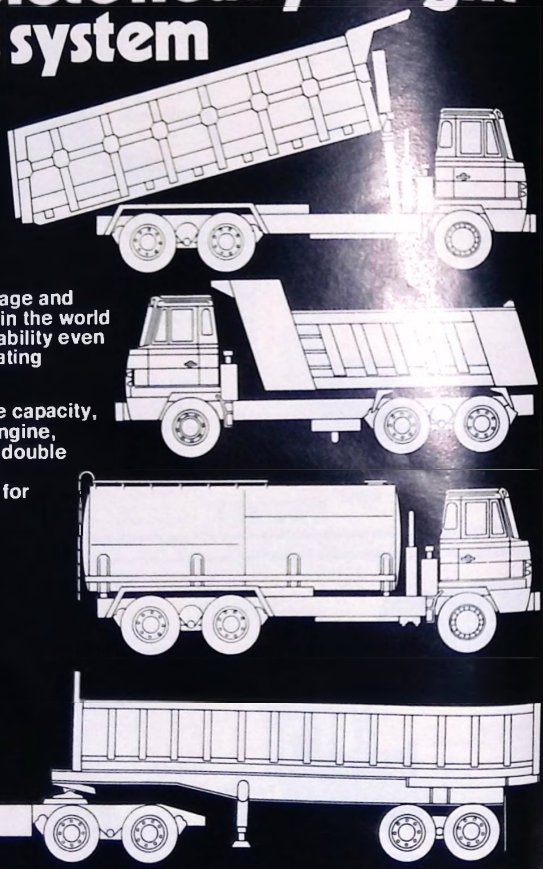

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Rectification of casting defect on an engine block using the arc welding process.

WELDING OF CASTINGS

Cast-weld assembly can offer many advantages in certain situations. This article takes a look at the important foundry factors to be considered before using this method.

FOR MANY centuries, the production of complex castings has been regarded as the mark of a skilled foundryman. Today, however, time, money and to some extent labour and production demands do not always allow the foundry to demonstrate their arts. Complicated castings are [illegible] when [illegible] smaller [illegible]

too frequently, insufficient consideration is given to the possibility of using cast composites in a foundry and too many design engineers consider a design simply as a casting or as a complete fabrication of wrought [illegible]

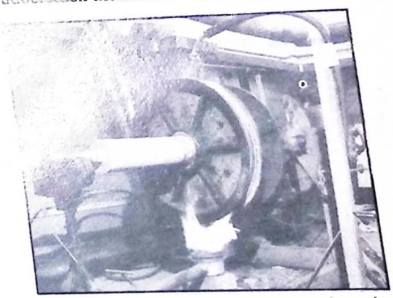
stainless steel impellers and valve castings. The greater proportion of these go to the power generation industry, in particular steam and interceptor chests or stop valve assemblies.

The cast-weld assembly can offer many advantages in particular situations, but there are a number of foundry factors about any particular castings which must be considered before a final decision is made. These are:

1. The soundness of the casting and the cleanliness of internal pressure wall surfaces
2. The ability to inspect surfaces and repair defects
3. Core support and renewal
4. Dimensional control
5. Tearing hazards
6. Casting size

Soundness of the casting

Soundness of the casting is particularly important from a quality viewpoint when considering power generation applications. One of the major contributory factors is shrinkage arising from difficulties in feeding molten metal to all parts of the mould and this problem can be reduced substantially by producing several simple castings rather than one highly complex one. The ability to inspect the casting and repair defects is also important. In one recent example, by altering the design of a cast-weld assembly in conjunction with both the foundry and the customer, it was possible to carry out the ultrasonic inspection of an assembly which previously had not been possible. another major advantage of considering the cast-weld procedure is that it can be used to overcome limitations in foundry melting and/or lifting capacity. In Russia, for example, the technique has been used in conjunction with the electroslag welding to produce heavy components and, in Scandinavia, the technique has been applied to the fabrication of rudderstock assemblies for supertankers.



A crane wheel being pre-heated and rotated during Casto Mat overlay.

When considering utilising the [illegible] assembly [illegible]

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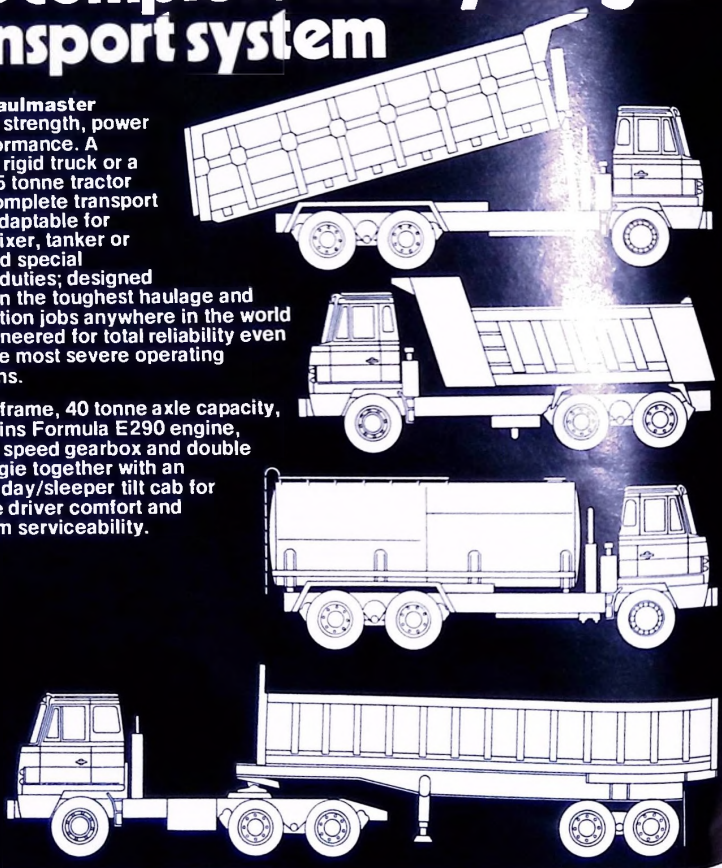

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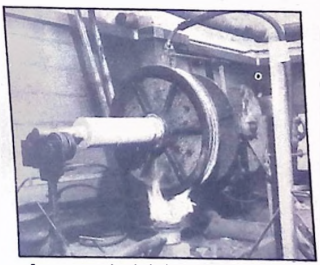
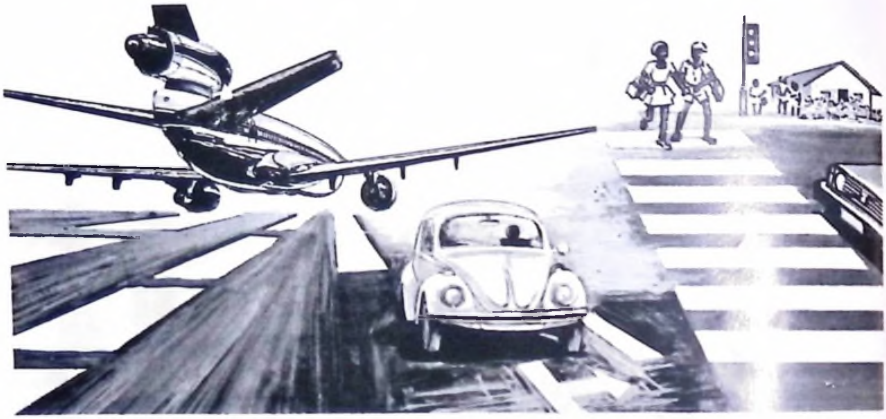


A crane wheel being pre-heated and rotated during Casto Mat overlay.

When considering utilising the cast-weld assembly route, careful thought should also be given to the nature and position of the welded joint and, more important, to its actual production. For any foundry to contemplate this production technique it is of



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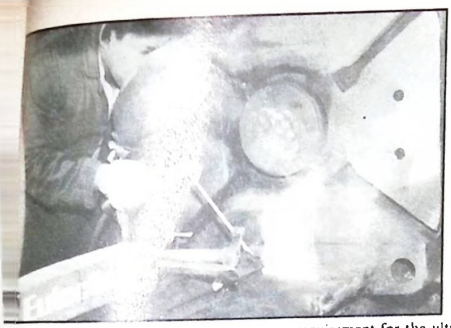

Repair of fracture in large casting caused by overloading.

tinued

industry, magnetic particle or dye
etrant testing are used as aids for the
ction of surface defects with ultrasonic
adiographic examination being used to
te any internal flaws. While many
ifications and documents are available
ssist the trained operator, he is still
ed to adapt his technique to suit the
itions under which he works.
ften it will be necessary to grind the
and the immediate surrounding area
any post weld heat treatment and then
arry out a magnetic particle examina-
. This would then be followed by an
asonic examination of the weld area
n all this work, however, it

s for
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an acceptance
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be rejected if it can be shown that the
might impair the serviceability of the
ture. It is accepted that brittle fracture
problem in
ot be overcome by non-destructive
g. Recent experience has shown that if
material is not inherently ductile at the
ting temperature it is a delusion to
st that any form of non-destructive
g offers a reasonable certainty of
ting critical flaws. If, however, a
rial is correctly chosen there is no
n why, for most structures, quite large
should not be tolerable and, in many
, a leak-before-break criterion should
hieved."

hichever technique or combination of
iques is used, it is vitally important to
nber that the correct techniques and
dures must be available. They can be
by the operator who will understand
act requirements of the specification
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h they cannot examine. The designers,
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requirement for the ultrasonic examination of casting specifies that defects less than 3mm should be detected, these are below the sizes which can be measured accurately by ultrasonic examination. On the other hand, the latest developments in fracture mechanics suggests that flaws of 4·6 mm could be quite acceptable in cast steel structures and in certain cases defects up to 100 mm long could be accommodated. The criterion is that the designer and metallurgist must be encouraged to produce a cast-weld structure with a fracture toughness level equivalent to that of the cast steel. This will enable the ndt engineer to be more accurate, decisive, definative and to give a quantitative value of the flaw size.

Choice and control of welding consumables

The choice of welding consumable is based upon the most important property required in the material used for the fabrication. Seldom are the consumables of matching composition to the casting; in general, for steel castings weld deposit analyses are lower in carbon content and higher in silicon and manganese than the component castings. For carbon steel castings, where strength is important, this difference is not a disadvantage. Welding electrodes are designed to attain a satisfactory strength in the as-welded or in the stress relieved conditions and a greater reduction intensile and yield strengths will be obtained if a full solution treatment is given after welding.

It is not desirable to leave the assembly in the as-welded condition despite the low hardness values of heat affected zones in low carbon plain carbon steels. Stress-relieving should be used wherever possible.
steel for more critical applica-
care must be taken in the choice
of weld
and in the constitu-
welding procedure.

e Post weld heat treatment

Recommendations for pre-heat conditions and post-weld heat treatment temperatures are given in BS 4570 : Pt 2. The temperatures and conditions for pre-heat

restraint. Pre-heating may be applied to the whole assembly or simply to local areas. If full pre-heat in a furnace is employed, the castimg may be covered in asbestos blankets to reduce the degree of discomfort for the welder — this will improve the chances of attaining high quality welds! Local pre-heating may be by electrical resistance elements or by gas burners, but a sufficient area on either side of the weld zone must be heated to avoid excessive thermal gradients.

Post-weld heat treatments are confined largely to tempering or stress-relieving, otherwise the reduction in weld metal properties which arises from solution treatment may be excessive. To avoid reducing the mechanical properties of the parent material, the post-weld stress-relieving temperature should not exceed previous tempering temperatures used during manufacture. The object of post-weld treatments is simply to lower the stresses induced by welding, to soften the heat-affected zone and to put the weld in a more ductile condition. For steels particularly prone to cracking, such as the Cr-Mo-V steels, the minimum pre-heat temperature should be maintained between the completion of welding and the stress-relieving treatment. Hot grinding can also be used to produce a smooth weld profile, thereby eliminating any chance of crack initiation.

In conclusion, it can be seen that this approach to fabrication has a big potential, offering a new scope for both foundries and conventional fabrication shops. It has already been used in the power generation industry for components weighing up to 100 t, as for example a Japanese cast-weld runner for a large vertical water turbine of 500 MW capacity; for the rudderstock of a supertanker in Scandinavia; the fabrication of magnesium alloy gas bottles for space technology; copper alloys for marine applications; a large cast aluminium helical staircase and perhaps one of the most exciting is the new Bush Lane House in London. This building is one of the few building structures in the world which makes extreme use of welded steel castings in stainless steel for the support of the structure. The unusual diamond lattice structure is the result of the site being intended as a working space for the construction of the London Underground Fleet Line. This defined the clear height under the structure and the possible position and size of the piles; it necessitated a light-weight cantilevered structure which could be largely prefabricated. The finished lattice work is filled with a potassium carbonate solution for fire protection.

As with any manufacturing process, however, it is not intended as a panacea but merely as an advantageous solution to some particular problems. It must be used in its correct application with full emphasis on design casting *and* welding from the initial concept. It is at this stage also that welding process and inspection techniques, quality assurance delivery and

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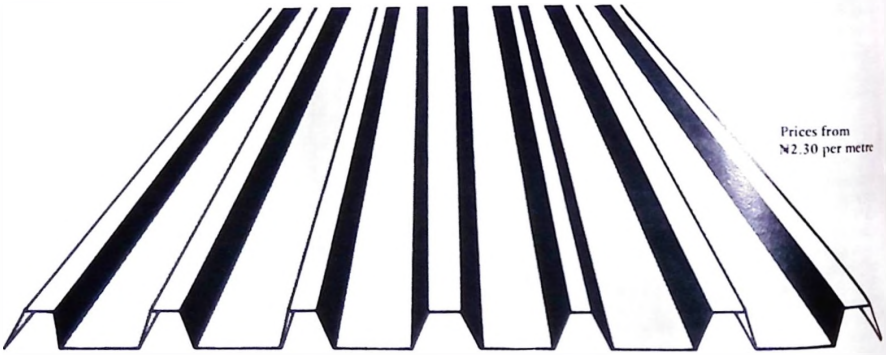

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COMMERCIAL VEHICLE — MAGIRUS DEUTZ

More horse[power] and a number of driveline changes have enabled the German company Magirus Deutz to extend its range of on/off-road tipper-dumptruck models. Ian Bunting looks at the latest V10-engined machines in detail.

Fully laden to 32 tonne gvw, the 310032K can climb a 40 per cent gradient.

JST OVER two years ago, in the Septem- 1976 issue of WATK, I described the /off-road vehicles currently marketed by igirus, with particular emphasis on the it and middleweight chassis sold in West ica.

Since that time there has been a marked id to larger vehicles, especially on public ks and civil engineering projects where tractors are using bigger excavators, vels, and scrapers in a bid to increase ductivity. Inevitably larger-capacity nptrucks figure in the calculations of project manager who is looking for s of meeting ever-more demanding et dates.

imilar machines are of course employed open-cast mining schemes. As African ntries seek to exploit their natural urces and convert them into wealth of nore tangible kind the mining and rrying of materials like iron and ium ore must grow in scope. And the e of such operations calls for greater lmoving potential.

emand for more oductive dumptrucks

Magirus Deutz has recognised the mand for more productive dumptrucks introducing additional models to its nge which are not only larger, but which ave more than enough engine power and orque to ensure that the [illegible] not

between the quarry/mine face and the tipping point. In fact power-weight ratio has gone up in each case.

For ultra-heavy haulage working by road, moving large indivisible items of plant or industrial machinery on low-loader semi trailers, the new V10-engined Magirus dumptruck chassis are readily adaptable as articulated tractor units, with a heavy duty fifth-wheel instead of a dumptruck body and tipping gear mounted on the frame. For such applications the latest bonneted Magiruses are suitable for use at train weights as high as 250 tonne.

Earlier Magirus bonneted trucks have had the Deutz F8L 413 engine fitted — an 11.3 litre V8, air-cooled of course, as are all Deutz diesels. And indeed the V8-powered chassis continue in production, meeting the needs of those users who regularly run on public roads and therefore have to conform with gross and individual axle weight restrictions imposed by law.

In contrast the heavier V10 six-wheelers — available in either 6 by 4 or all-wheel-driven form — are rated at 32 tonne all-up weight. This gvw is far higher than the limit laid down for three-axled vehicles in any country where on-road vehicle weight legislation is imposed (and enforced).

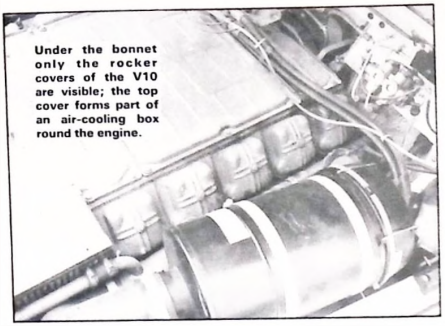
Deutz engineers have done more than simply add a further pair of cylinders to produce the big V10 diesel. They have also increased the piston stroke, from 125 to 130mm, so that the increase in swept volume is not just the 25 per cent one would expect, but 30 per cent. Maximum "DIN" horsepower goes up from 228 to 305 bhp — a 34 per cent boost; and the peak torque level is raised correspondingly, by 26 per cent from 722 to 912 Nm.

All this extra performance is available to go with an additional 6 tonne gross weight (at off-road ratings) so that performance, in terms of acceleration and gradient-ability does not suffer if weight-carrying capacities are fully expoited.

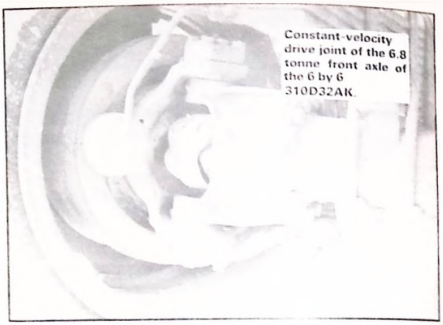
Payload capacity of great consequence

For many users, of course, the gross weight is a rather academic statistic, albeit often related closely to fuel consumption. Of far greater consequence is payload capacity, particularly in the case of mine and quarry hauling dumptrucks where the commodity being extracted from the earth is subsequently sold *by weight*. It is pertinent therefore to look at the latest V10-powered Magirus machines and compare them with their older smaller-engine stablemates, in payload terms.

The 6 by 6 and 6 by 4 Magirus 32 tonne dump-trucks are available with 10 cu.m. rock bodies.



Under the bonnet only the rocker covers of the V10 are visible; the top cover forms part of an air-cooling box round the engine.



Constant-velocity drive joint of the 6.8 tonne front axle of the 6 by 6 310D32AK.

With a typical medium-duty scow-ended quarry body fitted the V10 machines can haul payloads up to about 17.5 tonnes, instead of only 13 tonne or so with the equivalent V8 versions. These figures refer to the 6 by 6 machines in each case. If your traction problems are no more than average for a quarry environment it is likely that the 6 by 4 derivatives, that is with a non-driven front axle, would perform quite adequately, in which case you could expect a further payload bonus of about 1 tonne.

Those payload ratings I have quoted also assume that the trucks will be operated up to, but not beyond, Magirus-Deutz's recommended all-up weight. It is widely acknowledged that in practice machines like the new V10-powered Magiruses, though rated on paper at 32 tonne gvw are in practice operated, off the road, at weights of 40 tonne or more — that is with payloads of around 25 tonne. And, what is more, the users who "overload" their machines in this way (and it applies equally to Mercedes, Foden, Volvo and others) will tell you that they are as reliable and durable and that they handle just as well at 40 tonne as they do at 32 or even say 25 tonne gvw.

Unfortunately the dumptruck manufacturers cannot sanction such high operating weights because they encroach into the (admittedly high) factors of safety built into the design. As such, these practices are apt to render void the vehicle's warranty. If one chooses to ignore the gross weight rating, then payload capacity is like the length of a piece of string.

V8 machines all have 2F gearboxes

The 24/26 tonne V8 Magirus machines all have ZF gearboxes. But the 900-series Eaton-Fuller constant mesh box is fitted in the top-of-the-range V10 chassis.

Another gearbox innovation on the V10 models is the adoption of a power-take-off on the output side of the transmission, to drive the tipping gear hydraulics at a higher speed. A special declutching device for the main vehicle drive is provided: a button is pulled between the seats. The pto can then be engaged with the gearbox in any gear of the Fuller's low range.

Wheelbase (measured from front axle to bogie centre line) goes up from 4.54 to 4.69m with the bigger engine and higher gvw. Manoeuvrability suffers accordingly, with turning circle diameter increased to 19.7m.

Because the cab sits higher, the entry steps are less easily scaled. The bottom "rung" on the 6 by 6 version is 500mm above ground, with the main external step 300mm higher, leading to a cab floor 1440mm above ground. The ability to step in using no hands, is lost because of the higher mounting. Nevertheless the Magirus dumptrucks — [illegible] included — remain the most ergonomically well planned of any.

Today Magirus [illegible] is a member company of the [illegible] Iveco group, along with Fiat, [illegible] OM and Unic. However, Magirus [illegible] runs a separate entity and in many [illegible] like those of West Africa, the [illegible] company competes with Fiat.

Marketing is handled in Nigeria by the Nigerian Technical [illegible] Co. Ltd., 11, Warehouse Road, PO Box 556, Apapa, in Cameroon by Dacos SA, PO Box 450, Yaounde and in Gabon by Daforga SA of PO Box 53, Libreville.

Under quarry conditions the bonneted configuration of Magirus dumptrucks makes for driver confidence.

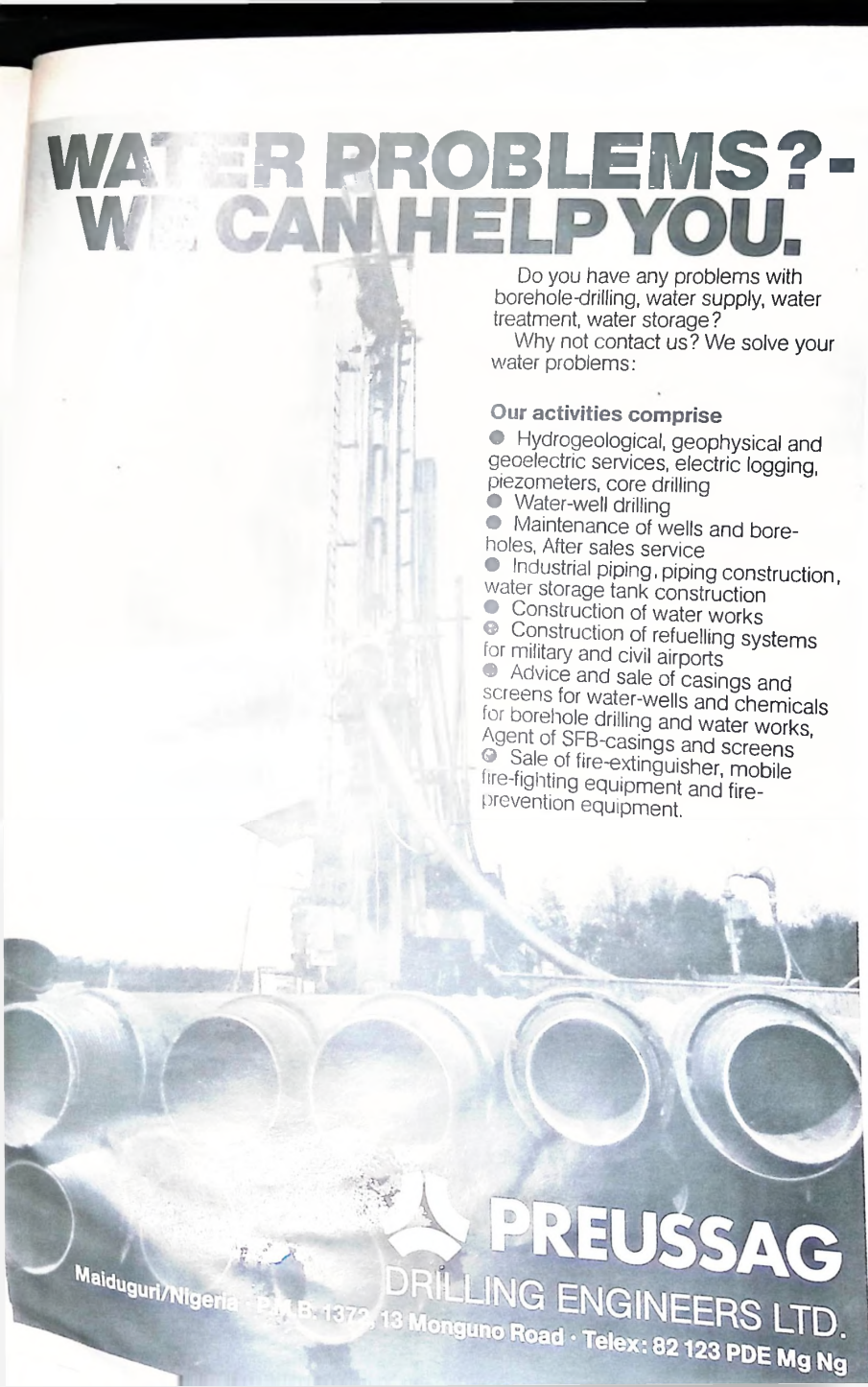
WATER PROBLEMS? - WE CAN HELP YOU.

Do you have any problems with borehole-drilling, water supply, water treatment, water storage?

Why not contact us? We solve your water problems:

Our activities comprise

- Hydrogeological, geophysical and geoelectric services, electric logging, piezometers, core drilling
- Water-well drilling
- Maintenance of wells and boreholes, After sales service
- Industrial piping, piping construction, water storage tank construction
- Construction of water works
- Construction of refuelling systems for military and civil airports
- Advice and sale of casings and screens for water-wells and chemicals for borehole drilling and water works, Agent of SFB-casings and screens
- Sale of fire-extinguisher, mobile fire-fighting equipment and fire-prevention equipment.



PREUSSAG

DRILLING ENGINEERS LTD.

Maiduguri/Nigeria · P.M.B. 1373 · 13 Monguno Road · Telex: 82 123 PDE Mg Ng

New biscuit factory opens at Shagamu

A NEW purpose-b... manufacture of bis... confectionery items ... Shagamu, Ogun Sta...

This factory is ... project being unde... Ogunyanwo, Olofin of M... also the Chairman o... tion of Lagos State.

During a recent ... Chief Ogunyanwo, he explained that he first decided to go into t... a few years ago, mainly because ... and loss is better than in baki... and also biscuits do not spoil so easily.

Baker Perkin's supply machinery

Baker Perkins are installing the complete biscuit making plant, which consists of mixing and cutting machines, a cooling plant and an indirect oil fired oven. They have also advised on all aspects of biscuit technology including factory layout and training of technicians. Rose Foregrove, sister company of Baker Perkins, is supplying two 'Flowpak' 84 GE packaging machines. These will annually package in excess of 3,000 tonnes of the hard type of biscuit that will be produced by Temitope, Chief Ogunyanwo's company. They will, in fact, be producing three different kinds of biscuit — Joy, Gem and Cabin.

Right from the start, Chief Ogunyanwo has been looking ahead, leaving nothing to chance, so, although the factory's initial production capacity is 3,000 tonnes per annum, the plant already has the capacity to exceed this.

Chief Ogunyanwo, who started baking bread in 1975, says he will continue the bread side in the new factory, as he feels he ... a duty to bread and he does not want his bread buyers to suffer.

Many employment opportunities created

This new venture will create many employment opportunities. Initially about 90 people will be employed; however, as extra shifts commence, the number of employees will increase. The majority of these people will already be experienced in biscuits, both production and engineering. However, during the installation of the plant two of Baker Perkin's engineers will be on site and will be able to give some on-the-spot training. In addition Chief Ogunyanwo has er... recruited by ... provide on-goin... Employees will ... courses of two t...

On the ques... ment over from ... all shipped in b... Ogunyanwo str... keen supervisi... nothing was da...

On the sub... Chief has an a... Mills of Niger... materials are p... Chief Ogunyan... growing his ow... pletely self-suff...

Chief Ogunyanwo going over the plans with Alan O'Donnell from Baker Perkins Ltd.

Product Digest

Simplified battery box production

Chloride Technical Limited have developed a simple rotational moulding machine for small volume production of polyethylene cell boxes for batteries.

The machine is very easy to install, operate and maintain and is ideally suited to the immediate needs of battery manufacturers in developing countries who wish to make their own boxes.

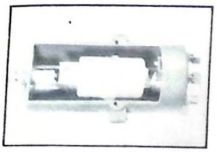
It offers an inexpensive alternative to the costly and complex plant required for the conventional injection and compression moulding methods of making cell boxes.

Although the rotational moulding principle is well known, commercially available machines tend to be unnecessarily elaborate, having been designed for items more complicated than cell boxes.

The body is manufactured in glass-filled nylon 6 for strength and resistance to diesel fuel. All other parts excepting the float are produced in unfilled nylon 6, including the terminal block and cover, magnet arm and magnet fixing bracket and the lower valve outlet. The float is in acrylic, ultrasonically welded to produce an airtight component. These materials were chosen for their engineering properties as Hydrableed is mounted on the side of a diesel engine and has to withstand excessive vibration and fairly high ambient temperatures.

'Hydrableed' eliminates air locks in diesel fuel systems

'Hydrableed' is a small tank, slightly larger than a fuel filter, which can automatically eliminate breakdowns of diesel fuel systems due to air locks. This revolutionary new device was developed by **Bridgemore Engineering Ltd.**

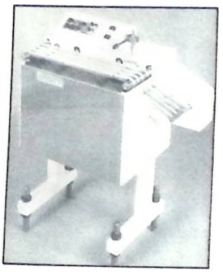


Normally fitted between the lift pump and the high-pressure injector pump, Hydrableed incorporates a float, automatic air valve, automatic shut-off valve and an automatic warning device to inform the operator that he is either running out of fuel or drawing in air. In certain applications it can be fitted at the fuel tank.

Although prototypes of the tank were produced in steel, copper and brass, the production model has plastics components re-designed by **Glover Plastics Ltd.**

Inexpensive checkweighers

Making its debut at Interpack 78, in Dusseldorf was the **Hunting Electrocontrols Ltd** "Weighmaster" range of low cost inlinecheckweighers. Designed as an inexpensive addition to the successful HD 300 series, the Weighmaster range nevertheless incorporates some of its well proven features. In particular the dependable 6005 series spring and flexure weighcell is utilised together with the Hunting universal electronic control module.



The Weighmaster has been produced for the volume "dry goods" manufacturing industry and its price will make it attractive for multi-line installations.

In its basic form the Weighmaster offers a three weight band classification with an air blast reject facility, while at the top of the range the machine is fitted with three tally counters and a lift flap reject system. Product transfer is by 2, 3 or 4 endless terylene belts.

This range of machines will handle around 100 items per minute to an accuracy of ± 0.5g or better. Standard weight range is 500g.

Stan-Tug 2600

The **Damen** Stan-Tug 2600 is a new addition to the standardized range of Damen workboats. The Stan-Tug 2600 is a modern tugboat with extremely good seakeeping characteristics under all weather conditions and can be employed in various operations such as:

- manipulation of large sea going vessels and pontons;
- transport of large objects;
- firefighting and oil pollution clean-up work;
- shifting and placing of anchors;
- general mooring operations;
- supply work;
- pushing duty.

It is possible to lengthen the Stan Tug 2600 with an additional section of 4 metres. The additional length can be used to lengthen the engine room, extend the capacity of the fuel tanks or allow the installation of extra auxiliary equipment such as pump or compressors.

Complete pharmaceutical packaging lines

The ability of **Newman Labelling Machines Ltd.** to supply economically-priced packaging lines ideal for use in developing countries is highlighted by an order just completed for **Pac Laboratories Ltd,** of Nairobi.

In this case, Pac Laboratories needed to mechanise its syrup packaging operations, but needed a line which provides the flexibility to handle other products, too. The company already possessed an Albro 2-head vacuum-filling machine, and this has been integrated into a line completed by a Newman conveyor, "2CT cap tightening machine and Model 24A semi-automati labelling machine. Newman ca supply similar lines — capabl of production speeds up to 3 containers per minute — incorporating a choice of mos types of vacuum or volumetri fillers.

The company's Sales Director, comments: "We feel that the convenience and reliable the packaging lines we offer meet the needs of many pharmaceutical packers particularly in developing countries. equipment is easy to and simple adjust for product and container changes. The price is also attractive."

New loading systems for paper

A new semi-automatic elevator device for loading and unloading of paper rolls and pulp units, based on the truck-to-truck transport method, has been developed by the Norwegian company **TTS Total Transportation Systems (International) A/S.**

The new method has great advantages over the traditional one, which is to take the rolls on board by the use of cranes. Instead of deck hatches the vessels are fitted with 2 side ports, and all loading and discharging takes place through the side ports by means of trucks ashore and electric trucks on board. By eliminating the middle handling stage expensive quay time is saved. The damage ratio goes down considerably, and stoppages due to bad weather have been reduced to a minimum of lay-time.

More information may be obtained on any item by using the Form facing page 179

Product Digest

Pumping unit for wet riser systems

Pullen Pumps Limited, have introduced a range of packaged pumping units to supply wet riser fire fighting systems in high rise buildings. The units are custom-built from standard components to match the requirements of particular installations and supplied on a compact frame work ready for simple installation and commissioning.

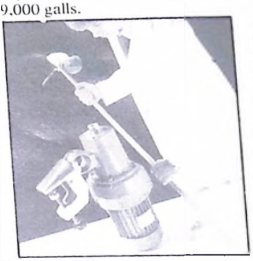
Wet riser systems, consisting of a rising main of pressurised water, serve the standard 2½ in. hydrants on each floor of a building, to which the Fire Brigade can connect hoses. The Pumps incorporated in the Pullen packaged units are sized to cater for three hoses operating at any one time, whilst also maintaining the maximum hose running pressure at the highest hydrant. Pullen type 'K' pumps are used in these units, horizontally mounted to facilitate maintenance by means of Pullen's 'back pull-out' concept.

In addition to the pumps, a membrane tank has been incorporated to provide a positive energy source for the system when the pumps are at rest, and to provide a small reserve of water to prevent pump operation due to any slight system leakage. Together with all necessary pipework, valves, flow switches and automatic electrical controls, all components are now grouped into one compact design. For further information contact Addis Engineering Ltd., Surbiton.

Special gearmotor for fluid mixers

Fluid Mixers Limited have recently had a gearmotor specially designed to their specifications by the manufacturers, **Electropower Gears Limited.** The gearmotor was an ESR 00 and was supplied to power the PG clamp-mounted mixer made by Fluid Mixers Limited.

Fluid Mixers specialise in the manufacture of electrically powered mixers for industry. They produce a wide range of slow, medium and high-speed mixers suitable for tank capacities from 25 galls to 9,000 galls.



The PG mixer is a medium speed propellor type, for tank capacities up to 2,500 gallons. As it is intended to be portable, size and weight are important design factors. The PG mixer unit has a standard output speed of 282 rpm, although variations above and below this can be accommodated. With a 0.09 kW (0.125 hp.) to 1.5 kW (2 h
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long haul operation a typical
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lost 7 tonnes or 10,000 litres
iesel.

The new Cummins E series
ge of 14 litre turbocharged
ylinder diesel engines which
used in the Ford
anscontinental features
revised fuel injector cams, improved matching of the exhaust gas driven turbocharger and a new engine water pump which absorbs less power.

In addition to these engine improvements the Ford Transcontinental now has more powerful brakes, a revised electrical system and a new paint style and a name badge for the cab which provides more space for custom designs and company sign writing. For further information contact **J. Allen and Co. Ltd.**, Apapa.

Desert night cools in the daytime

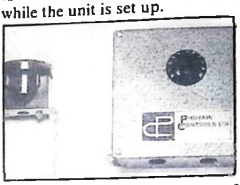
A small communications station in the African desert is constantly heated up by the dissipation of its radio relay amplifiers and yet even in the extreme midday heat the temperature inside the insulated shelter is about ten degrees below that outside. The cooling effect is produced without pumps and fans, entirely without the use of energy, by means of an ingenious "rectifier" system of air and water cycles devised in the Siemens development laboratories.

Working roughly on the principle of gravity-circulation hot-water heating, the system extracts heat from the interior during the day, stores it in a water tank and discharges it to the environment during the night. In this way the system acts as a "refrigerator" during the day. For further information contact **Siemens Nigeria Ltd.**, Apapa.

Photoelectric switch for indoor lights

An automatic switch developed by **Photain Controls Ltd.** saves electricity by switching on lighting in offices and factories only when natural light falls below a pre-set level; it switches off the lighting as natural light starts to exceed this level.

The Type TLC-1 photoelectric control can be set to operate at any point between 100 lux and 1,000 lux. Its five-minute timer ensures that the light level is stable before the switch is triggered. A two-way selector enables the time delay to be isolated from the circuit while the unit is set up.



Contained in a waterproof housing, the photoelectric cell can be mounted outdoors or indoors in a position where it is not affected by artificial light. The control unit can be sited in any convenient place indoors.

By fitting one photoelectric cell to each bank of lighting in an office and setting each cell to operate at a different light level, lighting can be switched on progressively as natural light diminishes. Alternatively, a single cell can operate all the lighting in an office or factory.

Portable welding and cutting unit

A small portable oxy-acetylene welding and cutting set which carries its own power source and a comprehensive range of equipment has been developed by **BOC Ltd.**

Mounted on a lightweight trolly, the Portapak offers users a versatile workshop on wheels, enabling them to perform a wide variety of duties which call for comparatively small quantities of gas. With its full range of equipment the trolley weighs only 32kg. Its overall measurements are 1m high x 450mm wide x 320mm deep — small enough to be packed into the boot of a car. It is particularly suitable for work in locations difficult to reach with much heavier and bulkier gas welding equipment conventionally used. Since the power source travels with the equipment, jobs can be done more conveniently — particularly at height — without the need for long and unsafe trailing hoses between cylinders and equipment.

Applications range from fusion welding of sheet steel up to 8mm thick and cutting through steel plate up to 20mm to brazing, hard soldering, bronze welding and heat-treating. Industrial/commercial uses include the repair and maintenance of motor vehicles, bicycles and agricultural machinery and equipment; work on steel erections at building and construction sites; in shipyards; and in heating, ventilating and plumbing installations. Other uses include rescuing accident victims from wreckage, and the makers believe that the equipment will also appeal to the handyman since it offers a relatively inexpensive means of carrying out a wide variety of repair and maintenance jobs in and around the home or farm. For further information contact **Industrial Gases Ltd.**, Apapa.

New 50-HZ Power Plants

A new line of utility power generation plants specifically designed for base load, reserve, peaking and emergency standby operation in countries with 50-Hz power requirements, has been announced by **Electro-Motive Division (EMD) of General Motors Corporation.**

The new power plants operate at 1,000 rpm, 50-Hz, and provide at 6,600 volts (Wye) or 3,300 volts. Kilowatt capacity of the plants at base load rating ranges from 2,600-kw for a single unit up to 13,000-kw for multiple units.

One of the primary advantages of the new generation equipment is its low cost per kilowatt. The new 1,000-rpm units offer a 15% reduction in cost per kilowatt compared to the 750-rpm, 50-Hz plants that have been available previously from Electro-Motive Division.

Other advantages of the new power plants include high reliability, ease of maintenance, interchangeability of parts

Product Digest

System for communication control rooms

A flexible control terminal from **Pye Telecommunications Ltd.**, provides rapid and automatic access to up to 100 channels in any combination of land-line, telephone, radio-telephone and microwave link from 100 operator positions within a communications system.

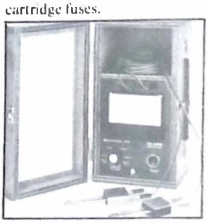
The Pye Mascot 1000 system comprises a terminal, operator-to-channel distribution units and operators' consoles. This fully modular system is equally suitable for small, medium and large networks and provides an easily configured radio control that can be expanded and varied by the addition of different function modules.

Since simultaneous access to all circuits is not normally required, the equipment is designed to allow each operator to choose a few channels — usually five or ten — for use at any one time. In this way, the need for channel allocation by a supervisor is eliminated and the task of overall network control is shared equally between those operator positions that are manned at a particular time. For further information contact **Satco**, Monrovia.

Low-current measuring of electrical resistance

A multi-range milliohmmeter from **Clare Instruments Ltd.** features a built-in amplifier enabling it to measure resistances from 1 milli-ohm to 10ohms with an accuracy of 2% f.s.d. (full-scale deflection) using a current of only 100mA. This compares with conventional equipment that normally requires a 50-100A current for small measurements.

Type V237, as the instrument is designated, is said to cost only about one fifth the price of conventional equipment. It operates from a small dry battery and weighs only 2kg so that it is particularly suitable for on-site use in mines and quarries, where electrical resistance — and hence safety — of cables must be checked regularly. It can also be used to calibrate small lengths of resistance wire or measure the resistance of contact and cartridge fuses.



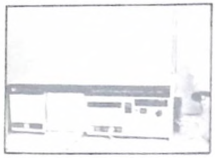
Accuracy is unaffected by the contact resistance of the test connections due to the high impedance of the instrument's build-in amplifier. Surfaces of wires need not even be cleaned before measurements are taken.

Operation is simple. The instrument is fastened to the resistance under test by two Kelvin clips, each of which has insulated current and voltage contacts. The electronically generated 100 mA constant current is passed through the test circuit, and the voltage across the resistance is amplified to give a direct reading in ohms or milli-ohms, depending on the range pre-selected by a rotary switch. There are seven measurement ranges: 0-10 milli-ohms: 0-30 milli-ohms: 0-100 milli-ohms: 0-300 milli-ohms: 0-1ohm: 0-3ohm: and 0-10ohms.

Equipment to induce and monitor labour

An induction and monitoring system for use during labour combines in a single compact unit apparatus to monitor and display fetal heart rates and intra-uterine contraction pressures together with a programmed infusion pump to administer synthetic oxytocin at accurately controlled dose rates.

Hospitals already equipped with fetal monitoring equipment can order the MP40 programmed infusion pump separately from the manufacturers, **Pye Dynamics Ltd.** This pump administers a progressively increasing (or decreasing) dose of oxytocin in solution, maintaining dosage at a precise rate to provide a safe delivery pattern for each individual patient. Most other pumps only increase or hold a specified dose.



Rates of infusion of the hormone preparations are controlled by reference to the total time for which intra-uterine pressure exceeds the pressure of the placental blood supply. The linear peristaltic pump accepts various administration sets without adjustment and without affecting its calibration.

Pump delivery rate is controlled by counting drips with a photo-electric sensor. The rate is expressed in milli-units a minute and displayed on an illuminated linear scale. Audible warning is given of any malfunction and, although the signal can be silenced by an attendant, the pump cannot be re-started until the fault has been rectified. Facilities are provided for manually controlling the infusion.

Multi-purpose operation table

The increasing use of X-ray systems with image intensifiers in operating theatres has led to the development of what is claimed to be the most advanced and versatile operation table in the world, by **Eschmann Bros. and Walsh Ltd.**

Introduced after three years of hospital trials, the Eschmann Alpha table is an all-purpose manually controlled workbench designed for all forms of major surgery, including orthopaedic, neurosurgical and micro-surgical procedures. It combines strength and stability with easy manoeuvrability. Gliding along on two large wheels, it can be effortlessly moved with one finger a[nd] when in position can be ma[de] immobile by simple ped[al] control.

The table top is believed to [be] the first of its kind [to] incorporate carbon fibres in i[ts] laminated plastics constructio[n]. This makes it about three tim[es] less resistant to X-rays tha[n] conventional operation tables s[o] that less X-ray power is neede[d] and the safety of both patie[nt] and staff is increased.

The whole of the table top [is] X-ray translucent, facilitatin[g] the use of image intensifiers an[d] mobile or fixed X-ray equip[-]ment using film. An X-ray fil[m] cassette carrier can b[e] introdu[ced] from either end o[f] the tabl[e] for precise positionin[g] at any [point] along the length. Likew[ise] [an] X-ray film cassett[e] tray ca[n be i]ntroduced from th[e] side. [For fu]rther informatio[n] contact [illegible] Chemists, Lagos.

700 E[illegible]sonde system

Scientifi[c] [Engi]neering Systems Inc. no[w] [produ]ces a full line of accustic [echo] sounding instruments. T[hese] range from the basic Mo[del] 700 Echosonde system [to] the Model 800 Doppler [E]chosonde which determines wind speed and direction up to 500 metres or more. These systems are designed for both scientific and industrial use. Since they are fully adjustable in pulse width and repetition frequency, they are easily adapted to a variety of meteorological situations.

The Model 700 Echosonde is a precision instrument which can be used to determine the height and approximate intensity of air temperature inversions up to 1500 metres or more. It does this by transmitting a loud tone burst into the atmosphere and then detecting the small amount of sound which is returned from the atmosphere. This return signal is amplified and displayed on a strip chart record according to the height from which it came.

The instrument is adjustable for a broad range of atmospheric conditions and applications. Maximum height of sampling is adjustable from zero to 3,400 metres in increments of 170 metres. The transmitted (tone burst) pulse length may be adjusted from 10 milliseconds (ms) to 990 ms in 10 ms increments.

More information may be obtained on any item by using the Form facing page

Product Digest

Climon* 2000 unitary air conditioning equipment

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This new concept in Unitary Air Conditioners is the result of years of research, development and worldwide involvement into the environmental requirements of the Textile, Paper and Tobacco Industries, which call for the precise control of temperature, humidity and air filtration.

The Climon* 2000 series fulfils all these requirements and are built from standard component units of modular construction, employing insulated panels, ensuring rigidity, good thermal and sound absorbent properties offering excellent aesthetic external appearances.

The units are built in two main flanged sections, one incorporating the heater batteries, return air filters, pneumatically controlled fresh air inlet louvres and pyramid air filtration bank; the other section houses the motor, axial flow fan and atomiser unit, complete with water pump and associated equipment.

Climon* 2000 units are available in four standard sizes, giving air volumes of 4, 8, 12 and 16 cubic metres of air per second.

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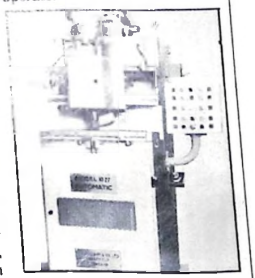
Fast automatic keyway miller

A precision automatic miller developed by **G. D. Speight & Co. Ltd.** cuts accurate keyways and slots in a single pass and therefore at a rate suitable for volume production.

Typical of its performance is the cutting of two keyways, 175 mm apart, each of them 9.5 mm wide x 45 mm long x 4.75 mm deep, in 1½ min.

Model 1027, which, says the firm, is highly competitive in price, is easy to set up and operate.



The first programme puts the miller into the manual mode for setting up; the second is a single automatic cycle, producing one keyway or slot per component; the third is a double automatic cycle in which the table is traversed to produce two keyways or slots in line per component; and the fourth incorporates an indexer that turns the component on its longitudinal axis to produce two keyways or slots separated from each other by 90°, 180° or any other distance required.

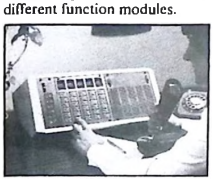
Hydraulically operated, the miller has a separate pump and circuit for the spindle drive to ensure that spindle speeds remain constant at their rev/min setting.

Product Digest

System for communication control rooms

A flexible control terminal from **Pye Telecommunications Ltd.**, provides rapid and automatic access to up to 100 channels in any combination of land-line, telephone, radio-telephone and microwave link from 100 operator positions within a communications system.

The Pye Mascot 1000 system comprises a terminal, operator-to-channel distribution units and operators' consoles. This fully modular system is equally suitable for small, medium and large networks and provides an easily configured radio control that can be expanded and varied by the addition of different function modules.

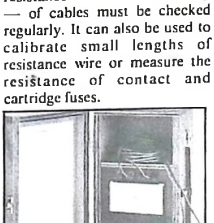


Since simultaneous access to all circuits is not normally required, the equipment is designed to allow each operator to choose a few channels — usually five or ten — for use at any one time. In this way, the need for channel allocation by a supervisor is eliminated and the task of overall network control is shared equally between those operator positions that are manned at a particular time. For further information contact **Sateo,** Monrovia.

Low-current measuring of electrical resistance

A multi-range milliohmmeter from **Clare Instruments Ltd.** features a built-in amplifier enabling it to measure resistances from 1 milli-ohm to 10ohms with an accuracy of 2% f.s.d. (full-scale deflection) using a current of only 100mA. This compares with conventional equipment that normally requires a 50-100A current for small measurements.

Type V237, as the instrument is designated, is said to cost only about one fifth the price of conventional equipment. It operates from a small dry battery and weighs only 2kg so that it is particularly suitable for on-site use in mines and quarries, where electrical resistance — and hence safety — of cables must be checked regularly. It can also be used to calibrate small lengths of resistance wire or measure the resistance of contact and cartridge fuses.



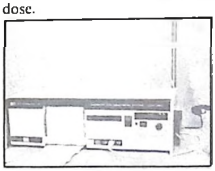
Accuracy is unaffected by the contact resistance of the test connections due to the high impedance of the instrument's build-in amplifier. Surfaces of wires need not even be cleaned before measurements are taken.

Operation is simple. The instrument is fastened to the resistance under test by two Kelvin clips, each of which has insulated current and voltage contacts. The electronically generated 100-mA constant current is passed through the test circuit, and the voltage across the resistance is amplified to give a direct reading in ohms or milli-ohms, depending on the range preselected by a rotary switch. There are seven measurement ranges: 0-10 milli-ohms; 0-30 milli-ohms; 0-100 milli-ohms; 0-300 milli-ohms; 0-1ohm; 0-3ohm; and 0-10ohms.

Equipment to induce and monitor labour

An induction and monitoring system for use during labour combines in a single compact unit apparatus to monitor and display fetal heart rates and intra-uterine contraction pressures together with a programmed infusion pump to administer synthetic oxytocin at accurately controlled dose rates.

Hospitals already equipped with fetal monitoring equipment can order the MP40 programmed infusion pump separately from the manufacturers, **Pye Dynamics Ltd.** This pump administers a progressively increasing (or decreasing) dose of oxytocin in solution, maintaining dosage at a precise rate to provide a safe delivery pattern for each individual patient. Most other pumps only increase or hold a specified dose.

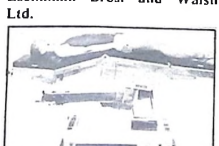


Rates of infusion of the hormone preparations are controlled by reference to the total time for which intra-uterine pressure exceeds the pressure of the placental blood supply. The linear peristaltic pump accepts various administration sets without adjustment and without affecting its calibration.

Pump delivery rate is controlled by counting drips with a photo-electric sensor. The rate is expressed in milli-units a minute and displayed on an illuminated linear scale. Audible warning is given of any malfunction and, although the signal can be silenced by an attendant, the pump cannot be re-started until the fault has been rectified. Facilities are provided for manually controlling the infusion.

Multi-purpose operation table

The increasing use of X-ray systems with image intensifiers in operating theatres has led to the development of what is claimed to be the most advanced and versatile operation table in the world, by **Eschmann Bros. and Walsh Ltd.**



Introduced after three years of hospital trials, the Eschmann Alpha table is an all-purpose manually controlled workbench designed for all forms of major surgery, including orthopaedic, neurosurgical and micro-surgical procedures. It combines strength and stability with easy manoeuvrability. Gliding along on two large wheels, it can be effortlessly moved with one finger and when in position can be made immobile by simple pedal control.

The table top is believed to be the first of its kind to incorporate carbon fibres in its laminated plastics construction. This makes it about three times less resistant to X-rays than conventional operation tables so that less X-ray power is needed and the safety of both patient and staff is increased.

The whole of the table top is X-ray translucent, facilitating the use of image intensifiers and mobile or fixed X-ray equipment using film. An X-ray film cassette carrier can be introduced from either end of the table for precise positioning at any point along the length. Likewise an X-ray film cassette tray can be introduced from the side. For further information contact **Kingsway Chemists,** Lagos.

700 Echosonde system

Scientific Engineering Systems Inc. now produces a full line of accustic echo sounding instruments. These range from the basic Model 700 Echosonde system to the Model 800 Doppler Echosonde which determines wind speed and direction up to 500 metres or more. These systems are designed for both scientific and industrial use. Since they are fully adjustable in pulse width and repetition frequency, they are easily adapted to a variety of meteorological situations.

The Model 700 Echosonde is a precision instrument which can be used to determine the height and approximate intensity of air temperature inversions up to 1500 metres or more. It does this by transmitting a loud tone burst into the atmosphere and then detecting the small amount of sound which is returned from the atmosphere. This return signal is amplified and displayed on a strip chart record according to the height from which it came.

The instrument is adjustable for a broad range of atmospheric conditions and applications. Maximum height of sampling is adjustable from zero to 3,400 metres in increments of 170 metres. The transmitted (tone burst) pulse length may be adjusted from 10 milliseconds (ms) to 990 ms in 10 ms increments.

More information may be obtained on any item by using the Form facing page 1

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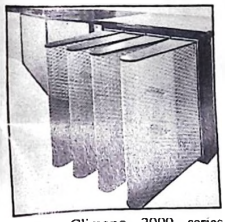

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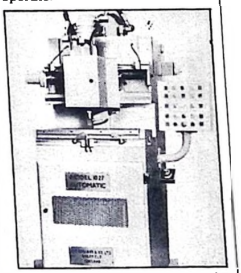

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Product Digest

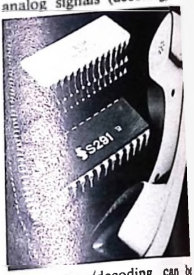
Oil spillage recovery

Machines which recover oil spilled accidentally on water or Land have been developed by **Oil Recovery International.** Designed to cope with any type of spillage — from minor spills on the factory floor to major harbour, estuary and coastal spills — the machines are said to offer a fast, efficient and economical means of cleaning up affected areas and, where appropriate, saving the recovered oil for subsequent refining and re-use. Since they operate by recovering oil, they are more effective in fighting pollution than detergents which merely disperse the oil (often only partially), leaving another type of pollution that can be as harmful to the environment as the original oil spillage.

There are five machines of different sizes and oil recovery capacities in the range; two are hand-operated and three motor operated, but all rely on a simple operating concept: a woven fibrillated polypropylene fibre which picks up the oil by absorption (adhesion of a liquid to a solid surface), used with equipment designed to extract the recovered oil from the fibre. The fibre can recover machine, animal or vegetable oils with a maximum water content of 15% Its absorption properties and large exposed area enable it to collect large quantities of oil while rejecting the adhesion of water. It is supplied in the form of a hand mop for use with hand-operated extraction equipment or in the form of a 15m or 31m long, 150/300mm diameter four-ply rope mop for use with the motor-operated extraction equipment. Having a high specific gravity, a rope mop will float on the surface of an oil slick.

Codec for the telephone

Siemens has developed a P 2-channel codec consisting two LSI circuits — SM 6 (in MOS technology) and S (bipolar). With these circuit is possible to convert ana speech signals into digital fo (coding) for transmission means of pulse code modulat (PCM) and to convert digital signals back again i analog signals (decoding).



The coding/decoding can be performed at any point in a tele phone connection, eg along the transmission path, at the switching centre or in the tele phone terminal. For further information contact **Siemens Nigeria Ltd.,** Apapa.

Fitzcroft generating sets

Fitzcroft Limited, design and manufacture mobile and static generating sets for all standard world voltages in the ranges 3- 650kVA, 50Hz and 3-712kVA, 60Hz, with hand, electric or automatic starting on standby to mains.

Fitzcroft specialises in the design of solid-state, plug-in function-control modules. Small and reliable, these units con tribute to ease and economy of maintenance and repair of control equipment.

Automatic standby-to-mains control equipment is constructed to a high standard and encased in a wall-mounted cubicle. Alternatively, the control panel can be mounted locally and the change-over contractor panel remotely.

Fully instrumented for the control of single or three phase mains supply and change-over to diesel power in the event of mains failure, the controls have a range of optional extras, including one to delay engine start-up by 0-90 secs. after mains failure and engine shut-down by 0-4 mins. after main return.

Product Digest

Assembly machine for mattress interiors

A new fully automatic machine launched by **Mutilatic Ltd.** will produce up to 400 top quality mattress interiors in the course of a single day of eight hours, compared with 150/250 which a skilled operative can produce on one of their semi-automatic machines. The interiors manufactured are produced to a patented design featuring the use of continuous springing, and are sold to the bedding, furniture and vehicle seating industries throughout the world.

Conceived, designed and manufactured by the company's engineers working behind closed doors over a period of several years, the prototype machine has been in existence for the last 12 months, during which time exhaustive tests have been run and the efficiency and performance of the machinery established at its current high level.

The system is acknowlwdged as one of the most advanced bed springing systems known, and it is used extensively in homes, hospitals and hotels.

Multiform wire bender

A Multiform Wire Bending Machine from **Crownflex Engineering** has been designed specifically for the production of small batch quantities and samples of formed wire elements at economical cost without the need for expensive dies and tooling. Its primary use is in the manufacture of suspension elements for car seating and furniture where the configuration of the element may be varied to provide the required stiffness along the length of the component.

The machine is semi automatic in operation and is easily adjustable to produce variable multi-form shapes of wire elements with bends in one plane. Batch quantities of up to 8 elements per batch can be produced at one time depending on the gauge of the wire and the geometric shape required. The machine will handle wire between 4.47 mm. dia. (7 swg.) and 2.642 mm. dia. (12 swg.) and up to 2.13 metres in length.

The main power source for bending the multi-form shape is pneumatic with low voltage electrical controls. Essentially simple in operation the circuitry is designed to ensure that one cycle of sequential movements is completed before the next is free to begin. The amount of bend or angle of bend is controlled by movable stops set on a bend stop cylinder.

Quick and precise film applicator

An electrically driven laboratory instrument for the accurate and rapid testing of paints, varnishes, printing inks and other surface coatings uses constantly weighted wire-wound stainless steel rods to apply the coating to a wide range of substrates has been introduced by **RK Printcoat Instruments Ltd.**

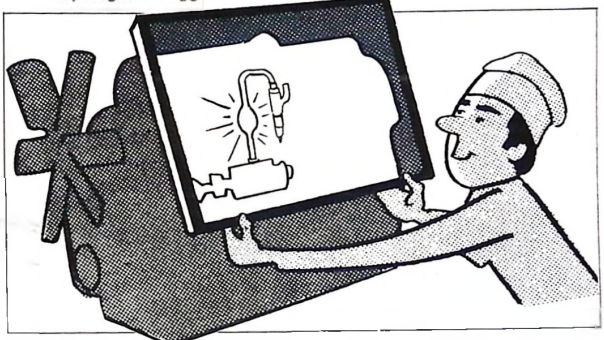
Paint or other fluid is poured in front of the rod which is drawn across the surface to be coated, leaving a wet film deposit of the required, very precise, thickness and taking away surplus paint which is deposited on an absorbent spoils paper beyond the area of the substrate.

The K Control Coater, which is available in four standard sizes, is suitable for the test coating of plastics films and aluminium foils, paper and boards, glass and steel plates, timber and textiles. The instrument's wired rod system is said to effect a quicker and cleaner coat than other film applicator systems, giving a repeatability of better than plus-minus 2% wet film. Used with a rubber-faced vacuum bed, the instrument is particularly effective when coating thin plastics films or aluminium foil.

TECHNICAL PAGE

ENGINE HAS NOZZLE PROBLEMS DON'T PANIC

by Roger C. Higgins



WHEN YOUR engine performance has deteriorated, don't immediately blame the injection nozzles and remove it for immediate replacement. A nozzle is an expensive item and it's a lot tougher than you might think. Very likely, a thorough check will show that one of several other factors related to engine performance are the likely cause for failure, although a nozzle can indeed have its problems.

Why do we tend to put primary blame on the injection nozzle? Its precise, minute holes strike us as being vulnerable to dirt. And so if an engine fails, or malfunctions, it's easy to assume that an injection system blockage has occurred.

Malfunctioning is more common than out and out failure. The procedures for investigating malfunctions are similar and basic to procedures to be followed in identifying cause of failure. We can detect malfunction and impending failure by loss of power, high exhaust temperatures or excessive smoke, or all of these together.

It is true that when excessive smoke appears the injection nozzles are involved, but only as a secondary cause. Something else failure in the engine could be reducing the pressure behind the injection openings and the combustion is incomplete.

Take tests to locate primary cause

In all cases, locating the primary cause of failure or malfunction starts with tests using an intake manifold pressure gauge, an exhaust temperature thermocouple and, if available, a PTO or other type of dynomometer. These will provide the substance for comparisons with the recommended data as detailed in service manuals and service bulletins.

1. The intake manifold pressure gauge will determine whether or not the intake manifold pressure is sufficient for proper horsepower output. If a problem is apparent, it will be observable as low pressure. This could indeed be a nozzle problem, but also indicated might be a turbocharger malfunction, valve leak, low compression or the like.

2. If excessive smoke is visible, it is frequently caused by lack of air.

Proper correction starts with a check of the air cleaner; it may be excessively constricted. In addition, turbocharged engine air systems should be examined for possible air leaks. Particular attention should be paid to the turbocharger, compressor discharge hose and the gasket connection of the crossover pipe to the intake manifold.

Check each leg of the intake manifold for possible leaks at the cylinder head. If the leak is sufficient to cause your problem, your hand will likely locate the leak. Or you can use a soap and water mixture to detect bubbles.

3. If excessive temperature is the problem and power is low, look for a valve leak, improper injection timing or turbocharger problems.

After these checks have been made and corrective action taken, your problem may be cleared up. But if it isn't, you're justified in checking injection nozzle.

Hand tester — a practical tool

A hand tester is a practical tool because it duplicates the pressure exerted in normal operation by the injection pump. Before the test is underway but after the nozzle has been removed, look for some potentially faulty areas nearby.

A. Check the compression pressures on the cylinders to determine if all meet the specifications. This test could show that valves leak, which can cause low pressure, smoke and high exhaust temperatures. Correction for this problem is a valve job.

B. When the injectors are removed, check their seating and gaskets for combustion leaks. Examine the lubricating oil for dirt as well, because dirt could be entering by way of oil filter.

If all these neighbouring assemblies and systems prove themselves not involved in the primary problem, you're ready to use the hand tester to check the nozzle itself.

- Is the nozzle pumping pressure up to specifications for new and reset conditions? A nozzle may drop 10 to 15 per cent, yet function within its capabilities. However, if there is a drop beyond this level the nozzle should be reset.
- Is the leak down rate suggesting that the needle is not seating properly in the nozzle tip? The leak down rate is the time elapsed between a greater and a lesser value. A leaking nozzle will permit fuel to dribble into the cylinder at the wrong time, causing smoke. This check is done in this way: with the nozzle held at approximately three-fourths of its opening pressure, check the time to determine if fuel is visibly leaking past the seat, definitely indicating a nozzle malfunction, likely caused by erosion or needle seat wear.
- Is the spray pattern uniform? A difficult test, this test seeks to determine if the proper cone shaped spray with "feathered" edges exists. While a full bodies spray is easy to observe, degrees of deterioration will require some careful viewing. In performing this test with the hand tester, pump the handle sharply to approximately the action of the fuel pump. A deteriorated pattern indicates that poor combustion may result.

If you detect 1) very low opening pressure, 2) seat leaks and 3) poor spray pattern, your nozzle is defective.

Can a nozzle be serviced?

Yes, if it has not deteriorated to the point where seat or needle have turned blue, due to combustion gases leaking into the nozzle.

However, service of a nozzle can go only so far. The initial troubleshooting, when added to the nozzle test, should give the necessary insight to determine if the nozzle can be cleaned and reset, lapped in or replaced.

However, because the nozzle is likely no at fault, it's desirable for the general condi tion of your engine that you start with th other possible primary causes and avoi making a snap judgement about the nozz while ignoring the real problem.

Mr. Higgins is Manager, Factory and Technica Service of Allis-Chalmbers Corp. Engine Div sion.

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 178.

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
KAH Engineering Services Ltd. (Hamzer), Apapa.
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.
Lolita Nigeria Ltd., Enugu.
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.
Tractor & Equipment, Lagos.

Agricultural Attachments
Tractor & Equipment, Lagos.

Air Cargo Services
IML Aircharterng (Nigeria) Ltd., Lagos and Kano.
Nigerian International Air Services Ltd., Apapa.

Air Courier Services
IML Aircharterng (Nigeria) Ltd., Lagos and Kano.

Air Compressors & Pneumatic Plant
Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Guthrie (Nigeria) Ltd., Lagos.
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.

Air Conditioning & Refrigeration
Adeoye Adejobi T. S. Ltd., Ibadan.
Drake & Scull (Nig.) Ltd., Lagos.
Equip lard (a Division of Scoa (Nigeria) Limited), Lagos.
Haden Nigeria Ltd., Yaba.
Haven Nigerian Computer Co., Lagos.
Holt Engineering Ltd., Apapa.
I.T.T. Nigeria Ltd., Yaba.
Leventis Technical Ltd., Lagos.
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.

Aluminium Doors & Windows
Crittal-Hope Nigeria Limited.
Flag Aluminium Products.

Aluminium Roofing & Cladding
Flag Aluminium Products.

Arc Welding Equipment Aluminium Doors & Windows
Alumaco Aluminium Manufacturing Company of Nigeria Limited, Apapa.
Nigerian Hardware Industries Limited, Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department.
Industrial Gases Ltd., Apapa.
Matori — Oshodi.
UTC Technical, Isolo-Mushin.

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

Audio Visual Equipment
Controls and Automation, Apapa.

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

Bearing Metals
Makeri Smelting Co. Ltd., Jos.

Biscuit Ovens & Equipment
Makin Ltd., Ilupeju.

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

Block Making Machinery
Afrotec Technical Services (Nigeria) Ltd., Isolo.
M. & E. (a Division of UAC of Nigeria) Ltd.
UTC Technical, Isolo-Mushin.

Boilers
VYB (Nigeria) Ltd., Apapa.

Bottling Machinery
Makin Ltd., Ilupeju.

Building & Civil Engineering Contractors
Alakija & Alakija Contracting Services Ltd., Lagos.
Costain (West Africa) Ltd., Lagos.
Cubitts Nigeria Limited, Lagos.
George Wimpey & Co. (Nigeria) Ltd., Lagos.
Alhaji M. R. Shittu & Sons Ltd., Lagos.
Structor, Apapa.
Taylor Woodrow of Nigeria Limited, Lagos.
Lion Construction Co. Ltd. (Hamzer), Apapa.

Building Materials
Bewac Limited, Apapa.
Bisiolu Enterprises Ltd., Apapa.
Chelleram's Building Materials Department, Apapa.
W. A. Dizengoff (Nigeria) Ltd., Apapa.
Dunlop Nigerian Industries Ltd., Ikeja.
Fibreglass Reinforced Plastics Co. Ltd., Abeokuta.
Leventis Stores, Lagos.
Nigerian Commercial & Industrial Enterprises Limited, Lagos.
Nigerian Foundries Limited.
Henry Stephens Builders' Merchants, Apapa.
C. Zard & Co. Ltd., Lagos.
Minister Technical Services (Nigeria) Ltd., Kano.
UTC — Hardware Div., Apapa.

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

Capacitors — AC Motor Starting & Electrolytic
Daley (Condensers) Ltd., Dorset, UK.

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

Cement Manufacturers
Calabar Cement Co. Ltd., Calabar.

Chemical Engineering
Heplac Nigeria Ltd., Lagos.

Civil, Electrical & Mechanical Engineers & Constructors
Haden Nigeria Ltd., Yaba.
James Kilpatrick (Nig.) Ltd., Lagos.

Compactors
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Leventis Motors Ltd., Apapa.
Morpol Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
NITECO, Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Scoa, Ikeja.
UTC Technical, Isolo-Mushin.
Tractor & Equipment, Lagos

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

Concrete Machinery
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Holman Brothers (Nigeria) Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd.
Morpol Industrial Corp. Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Structor Yechnique.
UTC Technical, Isolo-Mushin.

Concrete Reinforcement
Nigerian Wire Industries Limited.

Containers & Tanks
Fibreglass Reinforced Plastics Co., Abeokute.

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

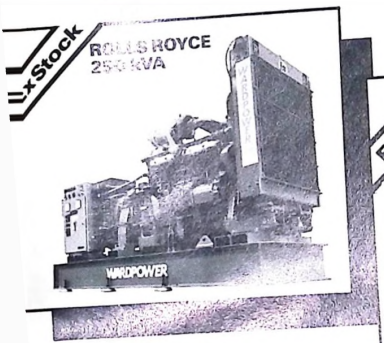
Corrugated Boxes
Polythene Enterprises (Nigeria), Ikeja.

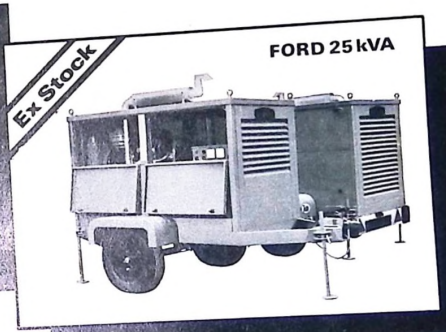
Cranes, Ropes & Hydraulic Excavators
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.
Conveyancer (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Henry Stephens Engineering Co., Ilupeju Industrial Estate.
Holt Engineering (a Division of M. & E. Ltd.), Apapa.
Leventis Motors Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
Stronghold (Nigeria) Ltd., Engineering Services Division, Ikeja.
Waateco Ltd., Technical Division, Lagos.

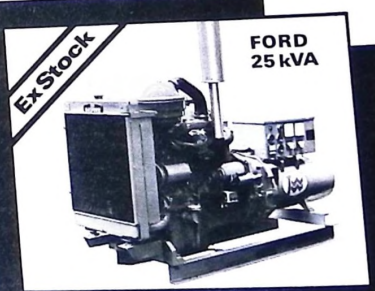
Cutting & Bending Machines
Afrotec Technical Services (Nigeria) Ltd., Isolo.

Why wait for Power?

NAMCO supply WARDPOWER GENERATORS - ex-stock







* Perkins engines also available

up to 312 kVA ex-stock
models up to 1000 kVA available

BASE LOAD, AUTO MAINS FAILURE OR STANDBY DUTY

WARDPOWER GENERATING SETS FROM:-

NAMCO NIGERIA LIMITED

Dantata House, Murtala, Mohummed Way,
KANO, Nigeria – Tel: 0672-4054-5 – Telex 77146

Wardpower Generating Sets manufactured in England by
Thos. W. Ward Ltd, Machinery (Wardpower) Division

Ward Centenary 1876 1976

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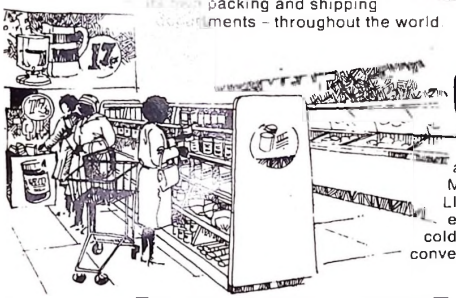
REFRIGERATION

—this is why you should know about HRP

Cold Fact No.1.

HRP Ltd. of London, England are specialists in every aspect of refrigeration, and we make many items of installation equipment both for ourselves and for the industry in general.

We are now one of the largest factoring organisations in Europe with depots covering the United Kingdom. We export through HRP Exports Ltd – an independent unit within the company with its own packing and shipping departments – throughout the world.

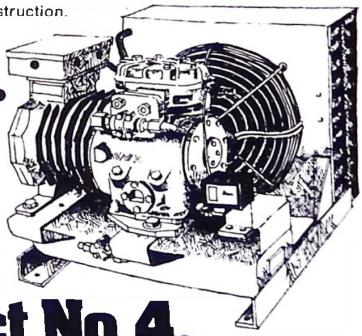


Cold Fact No.2.

We have highly qualified staff to advise on and make recommendations for any applications of commercial and light industrial refrigeration, including COLDSTORES, MORTUARIES, ABATTOIRS, SUPERMARKETS, LIQUID CHILLING etc. As well as supplying all necessary equipment for these, we can also quote for sectionalised coldstores of both modular and conventional construction.

Cold Fact No.3.

We carry a full range of equipment, some examples being Compressors and Condensing Units, 1/12 to 70 H.P. for R.12, R.22 and R.502. ✻ Coolers (wall or ceiling mounting or floor standing) and Remote Condensers ✻ Copper Tube ✻ Fittings ✻ Line Valves ✻ Driers ✻ Liquid Receivers ✻ Controls ✻ Tools ✻ Analysers & Recorders ✻ Refrigerant ✻ Hardware ✻ Coldstore doors and frames etc. In addition, any products of our manufacture can be made to your own specification – for many years we have been making liquid receivers and valves for several leading U.K. and Overseas companies.



Cold Fact No.4.

We supply equipment to many famous U.K. food & supermarket companies, to leading breweries and hotel chains, rail and airline operators, oil rigs, shipping lines etc. HRP Exports Ltd. have supplied complete coldstore equipment to Nigeria and similar projects in other African countries. We have supplied equipment for the Government Technical Training School in Nigeria and supply many other overseas governments through the Crown Agents.

ALL THE FACTS ADD UP TO HRP for every aspect of Refrigeration

HRP EXPORTS LTD

We welcome all enquiries, which should be sent to
HRP Exports Ltd.,
314 Balham High Rd., London SW17 7AT, England.
Telephone 01-672 0111. Telex 946083. Cables: Harpest, London.

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 178.

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
KAH Engineering Services Ltd. (Hamzer), Apapa.
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.
Lolita Nigeria Ltd., Enugu.
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.
Tractor & Equipment, Lagos.

Agricultural Attachments
Tractor & Equipment, Lagos.

Air Cargo Services
IML Aircharter ing (Nigeria) Ltd., Lagos and Kano.
Nigerian International Air Services Ltd., Apapa.

Air Courier Services
IML Aircharter ing (Nigeria) Ltd., Lagos and Kano.

Air Compressors & Pneumatic Plant
Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Guthrie (Nigeria) Ltd., Lagos.
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.

Air Conditioning & Refrigeration
Adeoye Adejobi T. S. Ltd., Ibadan.
Drake & Scull (Nig.) Ltd., Lagos.
Equip lard (a Division of Scoa (Nigeria) Limited), Lagos.
Haden Nigeria Ltd., Yaba.
Haven Nigerian Computer Co., Lagos.
Holt Engineering Ltd., Apapa.
I.T.T. Nigeria Ltd., Yaba.
Leventis Technical Ltd., Lagos.
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.

Aluminium Doors & Windows
Crittal-Hope Nigeria Limited.
Flag Aluminium Products.

Aluminium Roofing & Cladding
Flag Aluminium Products.

Arc Welding Equipment Aluminium Doors & Windows
Alumaco Aluminium Manufacturing Company of Nigeria Limited, Apapa.
Nigerian Hardware Industries Limited, Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department.
Industrial Gases Ltd., Apapa.
Matori — Oshodi.
UTC Technical, Isolo-Mushin.

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

Audio Visual Equipment
Controls and Automation, Apapa.

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

Bearing Metals
Makeri Smelting Co. Ltd., Jos.

Biscuit Ovens & Equipment
Makin Ltd., Ilupeju.

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

Block Making Machinery
Afrotec Technical Services (Nigeria) Ltd., Isolo.
M. & E. (a Division of UAC of Nigeria) Ltd.
UTC Technical, Isolo-Mushin.

Boilers
VYB (Nigeria) Ltd., Apapa.

Bottling Machinery
Makin Ltd., Ilupeju.

Building & Civil Engineering Contractors
Alakija & Alakija Contracting Services Ltd., Lagos.
Costain (West Africa) Ltd., Lagos.
Cubitts Nigeria Limited, Lagos.
George Wimpey & Co. (Nigeria) Ltd., Lagos.
Alhaji M. R. Shittu & Sons Ltd., Lagos.
Structor, Apapa.
Taylor Woodrow of Nigeria Limited, Lagos.
Lion Construction Co. Ltd. (Hamzer), Apapa.

Building Materials
Bewac Limited, Apapa.
Bisiolu Enterprises Ltd., Apapa.
Chelleram's Building Materials Department, Apapa.
W. A. Dizengoff (Nigeria) Ltd., Apapa.
Dunlop Nigerian Industries Ltd., Ikeja.
Fibreglass Reinforced Plastics Co. Ltd., Abeokuta.
Leventis Stores, Lagos.
Nigerian Commercial & Industrial Enterprises Limited, Lagos.
Nigerian Foundries Limited.
Henry Stephens Builders' Merchants, Apapa.
C. Zard & Co. Ltd., Lagos.
Minister Technical Services (Nigeria) Ltd., Kano.
UTC — Hardware Div., Apapa.

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

Capacitors — AC Motor Starting & Electrolytic
Daley (Condensers) Ltd., Dorset, UK.

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

Cement Manufacturers
Calabar Cement Co. Ltd., Calabar.

Chemical Engineering
Heplac Nigeria Ltd., Lagos.

Civil, Electrical & Mechanical Engineers & Constructors
Haden Nigeria Ltd., Yaba.
James Kilpatrick (Nig.) Ltd., Lagos.

Compactors
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Leventis Motors Ltd., Apapa.
Morpol Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
NITECO, Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Scoatrac, Lagos.
UTC Technical, Isolo-Mushin.
Tractor & Equipment, Lagos.

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

Concrete Machinery
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Holman Brothers (Nigeria) Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd.
Morpol Industrial Corp. Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Structor Yechmque.
UTC Technical, Isolo-Mushin.

Concrete Reinforcement
Nigerian Wire Industries Limited.

Containers & Tanks
Fibreglass Reinforced Plastics Co. Ltd., Abeokuta.

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

Corrugated Boxes
Polythene Enterprises (Nigeria) Ltd., Ikeja.

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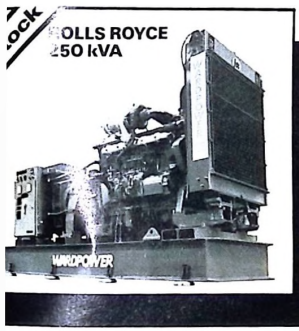
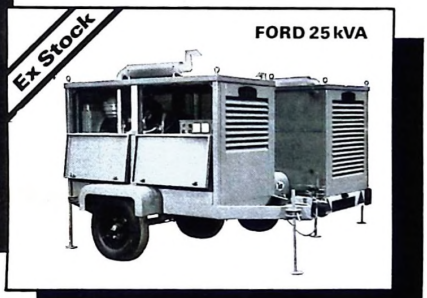
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.
Conveyancer (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Holt Engineering (a Division of J. Allen & Co. Ltd.), Apapa.
Leventis Motors Ltd.,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

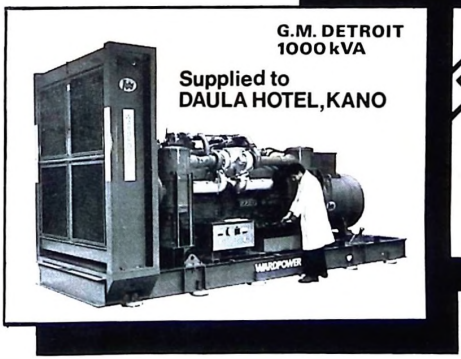
Cutting & Bending Machines
Afrotec Technical Services (Nigeria) Ltd., Isolo.
UTC — Hardware Div., Apapa.

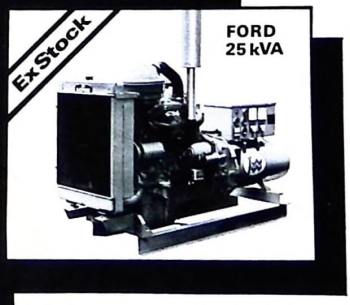
Why wait for Power?

NAMCO supply WARDPOWER GENERATORS - ex-stock









✱ Perkins engines also available

up to 312 kVA ex-stock
models up to 1000 kVA available

BASE LOAD, AUTO MAINS FAILURE OR STANDBY DUTY

WARDPOWER GENERATING SETS FROM:-

NAMCO NIGERIA LIMITED

Mantata House, Murtala, Mohummed Way,
KANO, Nigeria – Tel: 0672-4054-5 – Telex 77146

Wardpower Generating Sets manufactured in England by
Thos. W. Ward Ltd, Machinery (Wardpower) Division

Ward Centenary 100 1878 1978

M155

Dewatering Wellpoint Equipment & Services
Morpol Industrial Corp. Ltd., Apapa.

Diesel Generating Plant
Adeoye Adejobe Trading Stores Ltd., Ibadan.
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Diesel Sales and Service Division, Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Hold Engineering Ltd.
I.T.T. Nigeria Ltd., Yaba.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria) Ltd.
Minister Technical Services (Nigeria) Ltd., Kano.
Nigerian Motors Industries Ltd., Apapa.
NITECO, Apapa.
Phoenix Motors Ltd., EB, Lagos.
Powermaker Generators (Technical Division Tarpaulin Inc. (WA) Ltd.), Apapa.
Scoatrac, Ikeja.
Stokvis Nigeria Limited, Ebute Metta.
Stronghold (Nigeria) Ltd., Engineering Services Division, Ikeja.
Structor Technique, VYB (Nigeria) Ltd., Apapa.
UTC Technical, Isolo-Mushin.
Waateco Ltd., Technical Division, Lagos.
C. Zard & Co. Ltd., Lagos.

Diesels — Industrial and Marine
Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Apapa.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria) Ltd.
Nigerian Motors Industries Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Ilupeju Industrial Estate.
Stokvis Nigeria Limited, Ebute Metta.
Tarpaulin Industries (WA) Ltd., Apapa.
UTC Technical Division, Isolo-Mushin.

Dispensing and Bulk Pumps
Wayne (West Africa) Ltd., Apapa.

Doors & Windows
Aluminium Manufacturing Company of Nigeria Limited (Alumaco), Apapa.
Bisiolu Enterprises Ltd., Apapa.
Crittall-Hope Nigeria Limited.

Dredging & Reclamation Contractors
Nigerian Dredging & General Works Led., Apapa.
Westminster Dredging (Nig.) Ltd., Lagos.

Dumpers
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Conveyancer (Nig.) Ltd., Apapa.
Leventis Motors Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd., Lagos.
Morpol Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Lagos.
Scoatrac, Ikeja.
Structor Technique.
UTC Technical, Isolo-Mushin.
Tractor & Equipment, Lagos.

Earthmoving Equipment
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Bewac Ltd., Apapa.
Blackwood Hodge (Nigeria Ltd., Apapa.
Greenham Plant Hire (a Division of UAC of Nigeria Ltd.), Ikeja.
Holt Engineering Ltd., Apapa.
Conveyancer (Nigeria) Ltd., Apapa.
Hallam Graders, Leicester, UK.
Holman Brothers (Nigeria) Ltd., Apapa.
Joy Manufacturing Co., USA.
Leventis Motors Ltd., Lagos.
Nigerian Motors Industries Co. Ltd., Apapa.
Scoatrac, Isolo.
Stronghold (Nigeria) Ltd., Engineering Services Division, Ikeja.
Tractor & Equipment (a Division of UAC of Nigeria Ltd.), Lagos.

Electrical Contracting Materials
Cutler-Hammer Nigeria Ltd., Yaba.
Holt Engineering Ltd., Apapa.
Pan Electric, Apapa.

Electrical/Electronic Equipment
Adeoye Adejobi T. S. Ltd., Ibadan.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Cutler-Hammer Nigeria Ltd., Yaba.
Dizengoff W. A. (Nigeria) Ltd., Apapa.
EMS (a Division of UAC of Nigeria Ltd.), Apapa.
Fado Engineering Co. Ltd., Ebute-Metta.
Haven Nigerian Computer Co., Lagos.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
Mofat Engineering Co. Ltd., Lagos.
Nigerian Computer Co., Lagos.
NITECO, Apapa.
G. N. Okosala Electric Company.
VYB (Nigeria) Ltd., Apapa.

Electrical Engineering Contractors
Adeoye Adejobe Trading Stores Ltd., Ibadan.
Aluminium Wire & Cable Co. Ltd., Electric Cable & Overhead Conductor.
Bennet Babs Electrical Co., Ikeja.
Drake & Scull (Nig.) Ltd., Lagos.
A. D. Green & Co. Ltd., Ibadan.
Heplac Nigeria Ltd., Lagos.
Marryat Daniel (Nigeria) Ltd., Lagos.
Minister Technical Services (Nigeria) Ltd., Kano.
Mofat Engineering Co. Ltd., Lagos.
Technical Constructions (Nigeria) Ltd., Lagos.

Electric Fans
Nigeria Engineering Works Ltd., Port Harcourt.

Electric Generating Sets
Tractor & Equipment, Lagos.

Electrical Projects
Afrotec Technical Services (Nigeria) Ltd., Isolo.

Electric Pumps
Tractor & Equipment, Lagos.

Electrolytic Capacitors
Daly (Condensers) Ltd., Dorset, UK.

Engineering Services
Cutler-Hammer Nigeria Ltd., Ikeja.
Drake & Scull (Nigeria) Ltd., Lagos.

Feed, Mill & Grain Storage Systems
Lohta Nigeria Ltd., Enugu.

Fencing
Nigerian Wire Industries Limited.

Fibreglass Stockists
Pilkington Glass (Nigeria) Ltd., Apapa.

Fire Fighting Equipment & Vehicles
Guthrie (Nigeria) Ltd., Lagos.
Leventis Motors Ltd., Lagos.
SIDES.
Stronghold (Nigeria Ltd., Security & Safety Services Division, Ikeja.

Fire Protection Equipment & Systems
Reiss & Co. (Nigeria) Ltd., Lagos.

Flow Meters
Wayne (West Africa) Ltd., Apapa.

Food Processing Equipment
Henry Stephens Engineering Co. Ltd., Apapa.
Makin Ltd., Ilupeju.
UTC Technical, Isolo-Mushin.

Fork Lift Trucks
Afrotec Technical Services (Nigeria) Ltd., Isolo.
Bewac Limited, Apapa.
R. T. Briscoe (Nigeria) Ltd., Technical Department, Apapa.
Conveyancer (Nig.) Ltd., Apapa.
Leventis Motors Ltd., Lagos.
Nigerian Motors Industries Ltd., Apapa.
NITECO, Apapa.
Tractor & Equipment (a Division of UAC of Nigeria Ltd.), Lagos.
Engineering Services Division, Ikeja.
Henry Stephens Engineering Co. Ltd., Apapa.
Tarpaulin Industries (WA) Ltd., Apapa.
Waateco Ltd., Iganmu.

French Windows and Doors
Crittall-Hope Nigeria Ltd.
Steel Works Ltd., Ibadan.

Full and Split Charter Operations
Air Marketing International Group of Co's, Crawley, UK.

Garage Equipment
Stokvis Nigeria Limited.
VYB (Nigeria) Ltd., Apapa.
Wayne (West Africa) Ltd., Apapa.
C. Zard & Co. Ltd., Lagos.

Glasshouses
Makin Ltd., Ilupeju.

Glass/Mirrors Processors
Pilkington Glass (Nigeria) Ltd., Apapa.

Graders
Blackwood Hodge (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Morpol Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
Tractor & Equipment, Lagos

Graphic Arts Requisites
A. M. Faltas (West Africa) Ltd., Lagos.

Hand & Power Tools
Landmark Industrial Supplies Limited.
UTC — Hardware Div., Apapa.

Hospital and Hotel Equipment
A. M. Faltas (West Africa) Ltd., Lagos.
Nirexim GmbH, Vienna.
Equipment Ltd, London.
Ihekole Int. Concern Ltd., Jos.
F. Steiner & Co. Ltd., Lagos.
UTC Technical, Isolo-Mushin.

Importers/Exporters
G.N.A. Hamzat & Co. (Nig.) Ltd.

Industrial Engines & Accessories
Tractor & Equipment, Lagos.

Industrial Gases
Gas & Welding (Nigeria) Ltd., Ikeja.

Insurance Brokers & Consultants
Interbroker

Intruder Detection & Alarm Systems
Reiss & Co. (Nigeria) Ltd., Lagos.

Ironmongery and Locks
UTC — Hardware Div., Apapa.

Irrigation Equipment
Afrotech Technical Services (Nigeria) Ltd., Isolo.
Guthrie (Nigeria) Ltd., Lagos.
Leventis Technical Ltd., Lagos.
Phoenix Motors Ltd., Lagos.
Stokvis Nigeria Limited, Ebute Metta.
Tractor & Equipment, Lagos.

Labelling Machines
Makin Ltd., Ilupeju.

Laboratory Chemicals/reagents
The Twilights Nigeria Ltd.

Laboratory Furniture
Nirexim GmbH, Vienna.

Laundry Equipment
F. Steiner & Co. Ltd., Lagos.
VYB (Nigeria) Ltd., Apapa.

Library Equipment
Nigeria Engineering Works Ltd., Port Harcourt.

Liquid Storage Tanks
Reiss & Co. (Nigeria) Ltd., Lagos.

Livestock Feed Mills
Makin Ltd., Ilupeju.
UTC Technical, Isolo-Mushin

Machine Tools & Woodworking Machinery
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria Ltd.), Lagos.
Nigerian Motors Industries Ltd., Apapa.
Stokvis Nigeria Limited, Ebute-Metta.
Stokvis-Nigerian Tool & Die Co. Ltd., Ebute-Metta.
UTC Technical, Isolo-Mushin.
UTC — Hardware Div., Apapa.
C. Zard & Co. Lagos.

YOU ARE CONCERNED WITH

REFRIGERATION

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Cold Fact No.1.

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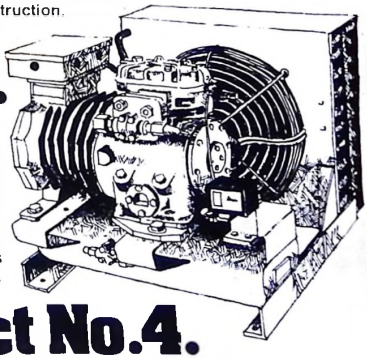

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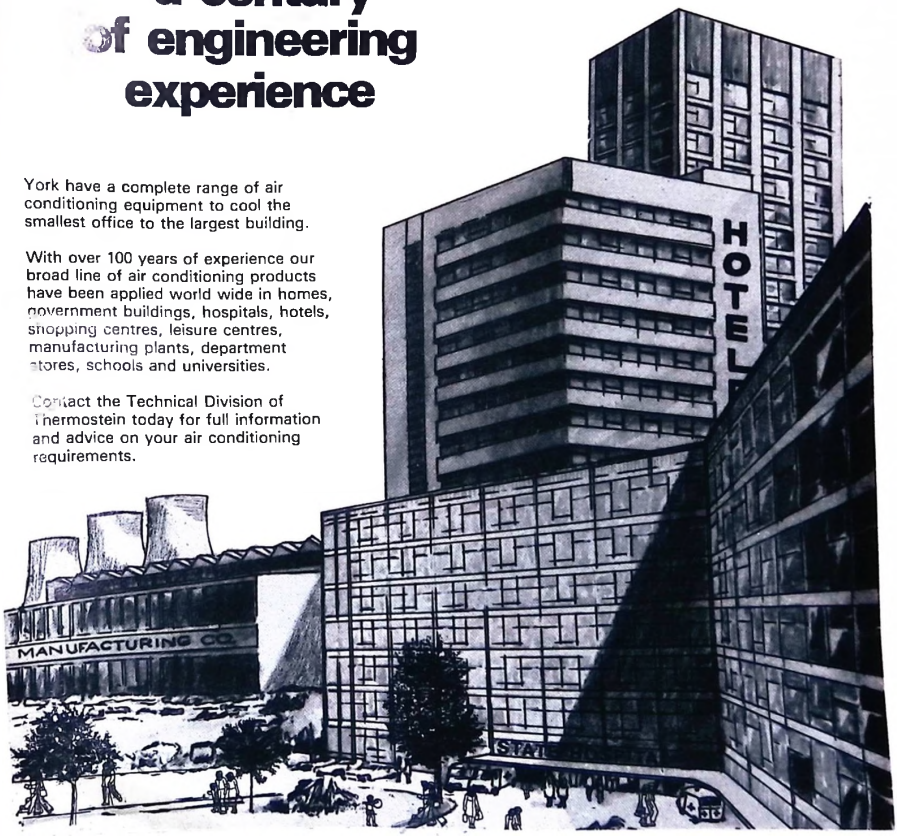

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29 Creek Road, PO Box 274, Apapa. Tel: 46893, 47216 and 47932.

VYB (Nigeria) Ltd.,
13-15 Wharf Road, P.O. Box 155, Apapa. Tel. 45811.

Waateco Ltd.,
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Wayne (West Africa) Ltd.,
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Weide & Company (Nig.) Ltd.,
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George Wimpey & Co. (Nigeria) Ltd., (Building, Civil Mechanical, Electrical Engineering Contractors),
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Westminster Dredging (Nigeria) Ltd.,
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