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INTERNATIONAL SOYBEAN PROGRAM

College of Agriculture University of Illinois at Urbana-Champaign

INTSOY

TRIP REPORT

LONDON, ENGLAND

SEPTEMBER 14-18, 1986

HAROLD E. KAUFFMAN

TRIP REPORT
H. E. KAUFFMAN

September 14-18, 1986

COUNTRY: London, England

ORGANIZATIONS/PERSONS CONTACTED:

A.	NEST Foundation	-	Ishrat H. Usmani
B.	ALFA-LAVAL	-	John E. A. Creaser, Hakan DolckC.
C.	TDRI	-	R. V. Harris
D.	Simon Rosedowns Corp.	-	Arthur R. Baker

A. FOUNDATION FOR NEW AND EMERGING SCIENCES AND TECHNOLOGIES (NEST) - Dr. I. H. Usmani, Head.

DISCUSSION/OBSERVATION:

1. Dr. Usmani's recent visit to Pakistan acquainted him with the intense need for edible oil and the interest in growing soybeans to help reduce import requirements. From his discussions with high government officials, his major goal is:

   (a) Form an umbrella private corporation to develop and manage a strong soybean industry. Partners would be the Agricultural Development Bank (ADB), Pakistan Council for Agricultural Research (PARC), the Ghee Corporation, and private industry.

   (b) Have INTSOY send a team of consultants to Pakistan to advise on technical aspects of a national soybean program.

2. Dr. Usmani outlines the following terms of reference for the team:

   (a) Determine what economic incentives farmers need to encourage them to grow soybeans.

   (b) Identify high-yielding varieties for various areas.

   (c) Recommend locations/varieties for conducting soybean nurseries.

   (d) Advise on type and location of demonstration farms to promote soybean production in various areas.

   (e) Advise on various types of processing facilities/methods to most efficiently extract the oil and make other products (meal, flour, milk, etc.) for use in Pakistan or for export.

Best Available Document

Dr. Usmani would like the two-man team to visit Pakistan for a period of three weeks during the last half of November and early December. Dr. Usmani would like to set up a contract with INTSOY to pay for the consultants.

The detailed terms of reference will be sent to INTSOY by Dr. Usmani.

A second area Dr. Usmani may be interested in funding is several research and development projects in extrusion/ expelling and the use of residue from soymilk and tofu.

A draft Memorandum of Understanding was left with Dr. Usmani for review/ revision and then to be returned to INTSOY.

B. ALPHA-LAVAL - John Creaser and Hakan Dolck

DISCUSSION/OBSERVATION:

Dr. Usmani invited Mr. Hakan Dolck (ALFA-LAVAL) to come to London to discuss the possible purchase of a soymilk plant in Pakistan. Dr. Usmani feels that a milk plant could provide a second market for the sale of soybeans by the farmers.

ALPHA-LAVAL has sold and are now building 11 soymilk plants in the following countries:

China	6	(the first dedicated September 10, 1986)
India	1	(near Bombay)
Nigeria	1	
Argentina	1	
Germany	1	
France	1	

They are having discussions with several other countries including Sri Lanka.

Dr. Usmani would like to see a 2000 l/hr plant built in Karachi. The cost would be approximately $2 million for the plant and an additional 1 1/2 million for the packaging equipment (TETRA PACK).

ACTION/FOLLOW UP:

(1) Telephone Usmani about two consultants

(2) Prepare proposals on extrusion/expelling and residue use from soymilk/tofu

C. TROPICAL DEVELOPMENT AND RESEARCH INSTITUTE (TDRI) - Dr. R. V. Harris and Dr. James Broadbent

V

DISCUSSION/OBSERVATION:

TDRI is the British Government organization that assists developing countries. The section on edible oils assists LDCs establish small-scale processing facilities. They have worked primarily with British made equipment such as Simon Rosedown.

Their major project now is in Zambia where they have introduced four Mini 40 expellers to process sunflower. They get many inquires about processing soybean but their only work has been unsuccessful processing small amounts of soy in the Mini 40. Their interest focuses on small equipment for small farm cooperatives. They are not interested in working with extruders as they feel they are too expensive and require too much power to operate.

ACTION/FOLLOW UP:

(1) Keep in touch with their program in Zambia (see attached).

(2) Consider using their consultants should we need help from an engineer specializing on expellers.

(3) Place Dr. Harris on INTSOY's mailing list.

D. SIMON ROSEDOWN - Arthur Baker and John Creaser

DISCUSSION/OBSERVATION:

The sale of approximately 80 Mini 40 expellers represents a small part of Simon Rosedown's total sales. Solvent extraction plants, presses, and oil refining equipment make up the bulk of their sales. Most of the Mini 40 expellers have been sold to LDCs for processing sunflower.

Their new Mini 200 was built several years ago, in part to a response to interest from TDI for a larger machine. They have not advertised them but have sold three (one each to Canada, China, and South Africa). They have one machine in their pilot plant. They were very interested in the concept of summary extrudate through the Mini 40 and Mini 200.

The Mini 200 is an up scale of the Mini 40 (approximately five times larger). They have processed up to 185 kg soybeans per hour and removed about 50 percent of the oil. A 15 HP motor runs the Mini 200. The price is:

Basic Unit	12,260 British Pounds
Tank	1,370
Filter System	5,560
Single Stage Cooker	7,430

ACTION/FOLLOW UP:

(1) They will send a price quotation for the Mini 200.

ATTACHMENTS

Attachment No. 1 - Calling Cards (Contacts in London)

Attachment No. 2 - H. E. Kauffman's Contacts/Itinerary

Attachment No. 3 - Tropical Development & Research Institute Brochure

Attachment No. 4 - Tropical Development & Research Institute Staff

Attachment No. 5 - Article "The Small-scale Expelling of Sunflowerseed Oil in Zambia," Hammonds, T. W., R. V. Harris, and N. MacFarlane.

Attachment No. 6 - Simon-Rosedowns Pamphlet, "Making the Most of Your Natural Resources," publication no. 823.

Attachment No. 7 - Simon-Rosedowns Pamphlet, "Oilseed Processing Plant and Equipment," publication no. 822.

Attachment No. 8 - Simon-Rosedowns Pamphlet, "Mini 40 Screw Press."

Attachment No. 9 - Photo - Simon-Rosedowns Mini 200

Attachment No. 10 - ALFA-LAVAL Pamphlet "Soymilk - Product and Process."

CONTACTS - ENGLAND ATTACH. #1
SEPT, 86

NEST

ALFA-LAVAL

Dr. I.H. Usmani
Ph D (Lond), DIC(Lond), S Pt
Secretary General

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REGIONAL MANAGER
FAR EAST

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TROPICAL DEVELOPMENT & RESEARCH INST.

OVERSEAS DEVELOPMENT ADMINISTRATION

James H. Broadbent
Plant Food Commodities Department

Tropical Development & Research Institute
56-62 Gray's Inn Road
London WC1X 8LU
Tele. 01-242 5412

OVERSEAS DEVELOPMENT ADMINISTRATION

R. V. HARRIS, B.Sc., Ph.D.
Head, Oilseeds and Edible Nuts Section

TROPICAL DEVELOPMENT AND RESEARCH INSTITUTE
CULHAM, ABINGDON
OXON OX14 3DA
ENGLAND
TELEPHONE: 0865 750 551

SIMON - ROSEDOWN

ROSEDOWNS

SIMON-ROSEDOWNS LTD
Cannon Street, Hull, England. HU2 0AD
Tel: 0482 29864 – Telex: 52226

Arthur Barker
Sales Office Manager

A SIMON FOOD Engineering Group Company.

ROSEDOWNS

SIMON-ROSEDOWNS LTD
Cannon Street, Hull, England. HU2 0AD
Tel: 0482 29864–Telex: 592226 SRHULL G

John E.A. Creaser
Product Manager – Oil Milling

A SIMON-FOOD Engineering Group Company.

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ATTACH. #2

ITINERARY FOR HAROLD E. KAUFFMAN

9/15 to 9/18 (date) London, England (City, Country)

CONTACT PERSON: I. H. USMANI

TELEX NO: 892251 Attn: Dr. Usmani, Nest Foundation

TELEPHONE: 9-011-44-1-929-2992

HOTEL: Tower Hotel, Katherines Dock

56 Gloucester Rd London Office 405-1943 Ext 580

9/16 to _____ (date) London (City, Country)

CONTACT PERSON: Dr. R. V. Harris, Head Oilseeds & Edible (TDRI)

TELEX NO: _____

TELEPHONE: 086-730-7551

HOTEL: Tower Hotel

TDRI
Industrial Dev. P
CULHAM
ABINGDON, OXON
OX14 3DA

9/17 to _____ (date) London (City, Country)

CONTACT PERSON: Alan Haythornthwaite & Ken Maitland (INSTA PRO)

TELEX NO: 67182G

TELEPHONE: (0253) 730888

HOTEL: Tower Hotel

OR

9/17 to _____ (date) Simon Rosedowns Corp. (City, Country)

CONTACT PERSON: Arthur Barker (Cannon Street - Hull, England)

TELEX NO: _____

TELEPHONE: 0482-29864

HOTEL: Tower Hotel

_____ to _____ (date) _____

CONTACT PERSON: _____

TELEX NO: _____

TELEPHONE: _____

HOTEL: _____

INSTA-PRO International. ST Ltd.

& PAT

ALAN HAYTHORNTHWAITE B.Sc (AGRIC)
PRODUCT DEVELOPMENT CONSULTANT

BOUNDARY ROAD,
LYTHAM, LANCASHIRE,
U.K. FY8 5HU
Tel (0253) 730888 Telex: 67182G Fax: (0772) 730788

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The Tropical Development and Research Institute

The Tropical Development and Research Institute

The Tropical Development and Research Institute (TDRI) was formed in April 1983 by the amalgamation of the Tropical Products Institute (TPI) and the Centre for Overseas Pest Research (COPR). The Institute is one of the scientific units of Britain's Overseas Development Administration (ODA), and is funded from the Government's overseas aid programme.

Because of the unparalleled breadth of services it offers to assist developing countries around the world, TDRI is a unique organisation and is recognised as the world centre of excellence in its field.

TDRI collaborates with the developing countries to solve agricultural and health problems caused by crop pests and disease vectors, and helps them derive greater benefit from their renewable resources by improved post-harvest handling, processing, preservation, storage, transportation and marketing of plant and animal products. This collaboration takes the form of research and development – in Britain and in the developing countries – and the provision of scientific, technical and economic information, advice and training.

A multidisciplinary institute

The Institute is a multidisciplinary organisation whose staff includes many specialists – scientists, technologists, engineers and economists. TDRI's approach to development problems is also multidisciplinary with appropriately staffed teams being deployed in Britain and overseas.

The main emphasis of TDRI's work is on the improvement of food supplies, in accordance with one of the major objectives of the British overseas aid programme. Work is also carried out on some non-food cash crops of particular importance to small farmers and/or the economies of the developing countries. TDRI concentrates its activities in areas where it has a comparative advantage in terms of knowledge, experience and cost effectiveness. At home and abroad it liaises closely with government and international organisations, universities and industry. TDRI also works closely with multilateral and bilateral aid agencies.

The work of TDRI

TDRI has 11 operational departments, eight of which are located in central London. Each department concentrates on specific areas of research and development:

Applied Biology Department

Developing novel and improving conventional pest management methods through a better understanding of pest behaviour and population ecology, linked with accurate pest identification.

Applied Ecology Department

Improving control strategies against major pests, especially migrants, from basic studies of their biology and relevant aspects of meteorology and biogeography.

Pest and Vector Management Department

Studying the behaviour and ecology of major pests in the field and developing improved strategies and techniques for their control.

Pesticide Application and Management Department (Porton Down, Wiltshire)

Researching and developing improvements in the effectiveness, economy and safety of pesticides and other control agents.

Animal Products and Feeds Department

Investigating post-harvest aspects of fish, meat, hides and skins, dairy products, animal feeds and fermentation products. The department also works on quality assurance and on mycotoxins.

Plant Food Commodities Department

Examining problems in the post-harvest sector relating to fruits, vegetables, root crops, beverage crops, oilseeds and edible nuts

Non-Food Commodities Department

Researching and developing post-harvest aspects of non-food cash crops such as spices, essential oils, naval stores, pulp and paper and vegetable fibres. The department also carries out work on the identification and synthesis of insect attractants

Storage Department (Slough, Berkshire)

Studying problems of storage of durable agricultural produce including the detection, identification and control of storage pests, engineering and environmental aspects of storage systems and structures, and improvements to packaging methods

Industrial Development Department (Culham, near Oxford)

Developing improved engineering and technological methods of handling and processing tropical produce, including waste and by-products. It also deals with the development of small- to medium-scale methods of energy production from biomass sources

Marketing and Industrial Economics Department

Investigating market opportunities for produce on a country, regional or worldwide basis. It also carries out feasibility studies of potential development projects, and of processes developed by TDRI. Studies are often aimed at appraising projects suitable for donor funding

Central Operations Department

Providing all these departments, as well as developing countries, with a wide range of services including contract work, project monitoring, training, publications, library and information, and giving specialised photographic and workshop support for the Institute's programmes

Post Available Document

TDRI Activities

The Institute's operations are divided into the following programmes:

Overseas assignments

As part of the British technical co-operation programme, TDRI sends specialists on long- and short-term missions in response to requests from developing countries. Individual overseas assignments may be concerned with pest-management or post-harvest research and development, training, advisory or planning activities, or with feasibility or marketing studies. Often a combination of these aspects is involved, and TDRI is well placed to field multidisciplinary teams where necessary.

Contract services

TDRI also undertakes work on a repayment basis for international agencies, regional development bodies, other bilateral donors, commercial and consultancy organisations and government and non-government bodies in developing countries. The emphasis is on services which cannot readily be supplied by the British commercial consultancy sector, with which TDRI has a close working relationship. TDRI can also undertake studies and laboratory work in Britain on a contractual basis.

Research and development

The extensive programme of research and development, and of market and agro-industry studies, at home and overseas keeps the Institute to the forefront of science and technology, notably in the pest management and post-harvest fields.

Training

TDRI gives specialist training in various aspects of pest management and post-harvest technology. In Britain it offers group courses and individual training tailored to meet the trainees' job requirements and future responsibilities. While overseas training courses are held on a country or regional basis. Training, especially of counterparts, is also an important element in the overseas assignments programme. Details of TDRI training courses are available on request.

Publicly Available Document

Advice

TDRI responds to requests from almost all developing countries for advice and information on pest management and post-harvest technology. More than 2,700 technical enquiries are dealt with each year: some involve short-term laboratory work, many others are answered fully by experienced specialist staff served by extensive library facilities and on-line access to external databases.

Information

TDRI's specialist information is disseminated through its own publications, and papers published in scientific journals. Details of TDRI publications are given in the Publications List, available on request.

Overseas network

Certain overseas visits are undertaken for project identification purposes, or to establish and maintain liaison with other organisations involved in the pest management and/or post-harvest sectors. Staff also participate in specialist international workshops and symposia.

Identification services

TDRI provides identification services for locusts, grasshoppers, termites and storage pests from all parts of the tropics and sub-tropics.

The scope of the programme

The following list of activities, which is by no means exhaustive, illustrates the scope of TDRI's programme for the benefit of developing countries. It provides examples of multidisciplinary activities soundly based on technology, practicability and cost-effectiveness.

Pre-harvest pests

Work with pre-harvest pests focuses on the following programmes:

Identification and behaviour: studies of taxonomy, biology, ecology, flight physiology and behaviour and the relationship between geographical variation and migration; behavioural studies in laboratory and field.

Forecasting: monitoring changing distributions of wind-borne pests by trapping and remote-sensing (radar and infra-red techniques); investigations of pest migration in relation to weather including the use of weather satellite observations.

Management: development and application of integrated control systems using pesticides, pheromones and viruses, and studies of their effect on the reduction of crop losses; identification and synthesis of pheromones and other insect products; physiological and morphological studies of the interaction between pests and their host plants to assist the development of resistant crop varieties; toxicology of insecticides; measurement of the efficiency, spray droplet size and reliability of spray equipment; examination of pesticide formulations and environmental monitoring of spray deposits; and the use of fungicides to control grassland termites.

TDRI's current target pests include:

- Brown planthoppers, the major pest of rice in south-eastern Asia
- African armyworms, migrant pests of cereals and grasslands
- Stem borers, widespread pests of maize and sorghum
- Termites, pests of grasslands, crops, forests and forest products and buildings
- Bollworms and leafworms, widespread pests of cotton, cereals, pulses and horticultural crops
- Grasshoppers, migrant and local pests of major food and cash crops and trees
- Defoliators, borers and sap-suckers, pests of forests and plantations
- Weevils, pests of bananas, a staple crop in many areas

Storage pests and storage technology

Studies in this area cover the relative resistance of food grain varieties to insect storage pests; the biology and ecology of insect pests of stored produce to improve control methods and commodity management; the toxicity of insecticides and fumigants to storage pests, and the development of techniques for applying insecticides and fumigants to stored produce.

Loss assessment: the development and application of methodology to quantify losses in stored grains, pulses

and other durable produce; initiation and development of loss reduction programmes

Engineering: studies of storage systems and structures and their applications; improvements to existing storage systems, and introduction of better systems at farm, village and central storage levels; development of instrumentation for use with stored produce

Environment: studies of the relationship between the environment and physical condition and keeping quality of stored produce

Inspection: development and application of improved methodology for the inspection of stored produce

Packaging: introduction and assessment of improved materials and methods for durable, perishable and processed foods

Food commodities

The commodities involved are as follows:

Fish: improvements in handling, processing, storage and transport; development of methods for preserving and utilising fish-processing waste, by-catches and other waste fish

Animal products: improved methods of handling and processing meat; techno-economic evaluations and design studies for terminal livestock markets and meat processing plants; development of methods for the processing and utilisation of abattoir wastes; improving the quality and marketability of hides and skins

Fruits, vegetables and root crops: improvements in handling, grading, processing, storage and marketing; studies on the effects of physiology, biochemistry and pathology on post-harvest losses and quality

Oilseeds and edible nuts: development of new and improved methods for processing and quality control

Cereals: development of improved methods of milling, processing and utilisation; advice on milling technology for special grains and flours; development of novel cereal-based products

Animal feeds: improvements in compounding and utilisation; development of new feeds based on raw materials available in developing countries; utilisation of agro-industrial wastes as animal feed ingredients

In addition, contamination and hygiene factors are assessed:

Mycotoxins: survey of the incidence of contamination; development of improved methods of analysis and of methods for the detoxification of contaminated food and feeds

Quality assurance and hygiene: monitoring food manufacturing and processing methods used in developing countries, and advising on microbiological standards and codes of practice to meet local and export requirements; determination of pesticide residue levels in food and feeds

Cash crops

TDRI helps developing countries make the most of their cash crops

Spices and essential oils: developments in processing and production methods to improve quality and marketability

Beverage crops: development of drying, processing and quality control procedures to improve quality

Vegetable fibres: improvements in processing and utilisation of hard fibres to increase commercial outlets

Forest products

Pulp and paper: evaluation of existing forest resources and examination of individual species as possible commercial sources of pulp and paper

Charcoal: development and introduction of improved methods of production and use; improvements to traditional methods of energy production by direct combustion of biomass

Naval stores: development of processing and production methods to improve quality and marketability of such commodities as turpentine and rosin obtained from pine trees

Process technology

Crop processing: design and development of improved techniques and equipment for the decortication, de-husking and other processing of tropical crops; design studies for small-scale oilseed expelling equipment

Crop drying: development of improved methods using solar and other techniques suitable for developing countries

Best Available Document

Waste product utilisation: gasification of wood and agricultural residues to generate motive power and electricity; processing of fish waste to produce silage for animal feeds

Building materials: production and testing of building panels from wood-wool and cement; design and development of small-scale production plant

Marketing and economics

The economists are involved in all aspects of TDRI's work. Marketing and economics studies are carried out in the following areas:

- Economics of pest and vector management
- Preparation of market prospects and export opportunity studies on a national, regional and international basis
- Studies of institutional aspects of marketing and pricing
- Feasibility, project identification and project formulation studies
- Agro-industrial rehabilitation and sub-sector planning studies
- Economic evaluation of new plant and animal products and new technology

Disease vectors

Insects that transmit diseases to man and domestic animals are a major problem. TDRI's targets are

Tsetse flies, vectors of trypanosomiasis in man and animals: pesticide appraisal and aerial spraying; environmental monitoring of spray deposits; identification and synthesis of host attractants to improve tsetse trapping techniques and to assess their potential as control agents

Blackflies, vectors of river blindness: bionomics, flight capability, ecology and control; evaluation of insecticides and formulations

Mosquitoes, vectors of malaria: evaluation of larvicides, adulticides and formulations in association with the World Health Organization (WHO)

Ticks, vectors of East Coast Fever and other animal diseases: production of kits for the Food and Agriculture Organization (FAO) for testing resistance to acaricides

How projects are commissioned

Requests from developing country governments which qualify for British Aid are channelled through the Overseas Development Administration. ODA may commission TDRI to carry out the work if it lies within the scope of its activities, and if the resources are available. In addition, TDRI may, subject to the claims on its resources commissioned by ODA, accept contracts on behalf of developing countries from multilateral aid agencies and other organisations.

For further information

Requests for further information, advice, investigations, training, or publications, should be sent to

The Director
Tropical Development and Research Institute
127 Clerkenwell Road
London EC1R 5DB
England
Telephone 01-405 7943
Cable TROPRODS LONDON

Available Document

Best Available Document

ATTACH. #9

TROPICAL DEVELOPMENT AND RESEARCH INSTITUTE

Deputy Directors	Heads of Departments		Heads of Sections	
Mr. T. Jones	Dr. W.A. Sands	Applied Biology	Mr. S. Bacchus	Termite Biology and Taxonomy
			Dr. J. Duncan	Larvicides
			Dr. N.D. Jago	Grasshopper Taxonomy and Ecology
			Dr. D.G. Campion	Moth Pheromones
	Dr. T.G. Wood	Applied Ecology	Dr. R.H. Cowie	Termite Ecology and Control
			Dr. A B.S. King	Heliothis Ecology and Control
			Dr. J.I. Magor	Biogeography and Meteorology
			Mr. D.E. Pedgley	
			Dr. J.R. Riley	Radar Entomology and Flight
			Dr. R.J. Cooter	Physiology and Behaviour
	Mr. D.J. deB. Lyon	Pesticide Application and Management (Porton)	Dr. I.H. Haines	Pesticide Management
			Mr. D.R. Johnstone	Pesticide Application
			Mr. D.J. McKinley	Viruses and Bioassay
	Mr. T.J. Perfect	Pest and Vector Management	Dr. A.G. Cook	Crop Resistance Mechanisms
			Dr. D.J.W. Rose	Armyworm Biology and Control
			Mr. M. Bigger	Crop Pest Management
			Mr. C.W. Lee	Vector Biology and Control
			Mr. R.J. Douthwaite	Pesticide Impact Assessment
Dr. N.R. Jones	Mr. D.J.B. Calverley	Storage (Slough)	Dr. P.F. Prevett	Pest Biology and Inspection
			Mr. D. Halliday	Chemical Control and Pesticide Analysis
			Mr. J.A. Hallam	Storage Engineering and Packaging
			Mr. J.A. McFarlane	Storage Operations and Management
	Mr. D. Adair	Industrial Development (Culham)	Mr. W. Nichols	Engineering (Mechanical)
			Dr. L. Kennedy	Engineering (Chemical)
			Mr. G.P. Bread	Biomass Energy
			[illegible]	[illegible]
	Dr. J.C. Caygill	Animal Products and Feeds	[illegible]	[illegible]
			[illegible]	[illegible]
			Dr. W.H. Parr	Animal Feeds, Nutrition and Toxicological Testing
			Dr. K. Jewers	Mycotoxins
	Dr. R.D. Cooke	Plant Food Commodities	Dr. R.V. Harris	Oilseeds and Edible Nuts
			Miss F.J. Proctor (Acting)	Fruits, Vegetables and Root Crops
			Dr. G.E. Howard	Beverage Crops and Miscellaneous
			Mrs. A.J. Wallbridge (Acting)	Microbiology and Fermentation
Dr. J. Mabney	Dr. J.H.S. Green	Non-Food Commodities	Mr. E.R. Palmer	Pulp, Paper and Fibres
			Dr. C.L. Green	Spices, Essential Oils and Other Plant Extractives
			Dr. D.R. Hall	Insect Products
			Mr. D.R. Martin	Laboratory Common Services
	Mr. M. Hebblethwaite	Marketing and Economics	Mr. C.P.J. Robbins	Non-Food Commodities
			Mr. A.D. Marter (Acting)	Food Commodities "A" (Animal)
			Mr. P.R. Walters	Food Commodities "B" (Plant)
			Vacant	Pest and Vector Management
			Miss S.M. Green	Statistics
			Mrs. A.C. Brueton	
	Mr. J.G. Disney	Central Operations	Dr. G.A. Norman	Scientific Secretariat and Training
			Mr. J.A. Wright	Library and Information Services
			Miss P.J. Wortley	Publications, Publicity and Public Relations
			Mr. J.O. Barron	Photography
			Dr. J.A. Cornelius	Safety
		Administrative Secretariat	Mr. R. Allen	
			Mr. B.W. Lister	Relocation and Security

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ATTACH. #5

The Small-scale Expelling of Sunflowerseed Oil in Zambia

There is a great need in many parts of the Third World for edible oil at a price which the rural population can afford. T.W. Hammonds, R.V. Harris and N. MacFarlane* describe the development of a small-scale oil expeller.

The need

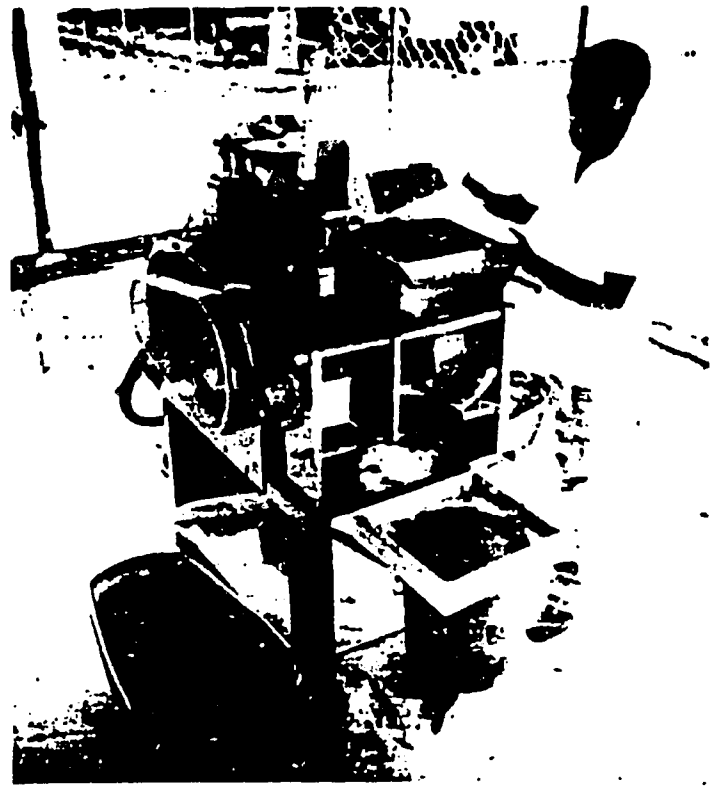
The Oilseeds Section of the British Tropical Development and Research Institute (TDRI) receives frequent enquiries from individuals, aid agencies and governments in developing countries on the local need for small-scale edible oil production. Correspondence and visits to developing countries make it clear that although there is a trend for developing countries to establish large modern edible oil production factories, the case for complementary small-scale equipment is often strong. The reasons for this are complex and differ in detail from case to case. Basically, however, the further away one is from the centralized factory, the harder it is to buy vegetable oil and when, or if, it is available, it is very expensive. It seems that the costs and logistics of seed collection and the distribution of oil from a centralized plant can often outweigh the advantages of the economies of scale to the point that small-scale oil production becomes an attractive possibility.

Recognizing the potential value of small-scale oil extraction equipment to developing countries, the TDRI discussed specifications for a small expeller with Simon-Rosedowns, a UK engineering company with a long tradition in the manufacture of large oil extraction machinery, and subsequently took charge of a prototype expeller for evaluation.

Trials in Zambia

On completion of this work the TDRI were asked to try out the expeller in Zambia using sunflowerseed as the oilseed. The site selected for the trials in Zambia was a Tobacco Board outstation at Mulilima, a village about twenty miles south of Serenje in Central Province. Sunflower cultivation was being encouraged as a cash crop in the area, and the trials were to be part of the Integrated Rural Development Programme financed by British Aid. The expeller was to be powered by a diesel engine rather than three-phase, 440-volt electricity because the latter was not available at the site. The high hull content of the Zambian sunflowerseed (forty-four per cent) led to the decision to use a seven horsepower (hp) diesel engine to make sure there was enough power available to cope with this high-fibre oilseed. The prototype expeller in the pilot plant in the UK had been powered by a three horsepower, three-phase electric motor.

During October to December 1982 the expeller package was shipped to Zambia and was installed and commissioned at the Mulilima Tobacco Board outstation by a TDRI oilseed technologist. At the site, the expeller was housed in a purpose-built lean-to building, which included ventilation for the diesel exhaust fumes, a store for spares and sunflowerseed oil, and another store for sunflowerseed and oilcake. The seed used in the trials came from the local Agricultural Marketing Board depot. The local staff consisted of an expeller operator and two labourers, each of whom was given on-the-job training.



The Mini 40 expeller in action in Zambia.

After a number of experiments, conditions were established for flood-feeding the expeller with sunflowerseed and opening the choke fairly wide to give an oilcake of about 3-4mm thickness. Before expelling, the seed was sieved to remove trash, including small stones and sand.

The oil obtained immediately after expelling was black in colour because it contained a fine suspension of seed particles. Experiments showed that leaving this oil in a forty-five-gallon drum for several days allowed these fine seed particles to settle, and a clear yellow oil was produced.

Local demand

By now we had reached the crucial stage of the project; finding out the local reaction to the edible oil produced. Workers at the Tobacco Board outstation tasted the oil and all agreed it had an acceptable taste. The swiftness of what followed surprised us. By word of mouth news spread quickly around the local villages that a good edible sunflower oil was being produced locally and within a few days there were eager queues of villagers wanting to buy the oil. The distribution and importantly, packaging, of the oil thus produced no problems; the villagers brought their own cups, plastic bottles and even plastic bags in which to put their purchase.

The oilcake found a ready market with local commercial farmers as a component of livestock feed during the dry season when grass is in short supply.

* *T.W. Hammonds, R.V. Harris and N. MacFarlane are members of the Tropical Development and Research Institute, 56-62 Gray's Inn Road, London WC1X 8LU, UK.*

Performance

The expeller has now been operated by local counterparts for twelve months since our return to TDRI and the following performance data was recorded:

Average amount of seed processed per operating day	277kg
Average oil output per operating day	50litres
Average cake output per operating day	214kg
Average fuel consumption per operating day	3.7 litres

In general one can produce about nine litres of clarified oil from each fifty kilogram bag of seed.

The local sunflowerseed has a low oil content of only twenty-four to twenty-eight per cent. Thus 277kg of seed contains between seventy-two and eighty-four litres of oil of which fifty are recovered for sale. Further experiments on heating the seed before expelling, and on recycling the residual sediment left after oil clarification, might evolve techniques for increasing the yield of saleable oil.

Future development

A TDRI oilseed technologist has now been posted to Zambia and several additional expellers have been supplied to other farmers' co-operatives in the area as part of the British Government Aid Programme. Research and development work will be done to try to enhance the yield of oil from sunflowerseed and to examine the potential of the expeller for processing other locally available oilseeds such as soya-beans and groundnuts.

One important aspect that remains to be decided is the administrative system under which the edible oil extraction facility can best be operated. Since the farmers at present regard sunflower as a cash crop they are generally anxious to sell it all at the time of harvest. The owners of the expeller would therefore, as things stand at present, have to purchase a whole year's supply of seed at harvest time and this would require a great deal of money. Possibly the Marketing Board, which currently buys the whole crop, can be persuaded to retain some at the local depots instead of selling it immediately to the central factory. Smaller quantities could then be sold throughout the year to a small expeller operator.

Another approach being examined is to persuade the farmers to keep back some seed themselves to sell to the small expeller operator to provide cash at other times of the year. A variation on this would be the so-called 'custom milling' concept whereby the farmer brings small quantities of seed to the expeller facility for extraction when he requires edible oil either for his own use or to sell to other villagers. No cash fee would be charged for the extraction, the farmer would be given the oil, but the oilcake would be kept by the mill operator as his payment, for subsequent sale to livestock owners. In this way the mill operator would at no stage need to buy the seed, nor would he own the oil. Such a procedure is widely used in the small-scale rice milling industry with the milled grain being returned to the farmer, and the miller retaining the bran as his payment.

An investigation of these various administrative alternatives is now under way in Zambia in addition to further technical work on the expeller, but the project seems to show that although Zambia has a modern large-scale solvent extraction plant for edible oil production, there are areas in the country where small-scale expellers can be of great value. ●

Mini 40 Costs - September 1985

The price of a Mini 40 expeller depends on the source of motive power.

(a)	Electric motor driven	£3,300
(b)	Diesel Engine driven	£4,140

A support frame can also be supplied at about £620 each extra, but is not an essential requirement as it would be possible to make a suitable support locally.

A list of essential spare parts for the expeller is given below:

1.	Wormshaft	£315 each
2.	Barrel rings (set of 12)	£217 each
3.	Ball thrust bearing	£10 each
4.	Choke	£44 each
5.	Thrust washer	£8 each
6.	Bush	£21 each
7.	100 0.010 inch spacers	£20
8.	200 0.005 inch spacers	£40
9.	Drive belts	£10

If a diesel driven version is selected, there will be additional costs for engine spares.

Contact in Zambia:-

Mr A A Swetman
Small Scale Oilseed Expelling Adviser
C/O British High Commission
PO Box 50050
Lusaka
Zambia

Background Considerations to Running a Small Scale Expelling Operation

1. What is the extent of the demand for vegetable oil in the locality.
2. Is enough oilseed grown in the area to provide sufficient feedstock for the expeller. The capacity of the Mini 40 expeller is around 40 kilos oilseed per hour, and the amount of oilseed required to supply an expelling operation would be from 50 to 100 tonnes a year.
3. Will the unrefined naturally flavoured oil produced by the expeller be acceptable to consumers who may be accustomed to bland tasting refined oil.
4. Is a subsidised social benefit operation envisaged or is an economically viable operation required.
5. If an economically viable operation is required, what is the price of the oilseed feedstock and what is the value of the crude oil and oilcake produced. The value of the oilcake is important as its sale may be the only way of covering the costs of running the expelling operation. The value of the oilcake would depend on the demand for it as an ingredient of animal feed formulations. For this a local livestock industry would be required.
6. How will the expelling operation be organised and how will the supply of oilseed feedstock be arranged? Possible modes of operation would be
   (a) process only - in which seed stocks are not required and the farmer brings his own seed for processing. In this mode a fee would be levied to cover costs. Depending on product value, the operator would either retain some oil and/or the oilcake, or a cash payment would be made by the farmer. However, this type of expeller operation may not recompense the farmer fully for nolding his crop back from sale and therefore insufficient raw material would be provided, furthermore, the amount of oil produced may be insufficient to supply the non-farming community.
   (b) buying in oilseed stock - if the crop is seasonal and the growers need to sell the crop to raise cash at harvest time a large financial outlay perhaps incurring financial costs would be required to buy in sufficient oilseed to supply a continuous expelling operation,
   (c) purchase of oilseed as and when required - this option could be suitable where the crop is produced more or less throughout the year, for example coconuts.
7. How will the oil be packaged - will the buyers bring their own containers or will bottles be provided by the expelling operation.
8. To these considerations account has to be taken of labour costs, financial costs including loan repayments and running costs including spare parts.

Overall, as the economics of expeller operation tend to be site - specific with costs and revenues varying according to location a feasibility study would be needed to assess the prospects. Added to this is a requirement for efficient management, technical and business backup services and a competant accounting system to prevent mishandling of the stock and funds.

9. Factors effecting the efficiency of oilseed expelling operation have also to be taken into consideration.

   (a) The mini expelling process is a simplification of large scale commercial expelling tending to lower expelling pressures which result in lower oil recoveries.

   (b) The type of oilseed processed can effect the efficiency of oilseed expression. As the production of frictional heat in the expeller considerably aids the expelling operation, seeds with a high fibre content such as sunflower seed are more efficiently processed than low fibre content seeds such as groundnuts where the amount of fibre present tends to be insufficient to maintain a favourable oil expelling temperature.

   (c) The method used to clarify the oil also influences the efficiency of oil extraction.

   Oil produced by the expeller always contains a certain proportion of fine oil seed particles which make the oil opaque and dark and which have to be removed to produce a clarified oil suitable for human consumption. Sunflower seed oil may be clarified by allowing to stand undisturbed for a few days in an oil drum but usually the clarification is not entirely complete and a proportion of oil (about one tenth) at the bottom of the drum where the seed particles have sedimented usually remains unclarified.

   The use of a filter press (equal in cost to the expeller) is needed to recover the remaining oil and consequently improve the efficiency of oil extraction.

10. Selection of oilseed. Oilseeds selected for mini expelling should have a good oil content (at least 30 per cent) and possess a suitable amount of fibre.

    e.g., Sunflower seed, copra, palmkernels, rapeseed.

    Seeds where oil yield is not the prime production consideration such as cottonseed and soyabeans have oil contents too low to be suitable for small scale expelling.

Making the most of your natural resources

SIMON-ROSEDOWNS

A world of experience in process

If economic progress and industrial investment are important to you, you will already be thinking about projects based on agriculture. The production of vegetable oils and fats is an important part of any agricultural development plan, because consumers value products based on vegetable oils. They want them – and they need them, because oils and fats form an essential part of our diet.

SIMON-ROSEDOWNS CAN HELP YOU MAKE THE BEST USE OF YOUR OILSEED CROP FOR ECONOMIC DEVELOPMENT AND SOCIAL PROGRESS.

First, our expertise and equipment will help to reduce dependence on expensive food imports by establishing a valuable home industry employing local labour and producing products for local consumption.

Secondly, profitable export markets can be identified to earn foreign exchange, often a major constraint on further developments. By adding value to your crop locally, you can avoid the old trap of exporting raw materials for processing elsewhere.

AN EFFICIENT OILSEED PROCESSING INDUSTRY IS A FUNDAMENTAL AGRO-INDUSTRY, ESSENTIAL FOR A COUNTRY'S FOOD SUPPLY AND FOR FUTURE INDUSTRIALISATION.

It acts as a starting point for the establishment of a chain of linked industries that use crude vegetable oils to produce refined oils. Such oils are used in the manufacture of cooking oils, frying oils, salad dressing and ice-cream. Other down-stream products are based on hydrogenated vegetable oil such as margarine, shortening and "ghee." A third group are technical oils used in the production of paints, varnishes, lubricants and plastics. By-products from these products include soap manufacture and detergents based on fatty acids. Finally, in addition to their value as a source of oil, the seeds of many oilseeds have a high protein content. Groundnut and soyabean are obvious examples. The residue of these seeds after the oil has been extracted is processed into animal feedstuffs, a crucial input

ng seeds, vegetable oils and fats

for a modern livestock industry. In this way an oilseeds industry can contribute indirectly to improving the supply of protein foods, just as it increasingly contributes directly by providing the feedstock for human protein foods.

OILSEED DEVELOPMENT IS VITAL IN TODAY'S WORLD – VITAL FOR ECONOMIC GROWTH, VITAL FOR IMPROVED LIVING STANDARDS, VITAL FOR EVERYONE.

Simon-Rosedowns contribution to increasing the economic independence of developing countries by helping to exploit the potential of oilseeds is well known. We are proud to have played our part in helping these countries tap the enormous potential of oilseeds – potential for further industrialisation, potential for increased food supply, potential for meeting the proper aspirations of people all over the world. Our complete extraction and refining systems operate on every continent converting primary oilseeds like Soyabean, Cottonseed, Corngerm, Rapeseed, Sunflowerseed, Copra, Palm Kernals, Sesameseed, Linseed, Cocoa and Castorbeans etc into edible oils and proteins, animal feedstuffs and valuable technical oils.

Simon-Rosedowns Ltd, a Simon Food Group company, is the leading international name in the design, manufacture, procurement, finance, construction, commissioning and management of process plant to the world's vegetable oil extraction and refining industry. It is a name that, unlike many newcomers to the business, can offer you engineering and contracting expertise gained from over 200 years of total involvement in a specialised field. A name that can point to a long, successful track record of completed projects in over 100 countries worldwide.

LET SIMON-ROSEDOWNS HELP YOUR COUNTRY ACHIEVE A GREATER DEGREE OF SELF-SUFFICIENCY WITH AN IMPROVED STANDARD OF LIVING.

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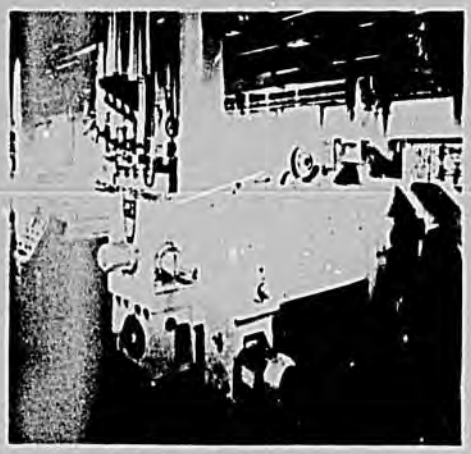
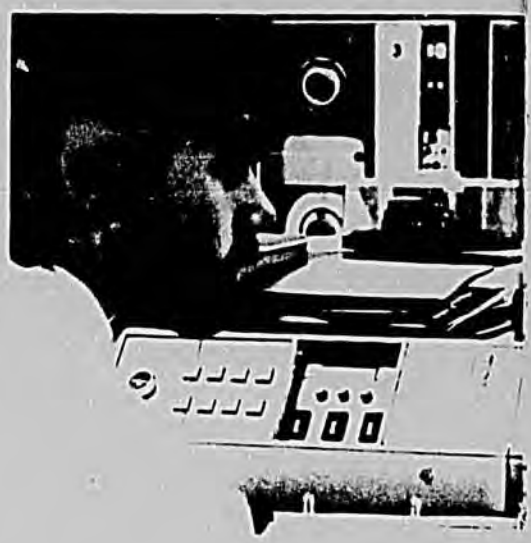
The highest standard of



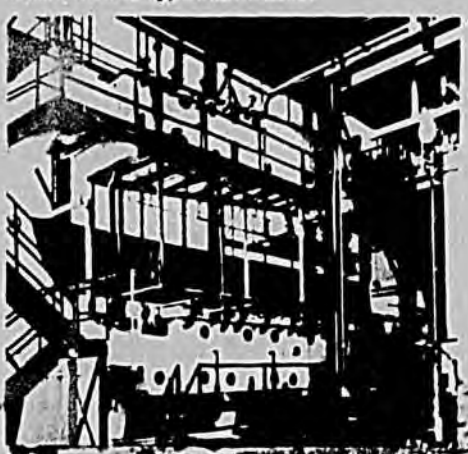
Rosedowns 'G' Type Pre-Presses.

The majority of plant and machinery is designed and purpose manufactured at Simon-Rosedowns 35,600 square metre operation in Hull, England. Detailed quality control and inspection ensure consistent quality and guarantee the highest standards for all our products.

Our process systems offer solutions to the problems of increased energy costs which face the oil-seed processing industry. Such cost-effective solutions can be found in our low maintenance screw presses; our easily installed, continuous rotary and loop extractors, and in our new generation of edible oil deodorisers and physical refining systems which offer numerous advantages with respect to basic vessel and tray design, 85% efficient heat recovery systems and micro-processor based automatic control.

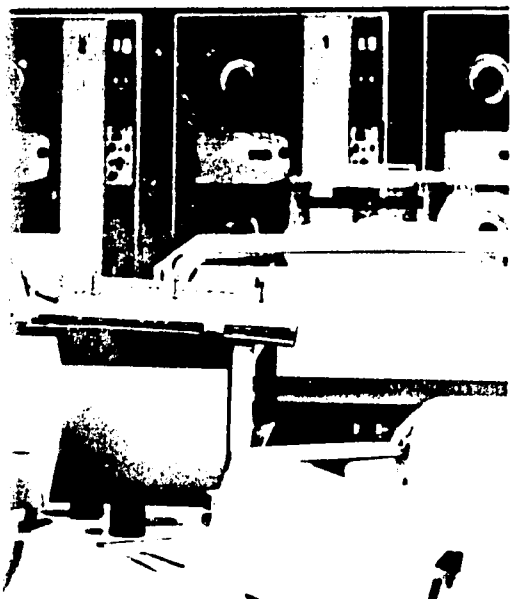


The Simon-Rosedowns range of extraction and refining plants is more technologically advanced and more economical in operation than any other similar system available in the world today. Our innovations will save steam and other energy inputs, increase labour productivity and end-product quality whilst reducing long term operating costs ... the recipe for a profitable operation.

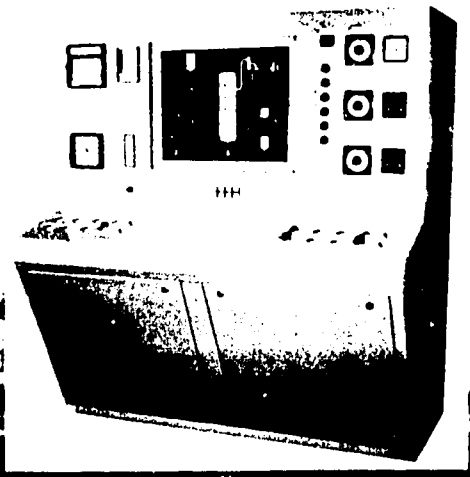


The Rosedowns

engineering reliability



A 30,000 lbs per hour Rosedowns/ Votator Semi-Continuous Deodoriser.



A 'Micro-Chip' based automatic control panel.

Project design and finan

A total appraisal, design, manufacture, contracting and management service to engineer complete projects anywhere in the world. This is the Simon-Rosedowns philosophy of complete client service ... and it is available to you. It is a service which covers every stage of the contract ... before, during and after installation. It begins with:

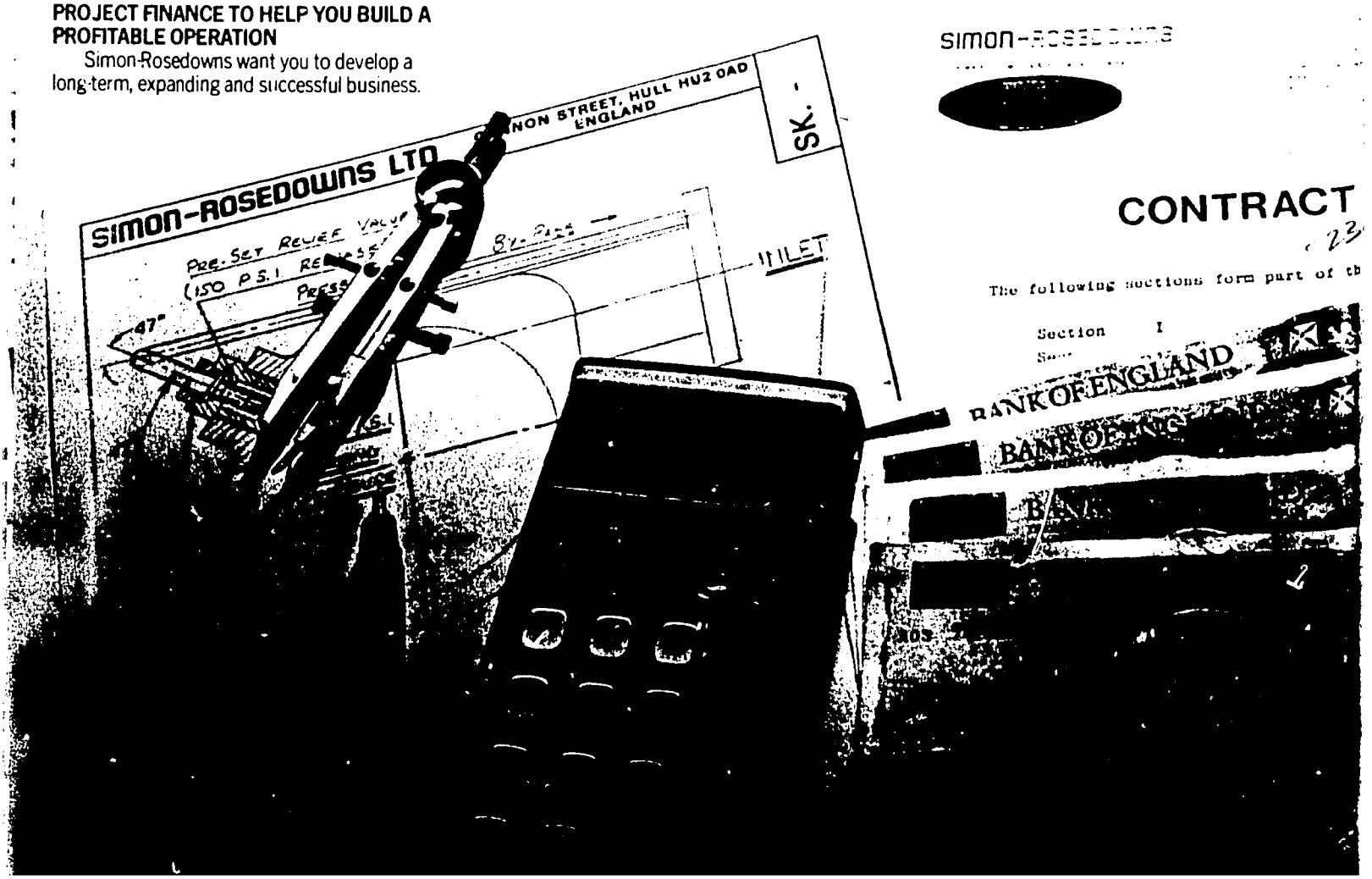
Advanced Computer Aided Design system.

FEASIBILITY STUDIES THAT WILL ASSESS THE NET FINANCIAL AND SOCIAL BENEFITS OF AN OILSEEDS PROJECT.

If you desire it, we will carry out a full financial and technical feasibility study. This will start with an assessment of the volume of home-grown oil-seeds and include a market survey for intermediate and final products. We give particular attention to the choice of the right technology and scale of operation, for it is that which will determine the ultimate profitability of your venture. As we make and supply equipment to suit your exact needs, we do not have a limited range of pre-made machinery to sell so we do not force **your** project into a form that suits **our** needs. We can supply **all** types and sizes of oilseed processing plant. We can, therefore, look at the whole picture; if necessary from growing the oilseeds right down to the finished consumer products on the food-store shelf.

PROJECT FINANCE TO HELP YOU BUILD A PROFITABLE OPERATION

Simon-Rosedowns want you to develop a long-term, expanding and successful business.



ce in a complete package

If the feasibility studies suggest that the potential is there, our associated companies will help you locate finance to realise that potential. Between us, we can put together a complete financial package which may include export credits, official development assistance, multilateral aid, international loans, domestic bank credit and equity. If you wish to bring in a joint venture partner, we will help locate him and put together a mutually satisfactory package of finance, expertise and risk bearing.

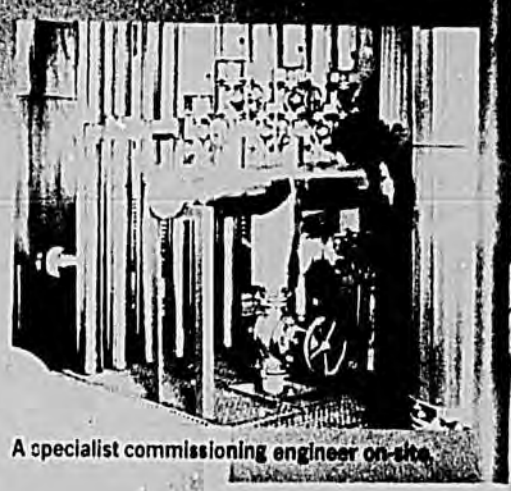
DESIGN STUDIES THAT GUARANTEE AN INTEGRATED, EFFICIENT PLANT.

Once the scale of the project is established and the technology chosen, our design engineers can go to work. They bring unrivalled experience to bear on designing a plant that will suit **your** requirements and can call on the very latest technology in terms of Computer Aided Design systems. If you require an integrated plant that will produce ready-for-sale consumer goods, they will co-operate at the design stage with other companies in the Simon Food Group to ensure that the whole enterprise is conceived, designed and planned in the most cost-effective way from the very start.

The to

...mon Rosedowns will provide a project ...gement team of experienced engineers ...echnologists to offer you expert advice and ...cal assistance on all aspects of project ...ution right through to after-sales service. ...e of the most important aspects are:

A service engineer giving after-sales assistance

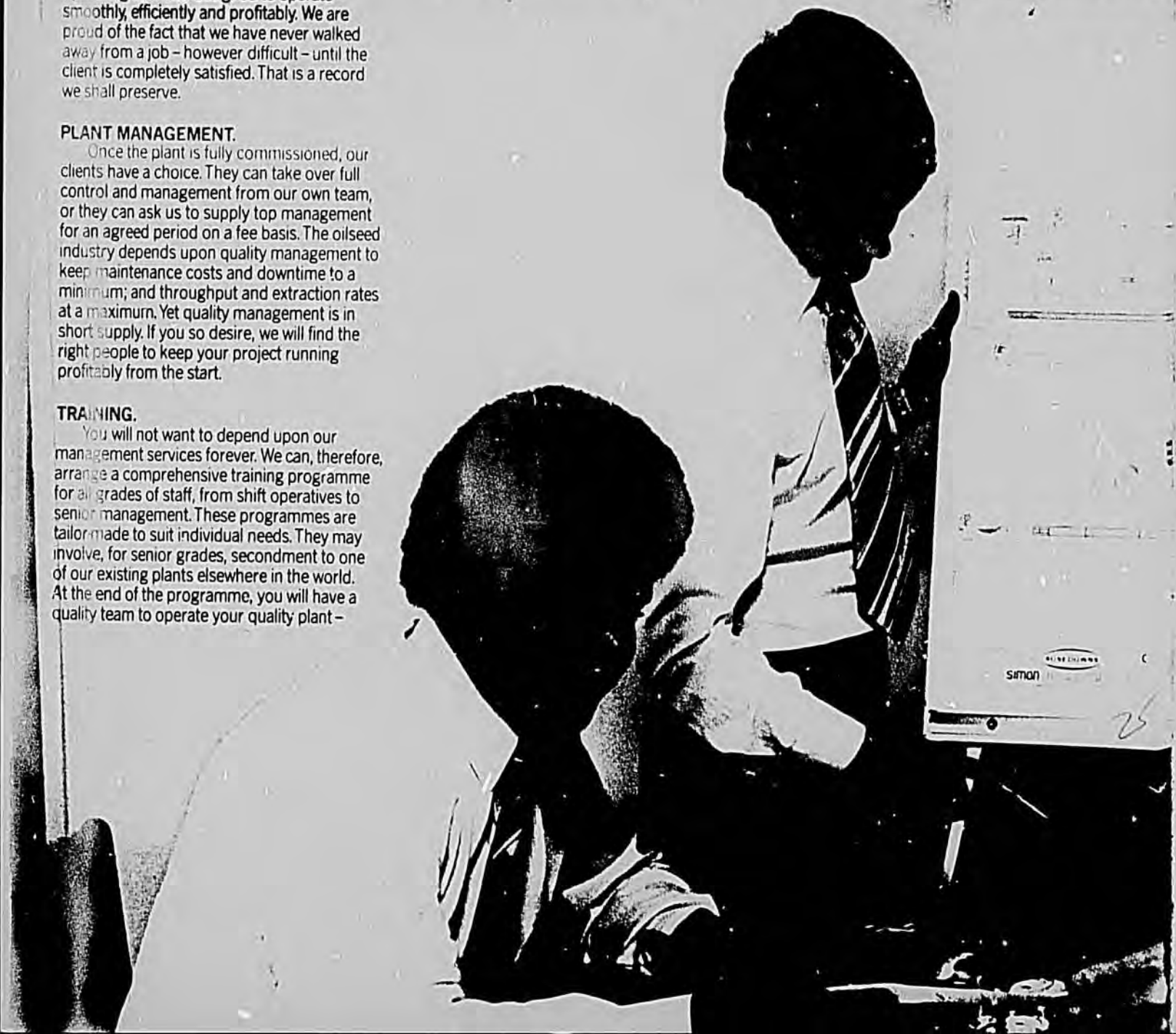


A specialist commissioning engineer on-site

ERECTION AND COMMISSIONING.
...ur engineers have erected and ...missioned our plants all over the world, in ...tions as diverse as equatorial forest and ...esert regions, northern tundra and remote ...rs to tropical coastal swamp-lands. We are ...to foreseeing and overcoming problems ...n less experienced hands, can cause delays and unscheduled expense. We do not consider our job complete until the plant is operating as it was designed to operate – smoothly, efficiently and profitably. We are proud of the fact that we have never walked away from a job – however difficult – until the client is completely satisfied. That is a record we shall preserve.

PLANT MANAGEMENT.
Once the plant is fully commissioned, our clients have a choice. They can take over full control and management from our own team, or they can ask us to supply top management for an agreed period on a fee basis. The oilseed industry depends upon quality management to keep maintenance costs and downtime to a minimum; and throughput and extraction rates at a maximum. Yet quality management is in short supply. If you so desire, we will find the right people to keep your project running profitably from the start.

TRAINING.
You will not want to depend upon our management services forever. We can, therefore, arrange a comprehensive training programme for all grades of staff, from shift operatives to senior management. These programmes are tailor-made to suit individual needs. They may involve, for senior grades, secondment to one of our existing plants elsewhere in the world. At the end of the programme, you will have a quality team to operate your quality plant –

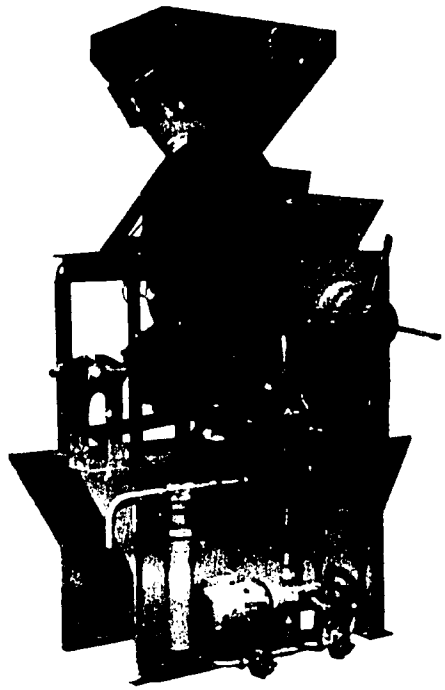


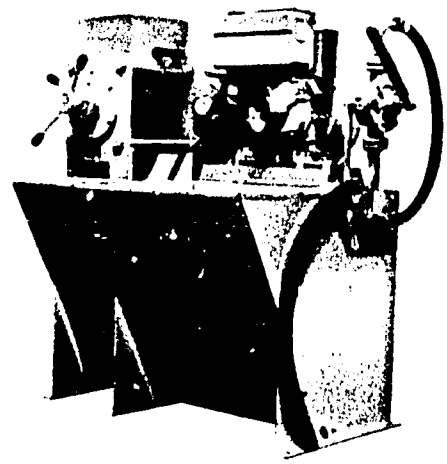
In-depth customer training in progress.

Appropriate technology

No matter how large or how small the contract, Simon-Rosedowns can give you a comprehensive service. From the project management and installation of complete "turnkey" processing complexes supplying consumer products to urban centres both home and abroad, the company can scale down to provide small package extraction units ideal for the needs of village industry and the farming community. Rural areas also have a requirement for self-sufficiency in cooking oil and for a ready supply of oilseed cake for animal feed purposes. These "mini-presses" also offer an interesting prospect to those countries whose farmers face problems with the supply or cost of diesel fuel for running their agricultural machinery. Initial research has indicated that certain vegetable oils may have a potential as fuel substitutes so the on-farm production of vegetable oil for fuel purposes is a developing technology with which we will keep a close association.

We have already supplied individual Mini 40 screw presses to Sudan, Malawi, Brazil, Egypt, Ethiopia, Zimbabwe, Cayman Isles, Sierra Leone, Uganda, Sri Lanka and Tanzania.





Portable Mini 40 screw press package unit.

A Mini 200 screw press package unit.

SIMON-ROSEDOWNS

Making the most of your natural resources

So if you are thinking of an Agribusiness enterprise consider the many advantages oilseed processing has to offer and let us call on you or plan us into your next visit to the U.K. Few suppliers can claim such a varied range of process systems producing quality products in over 100 countries worldwide. Let Simon-Rosedowns help you identify your exact needs and suggest the most cost-effective way to satisfy them.

Designed and produced by Farmer Advertising (Hull) Ltd Printed by Dayprint Humberside

SIMON-ROSEDOWNS

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Cannon Street, Hull, England
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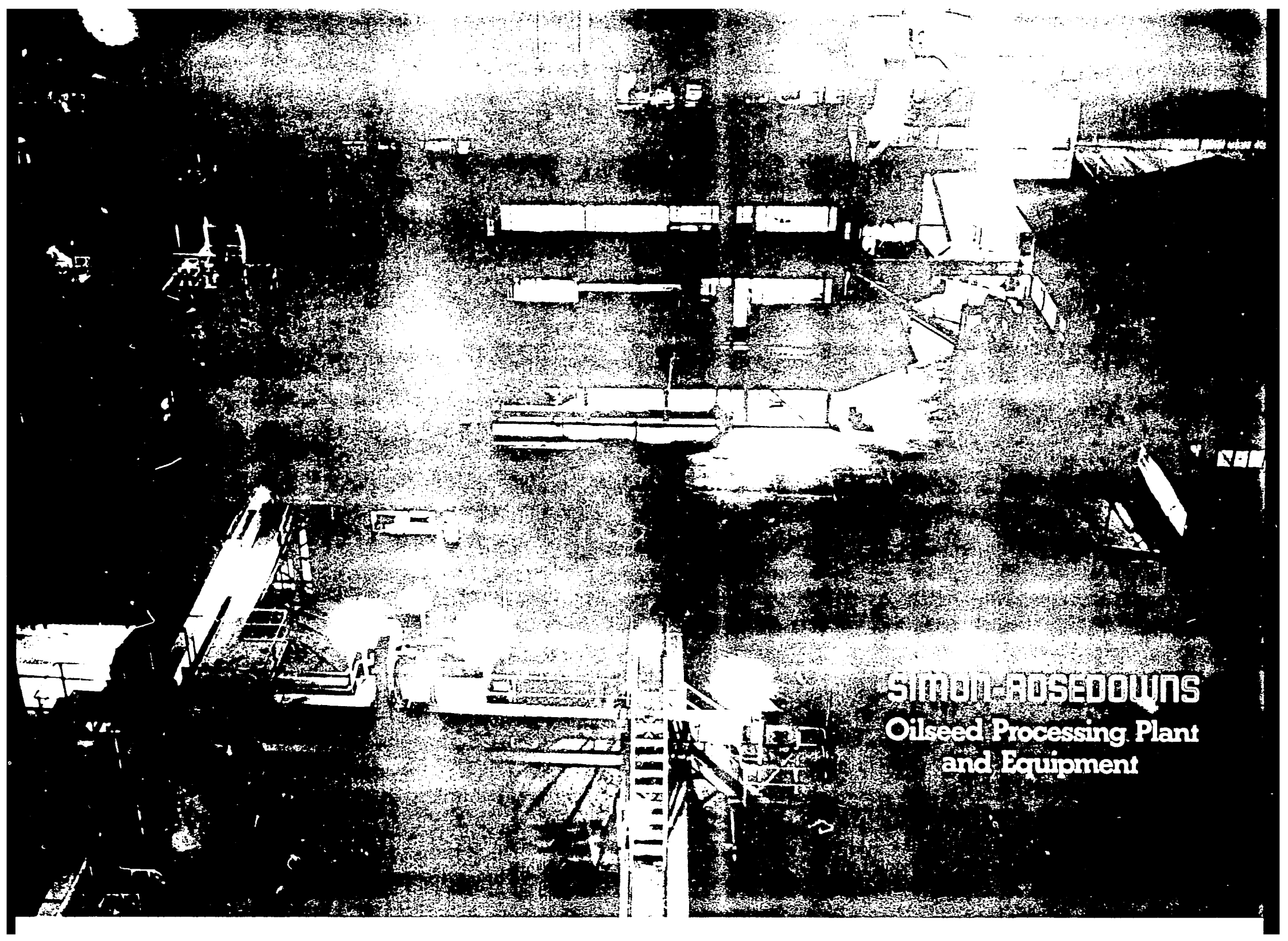

SIMON-ROSEDOWNS
Oilseed Processing Plant
and Equipment

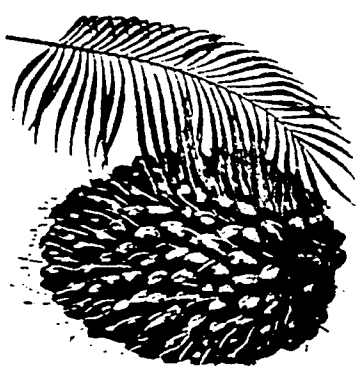
Who are we?

Simon-Rosedowns is a member of 'Simon-Food', one of the five operating groups of Simon Engineering public limited company, a major British Company engaged in the supply of engineering and industrial machinery, plant and services. Simon Engineering plc is the parent company of over 50 subsidiaries worldwide and turnover in 1980 reached some £324 million of which over 60% was accounted for by direct exports from Britain and the work of overseas companies. It provides employment for around 8,500 excluding associates. Simon Food offers a most comprehensive service to the world's agro-food industries and details of the main product companies within this division can be found on the back of this leaflet.

From the manufacture of single, highly specialized machines for processing all types of vegetable oil seeds and nuts or other extractable material (see Special Applications) to the design and installation of complete processing plant, Simon-Rosedowns has the service for you.

We have the experience, resources and expertise to undertake any type of contract and can vary the extent of supply to suit individual customer requirements.

This corporate brochure will give you an overall background to the equipment and services offered by Simon-Rosedowns Limited, suppliers to the vegetable oil extraction and processing industry. In addition to a brief description of our main product ranges it also explains the highly functional structure of the company and the co-ordinated, integrated approach to "project-management" ensuring optimum COMPLETE CLIENT SERVICE.



Palm

Our Heritage

As well as being one of the four longest established engineering companies in the United Kingdom, Simon-Rosedowns Limited, (formerly Rose, Downs and Thompson Limited), established in 1777, is also the oldest manufacturer of oil mill machinery in the world. The original Cannon Street site of the Old Foundry, where the present day works and offices are still situated, derived its name from the casting of cannon to be used in the Napoleonic wars at the end of the 18th century. It was inevitable that the company would soon become involved in the manufacture of oilseed equipment as Hull became, for many years, a leading European centre for oilseed crushing.

Over the decades the company has diversified its product range of oilseed processing and oil refining equipment considerably, and has maintained a continuous history of development and improvement of process methods. It has pioneered research and has been at the forefront of technical innovation which have transformed the industry from its modest beginnings into the modern commercial business of today. Nevertheless, we still cater for the important smaller processor down to the village scale requirements of the rapidly developing agricultural communities of the "third world".

In 1974 the company became part of Simon Engineering and since then the depth of experience and expertise gained over the years has been merged with that of the Simon Food processing group to provide the ultimate in quality and reliability.

Sesame

Groundnut

Sunflower

Flax


Coconut
Soya
Cotton

The Company Today

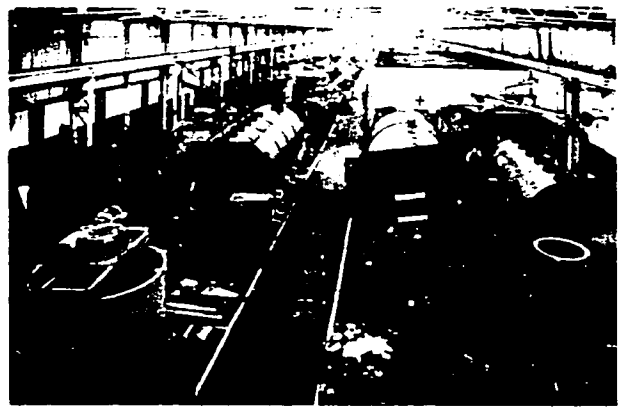
No other equipment supplier to the world's oilseed processing industry can provide the range of services now offered by Simon-Rosedowns with its UNEQUALLED YEARS OF EXPERTISE IN THE CONTRACTING–ENGINEERING–PROCUREMENT BUSINESS.

There is far more to Rosedowns engineering than superior process technology, since most of our projects include research and development, pre-engineering, design, manufacture and procurement, shipment, site installation and commissioning services combined with a considerable marketing, financial and administrative input.

This complete range of engineering skills is undertaken by highly qualified people in a complex of buildings covering an area of around 8.8 acres (35,600 square metres).

Rosedowns can justifiably claim to offer the ultimate engineering service since, unlike many of its competitors the company operates modern, well equipped workshops and is able to implement rigorous quality control and inspection procedures at each stage of main plant and spares manufacture. This is the only rational way for a company to guarantee consistency of quality and regular high standards in its products.

We pride ourselves on our ability to communicate both internally and externally and, having conducted business in over 110 countries worldwide, our philosophy is one of COMPLETE CLIENT SERVICE both before, during and after the successful execution of a contract.



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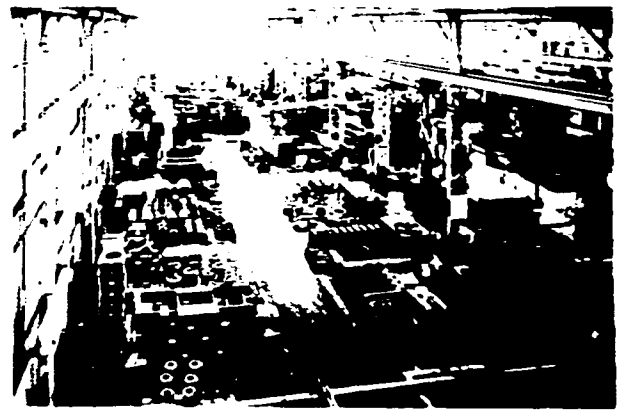

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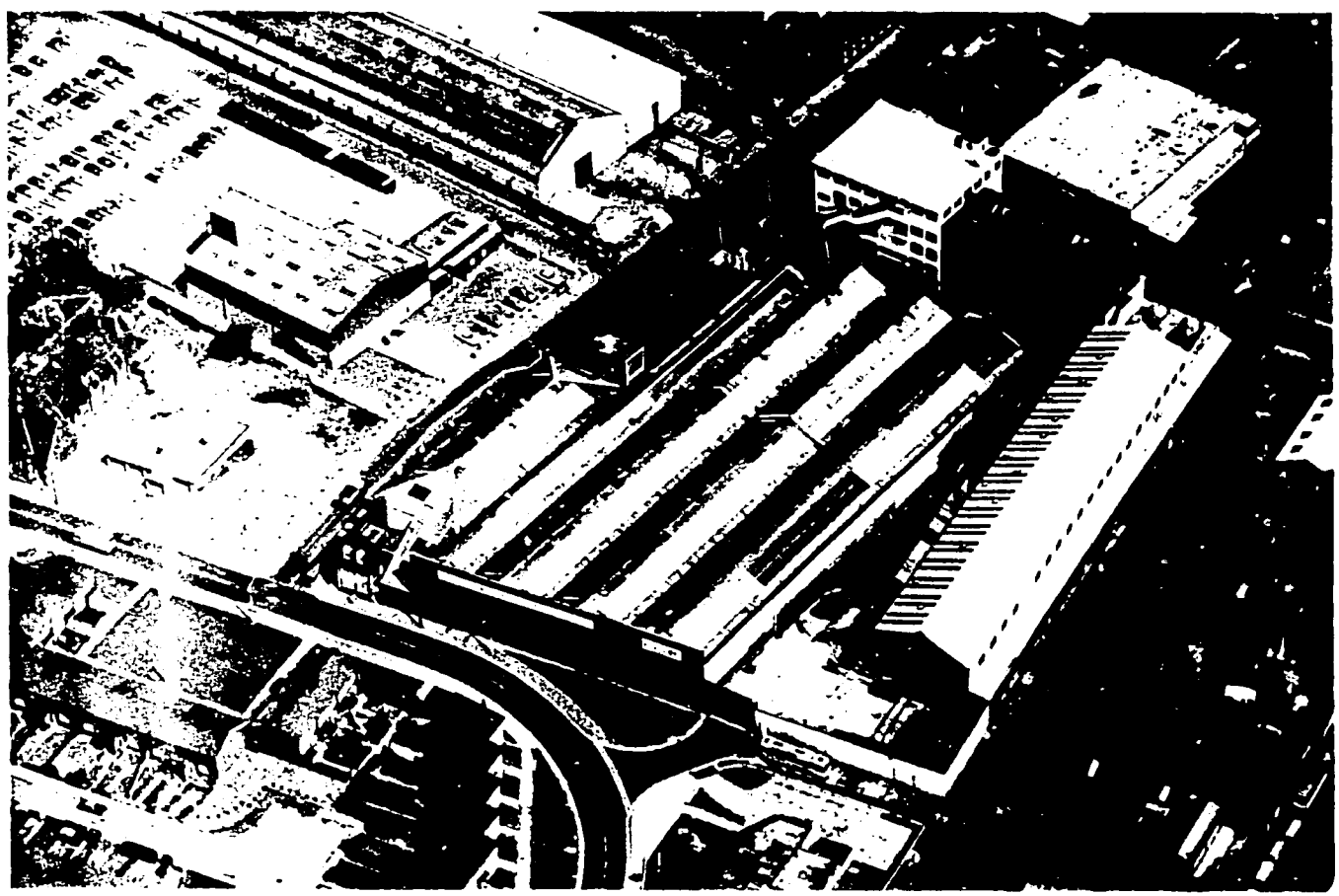


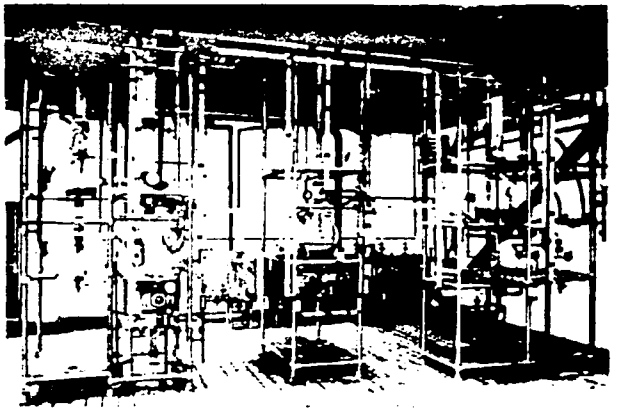
3

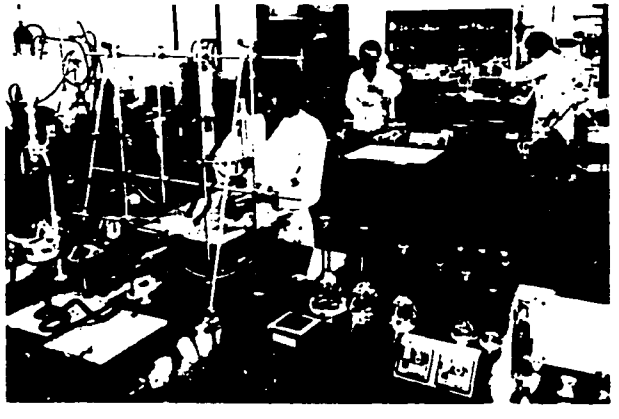
The Future

Rosedowns progressive attitude towards machinery and process development is reflected in the recent completion of its new 600 square metre, multi-floored, Rosearch and Development Centre. The building incorporates a modern laboratory and specialised mechanical and chemical test bays and is indicative of the company's desire to maintain its leading position in the vegetable oil extraction and processing field.

This test-house enables the company to improve the operations of its existing product ranges, develop new equipment to meet the future needs of the industry with specific reference to energy conservation, and investigate new applications for its machines and processes.

The facilities are also available to undertake research work into improving a client's existing operation or ascertaining the feasibility of a scheme for a prospective new customer. This is all part of the overall COMPLETE CLIENT SERVICE approach and versatility to meet any clients specific needs.



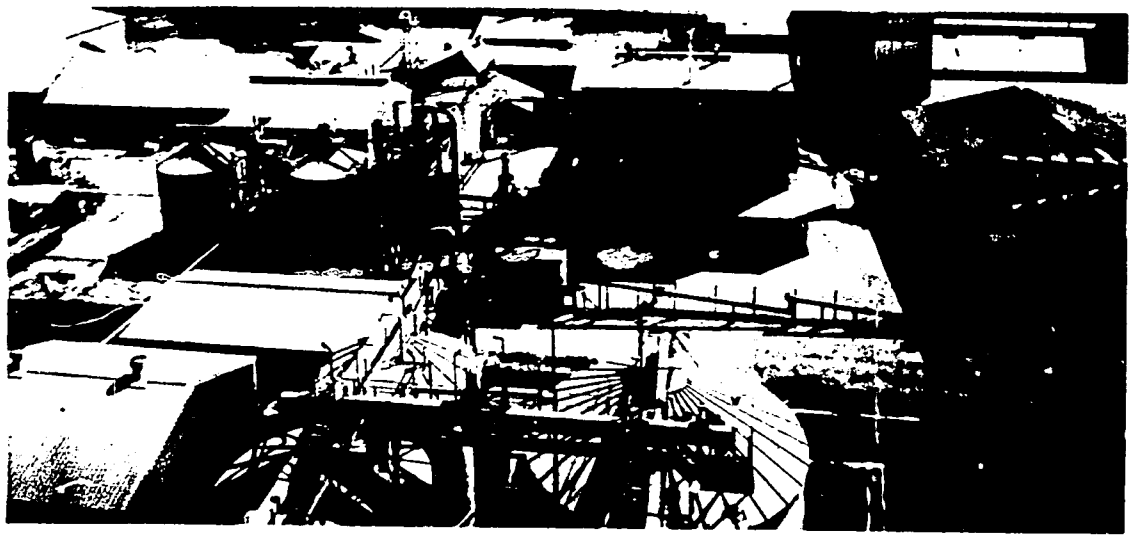


The Project Management Concept

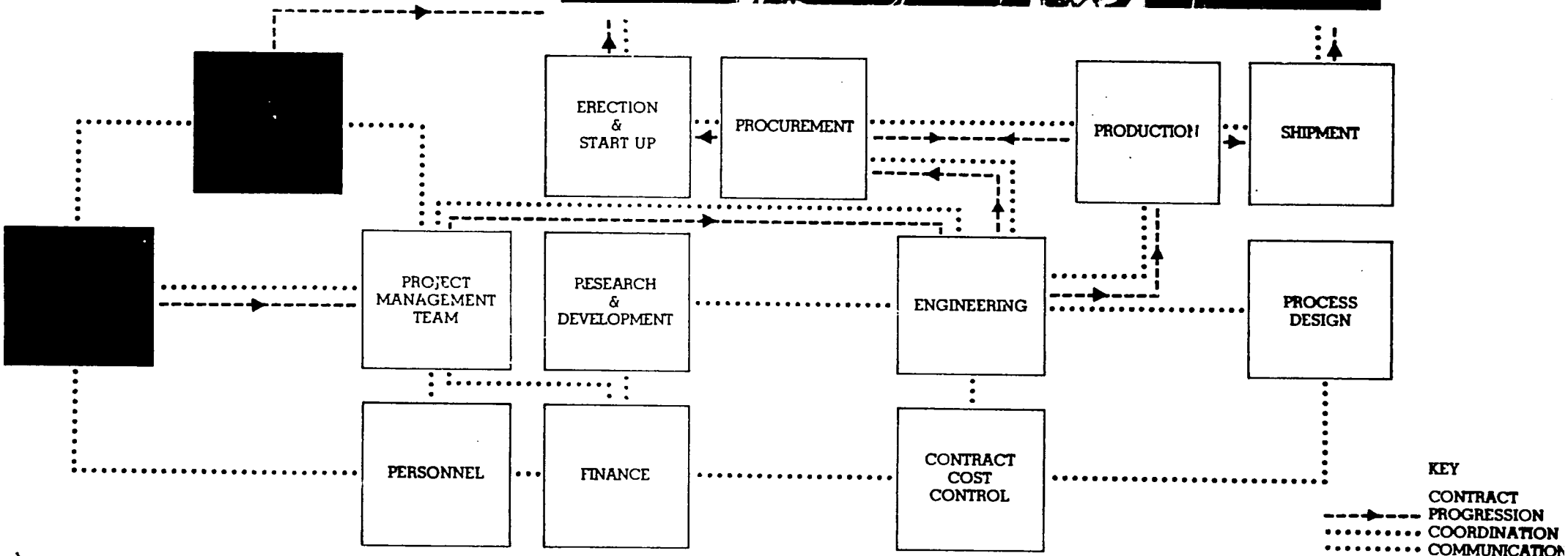
From many clients' viewpoint the most critical service provided by Simon-Rosedowns is efficient, effective TOTAL PROJECT MANAGEMENT.

In each given set of circumstances the most appropriate level of technology and economic viability are combined to maximise cost effectiveness within the clients' project budget. Our proposals take full account of local geographical and socio-economic conditions so that each type and size of plant offered is best suited to each customer's particular site location.

The objective of the project management team is to ensure that single point responsibility and teamwork are available at all times. This leadership will ensure the successful completion of each stage of the contract by co-ordinating all the various departmental services to interact in the clients' best interests. Through the Sales section the team maintain a continuous contact with the client until all aspects of the project are completed to the clients' satisfaction.



Complete Vegetable Oilseed Processing Complex supplied by Simon-Rosedowns Limited including Preparation-Prepress/Solvent Extraction and Semi-Continuous Deodoriser equipment.



Communication, Co-ordination and Computing

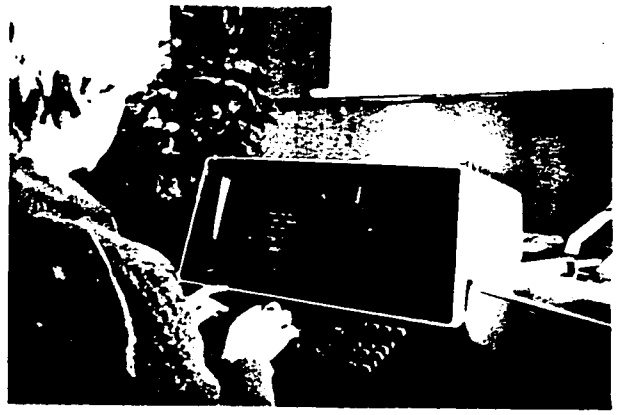
We at Simon-Rosedowns believe that there is no substitute for personal contact during business negotiations.

Experienced engineers and chemists are available, at any time or place, to meet and advise clients on all contractual aspects from project planning to after sales service. This might cover such matters as plant layout, on site installation/ commissioning, staff training programmes, quality control procedures and spares maintenance plans.

This policy is the most important part of a totally integrated and flexible organisation which, in addition to providing each client with the most effective DESIGN, MANUFACTURE, PROCUREMENT AND FINANCE PACKAGE, will confidently take total responsibility to ENGINEER COMPLETE PROJECTS ANYWHERE IN THE WORLD.

Such a positive attitude to communications enables the company to adapt to all customer needs ranging from the supply and construction of single machines to the role of "turnkey" project managers with all the associated technical, financial and co-ordinating complexities.

Also, to increase overall business efficiency, the company has been at the forefront in the use of micro-electronics. Computers are already actively involved in many areas including the monitoring of factory load, machine tool operation, process vessel design, automated plant control, purchasing and expediting as well as aiding numerous administrative and financial duties.



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8

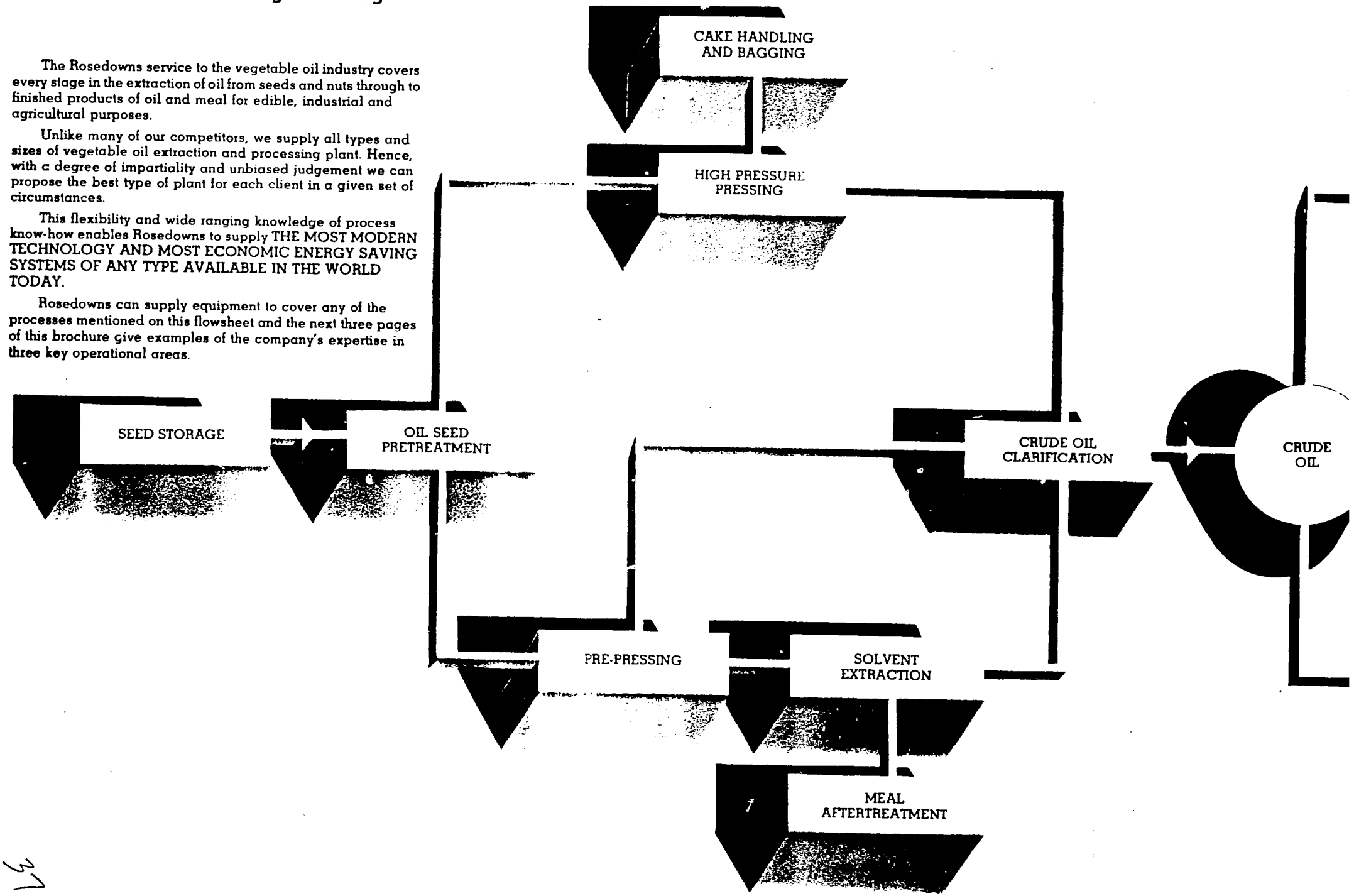
Complete Process Engineering

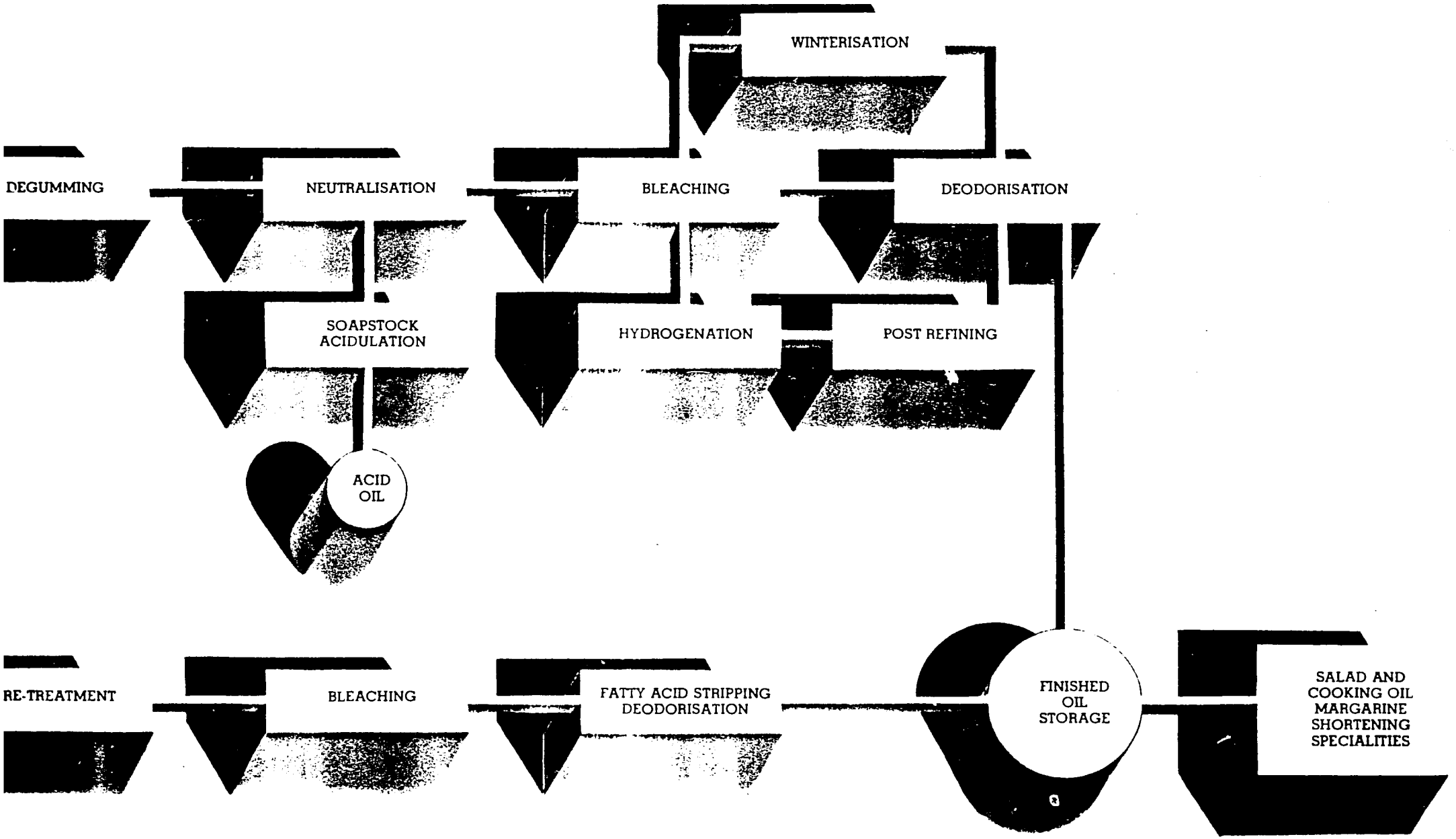
The Rosedowns service to the vegetable oil industry covers every stage in the extraction of oil from seeds and nuts through to finished products of oil and meal for edible, industrial and agricultural purposes.

Unlike many of our competitors, we supply all types and sizes of vegetable oil extraction and processing plant. Hence, with a degree of impartiality and unbiased judgement we can propose the best type of plant for each client in a given set of circumstances.

This flexibility and wide ranging knowledge of process know-how enables Rosedowns to supply THE MOST MODERN TECHNOLOGY AND MOST ECONOMIC ENERGY SAVING SYSTEMS OF ANY TYPE AVAILABLE IN THE WORLD TODAY.

Rosedowns can supply equipment to cover any of the processes mentioned on this flowsheet and the next three pages of this brochure give examples of the company's expertise in three key operational areas.




WINTERISATION
DEGUMMING
NEUTRALISATION
BLEACHING
DEODORISATION
SOAPSTOCK
ACIDULATION
HYDROGENATION
POST REFINING
ACID
OIL
RE-TREATMENT
BLEACHING
FATTY ACID STRIPPING
DEODORISATION
FINISHED
OIL
STORAGE
SALAD AND
COOKING OIL
MARGARINE
SHORTENING
SPECIALITIES

Continuous Screw Pressing

For the mechanical extraction and recovery of clean, crude vegetable oil, Simon-Rosedowns supply a complete range of preparation, screw pressing and oil clarification equipment.

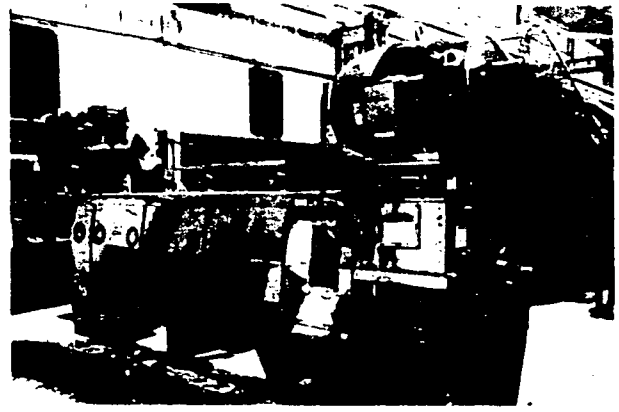
For efficient oil removal, correct pre-treatment is essential, such as cleaning, breaking, flaking, rolling or grinding depending upon the material being processed. Rosedowns supply this full range of pre-treatment plant including the stack-type, steam heated cookers which work in conjunction with the larger screw presses and ensure optimum temperature and moisture condition of the seed prior to oil expelling.

Crude oil aftertreatment plant covers the removal of both large and small particles from the expressed oil with provision to return these solids to the pressing section. In addition to this screening and filtration equipment, on larger plants a "foots-press" can be supplied to avoid excessive recycling.

The screw presses will process a diverse range of correctly prepared seeds and nuts and have capacities from 40 kg. to 8.750 kg. per hour.

The range includes the Mark 2B, Mark 3B and Mark 5 for single pressing, high pressure work with facility for easy conversion to low pressure, pre-pressing if double pressing or plant expansion is required. The Mark 4 and 'G' type are both specifically designed as pre-presses to meet the ever increasing capacity demands of the present generation of modern oil extraction factories. The Maxoil is still available for the smaller processor and animal by-products industry whilst, more recently, the simple Mini 40 and Mini 200 package units have been developed to serve not only the "cottage industry" sector of the third world, but also the new growth market for on-farm production of diesel fuel substitute from vegetable oil.

In all cases the principal design parameters are those of producing energy efficient machines aimed at keeping maintenance costs and downtime to a minimum whilst giving the maximum capacity and oil recovery rate for a competitive investment.



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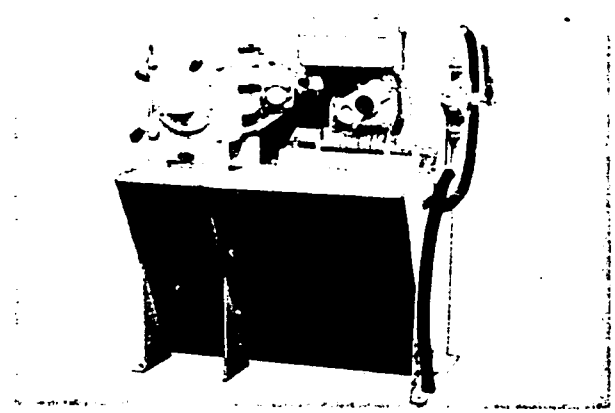

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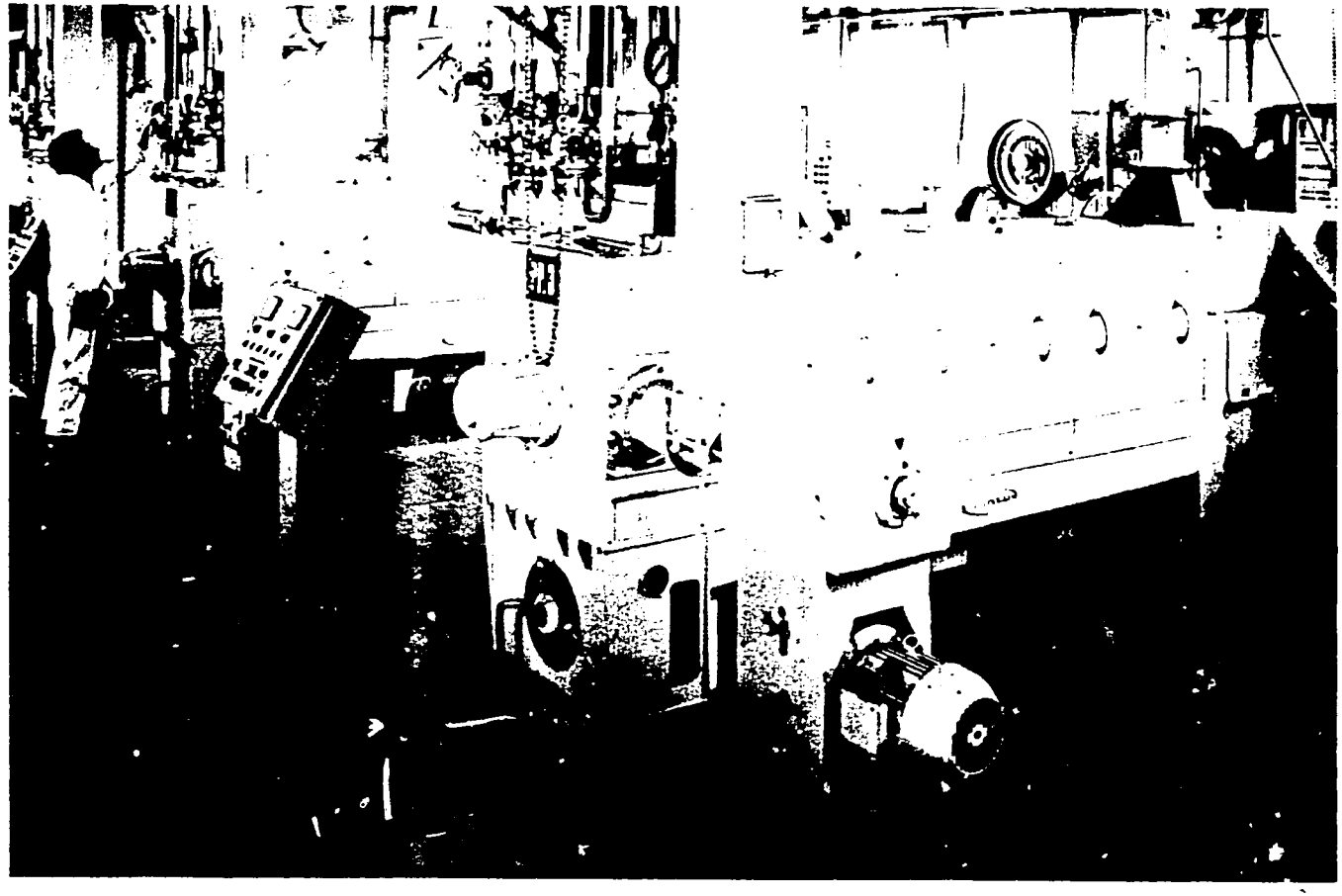

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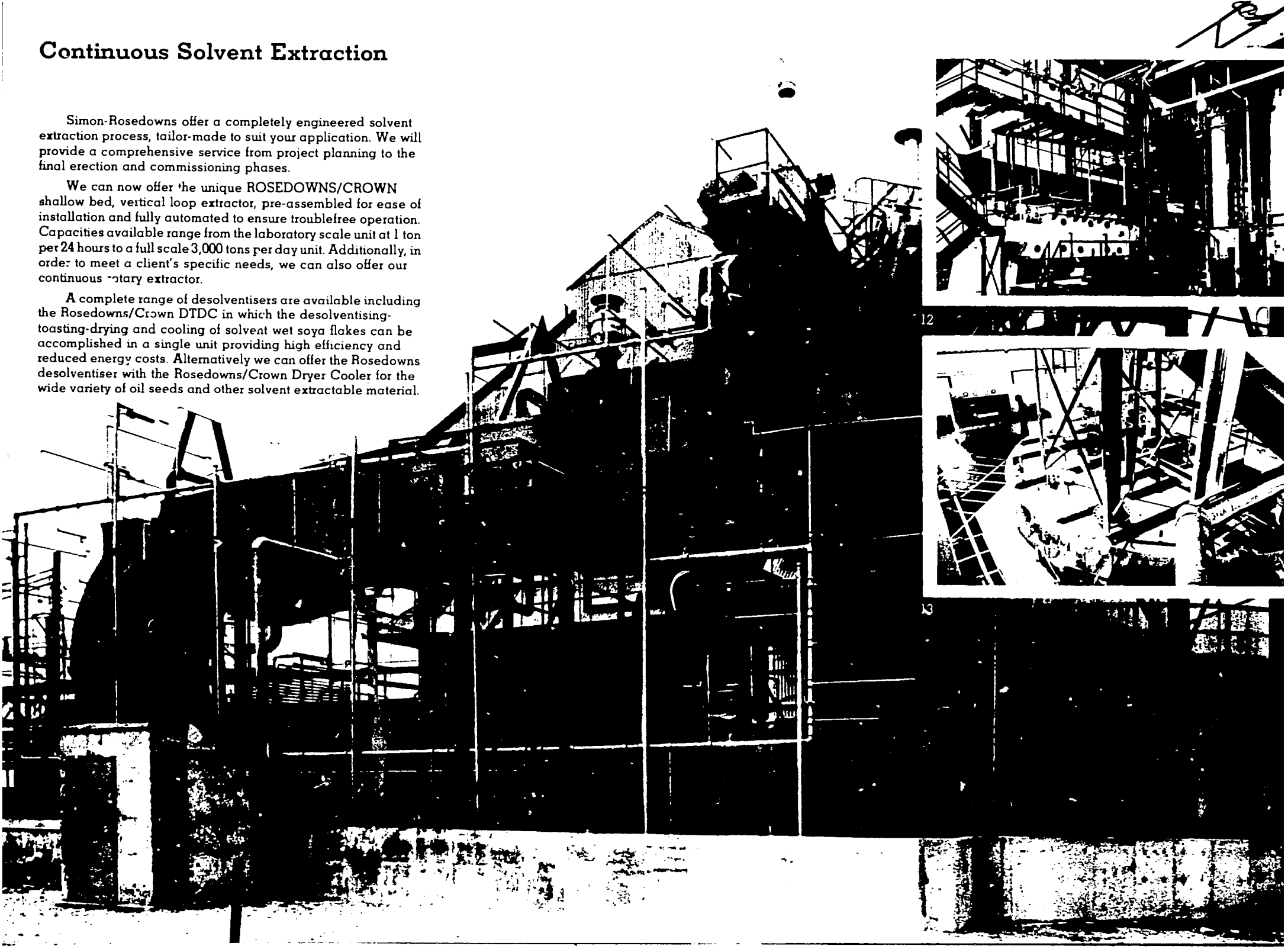
Continuous Solvent Extraction

Simon-Rosedowns offer a completely engineered solvent extraction process, tailor-made to suit your application. We will provide a comprehensive service from project planning to the final erection and commissioning phases.

We can now offer the unique ROSEDOWNS/CROWN shallow bed, vertical loop extractor, pre-assembled for ease of installation and fully automated to ensure troublefree operation. Capacities available range from the laboratory scale unit at 1 ton per 24 hours to a full scale 3,000 tons per day unit. Additionally, in order to meet a client's specific needs, we can also offer our continuous rotary extractor.

A complete range of desolventisers are available including the Rosedowns/Crown DTDC in which the desolventising-toasting-drying and cooling of solvent wet soya flakes can be accomplished in a single unit providing high efficiency and reduced energy costs. Alternatively we can offer the Rosedowns desolventiser with the Rosedowns/Crown Dryer Cooler for the wide variety of oil seeds and other solvent extractable material.



Oil Processing

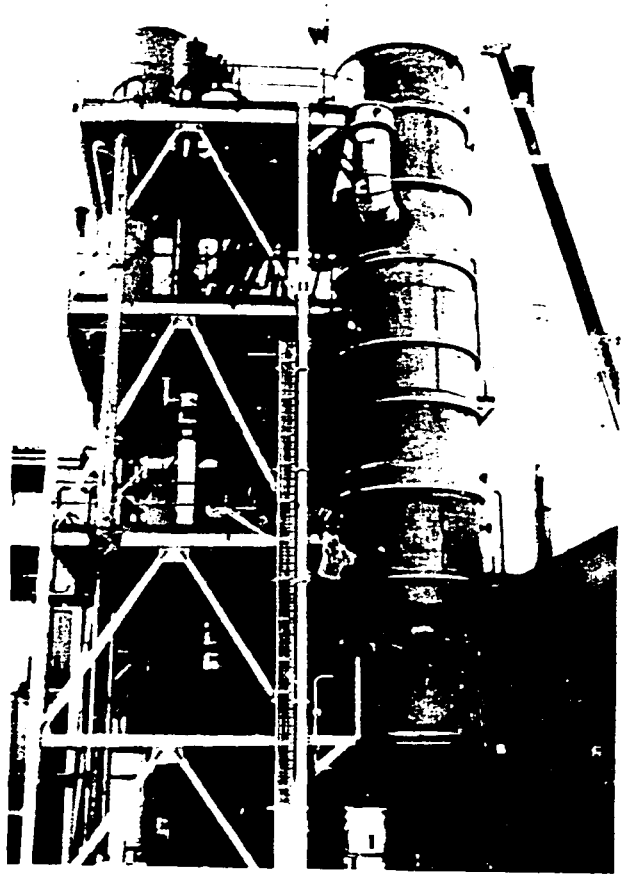
Simon-Rosedowns can supply both batch and continuous plant to convert crude vegetable oils into edible oils, fats and cooking compounds for domestic use or as a feed manufacturing intermediate.

The former is available in a range of capacities from 5 to 50 tons per 24 hours whereas the continuous systems will cater for upto 325 tons per 24 hours. With both types of plant specialist assistance is available at all stages of planning, erection and commissioning.

Rosedowns continuous oil processing equipment has been designed to cover the many varying process requirements of refiners throughout the world. Therefore, a choice of systems are available with each plant "tailor-made" to customer's specifications. Some of the better known alternatives include the Zenith neutralising and bleaching systems and the Rosedowns/Votator Semi-continuous and Econoflow type deodorisers.

Simon-Rosedowns can also supply physical refining systems suitable for an increasing range of edible oils and fats.

It should also be noted that the company is a pioneer in developing the use of "micro-chip" technology for control of automatic refinery operation. The programmable logic control system (PLC) is now widely available for deodorising systems and has reduced both feedstock change time whilst virtually eliminating human error from the operation. The PLC system has already been extended to bleaching plant control and tank farm systems.



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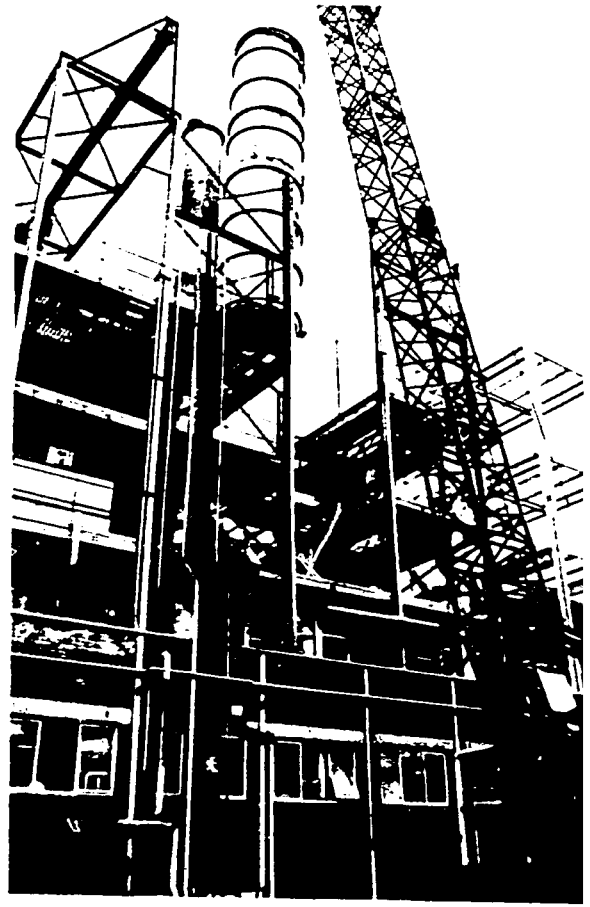

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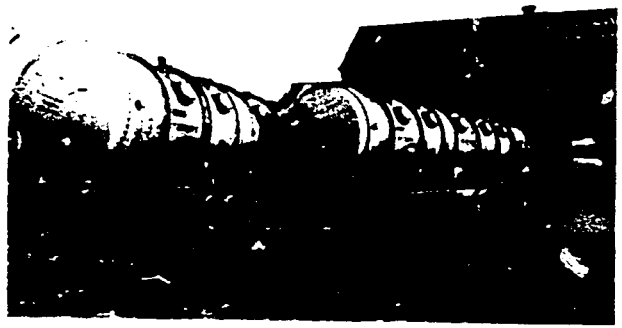

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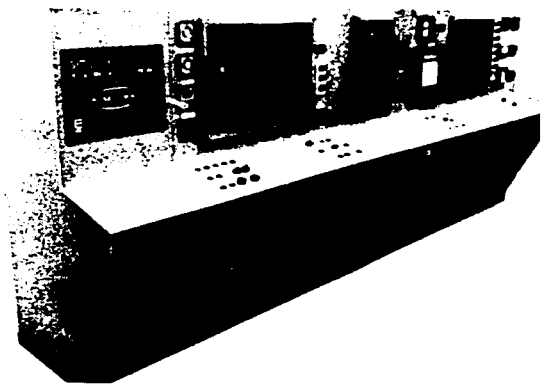

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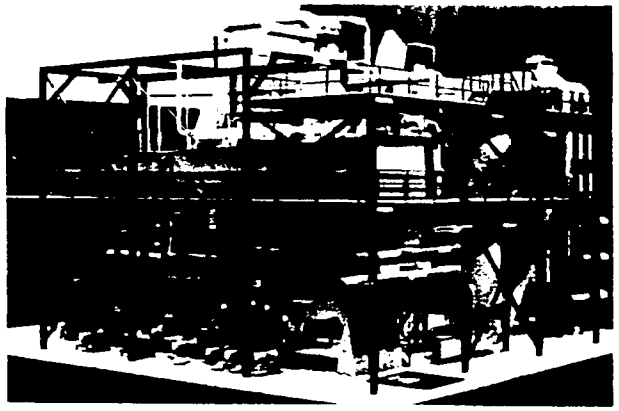
Special Projects

Simon-Rosedowns believe that the maintaining of its position among the world leaders in the vegetable oil industry depends on its ability to meet every challenge and customer request.

For instance, when Cargill, a major American based agro-food company ordered a continuous rotary extractor for a new plant in the Netherlands on a very demanding delivery schedule, Rosedowns assembled the unit on the dockside in Hull and shipped it as a single 79 ton, 9.4 metre diameter package. From loading to placement on site foundations took only 5 hours.

Similarly, in addition to Rosedowns own pilot plant facilities, the recently announced collaboration with Crown Iron Works Co. of Minneapolis, U.S.A. means that an increasing range of services are available for any client. This might cover any aspect of project feasibility such as model construction or pilot plant availability/supply to determine optimum layout schemes or extractability data as a pre-requisite for major investment.



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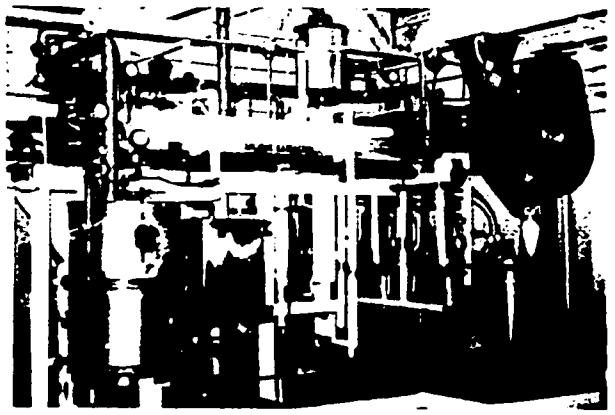

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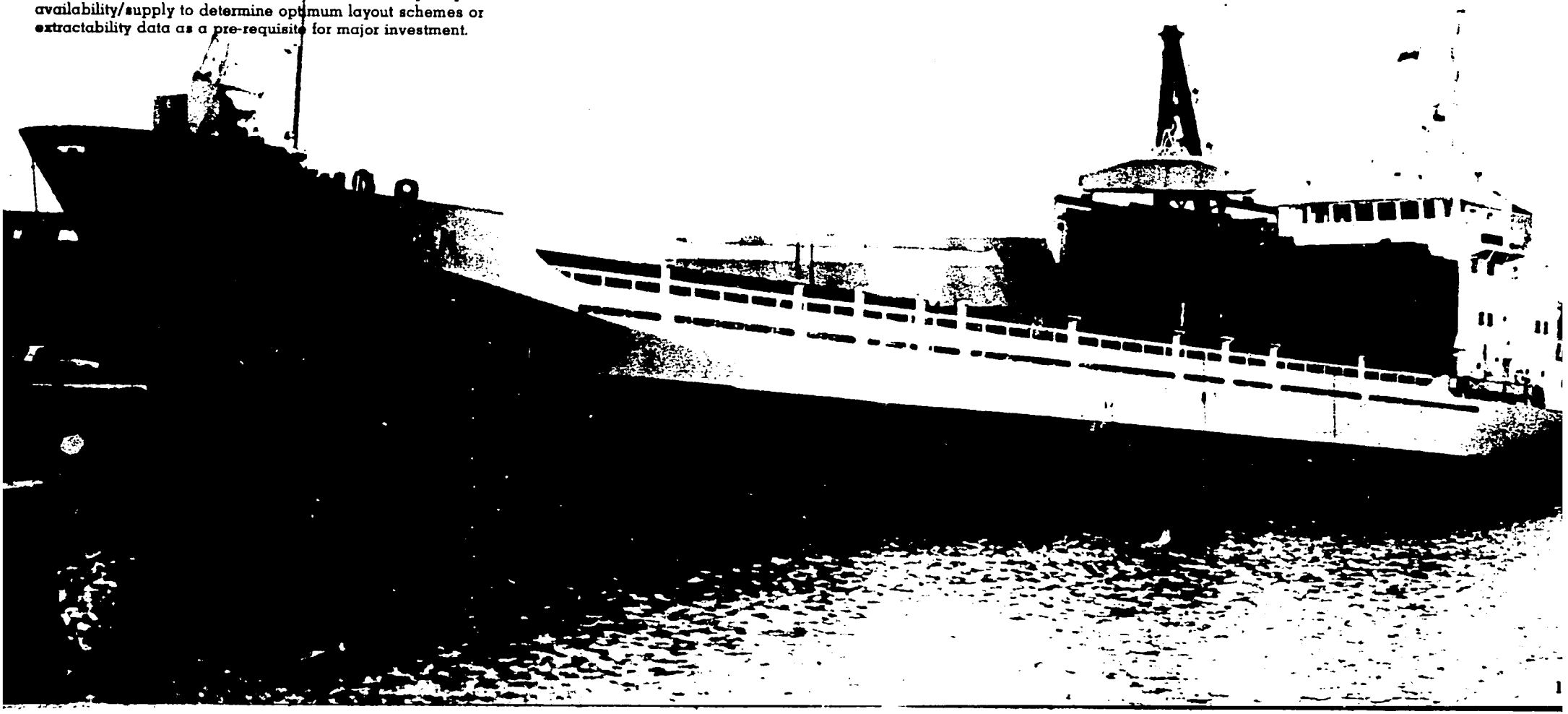
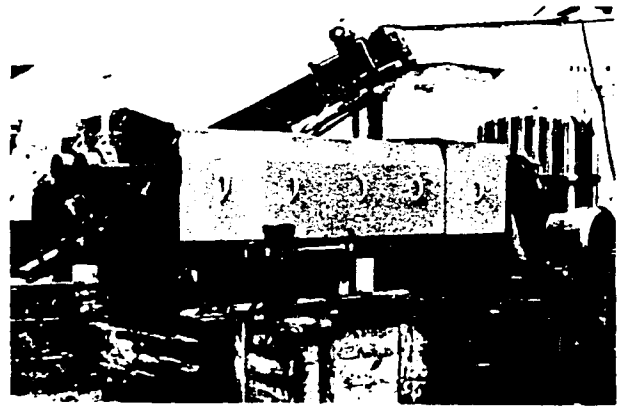


Special Applications

The application of screw presses extends beyond the oil seed field, not only in the animal by-products industry, but also in the case of pressure deliquefying a wide range of wet materials.

The Mark 3M, Universal and Low Pressure Meat Meal Presses are specifically designed for efficient recovery of tallow and production of high protein meal from rendered animal or poultry waste. We can also supply a range of twin screw de-watering presses (0.5 – 30 tons/hour) for the preliminary moisture removal or extract recovery from a wide range of pulps, slurries and re-cycled products. Our latest specialist machine is a screw press extruder designed to dry low density polyethylene flakes.

As with screw presses, the basic extractors including batch derivations are used for a wide variety of liquid/solid extraction duties. Materials which have been successfully extracted include alkaloids, chemicals, waxes, resins, insecticides, biomass and pharmaceutical base materials.



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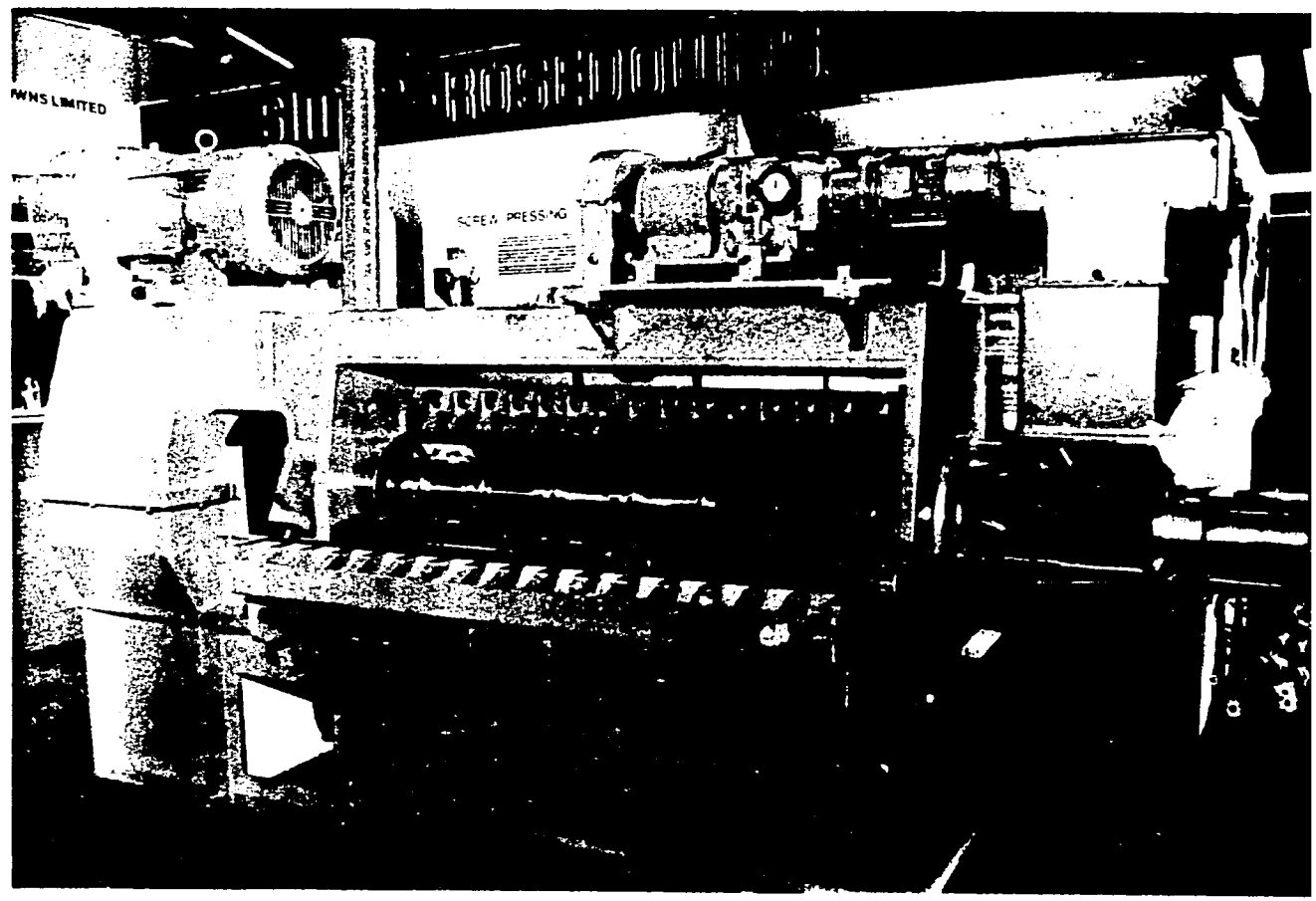

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Index to Photographs

We hope this brochure has given you an outline of the comprehensive engineering services offered by Simon-Rosedowns and the depth of process experience gathered in over 200 years of involvement in a specialist field. Should you require further details of our products, expertise or any specific aspect of our COMPLETE CLIENT SERVICE, please let us know.

In the meantime, you may be interested to know a little more about the various photographs illustrating this publication.

Pages 2–3

Oilseed illustrations reproduced by courtesy of Unilever Ltd.

Page 4

1 View of one of Rosedowns Assembly Shops showing solvent extraction desolventisers under manufacture.
2 General view of Rosedowns Machine Shop.
3 Aerial view of Cannon Street works and office site.

Page 5

(Background) Simon-Rosedowns new Research and Development facility.
4 Mini 200 screw press package unit installed for trial work in mechanical test bay.
5 Pilot solvent extraction test rig installed in chemical test bay.
6 Comprehensive laboratory facilities also situated in the Research and Development building.

Page 7

(Background) Rosedowns specialists are always available for client consultation.
7 A 'word-processor' in the Services Department – an essential aid to data storage and retrieval.
8 Rosedowns has constant links with the Simon Engineering computer terminal.

Page 10

9 A new Mark 5 dual purpose screw press destined for Indonesia.
10 The Mini 40 screw press package unit for village operation or the on-farm production of fuel from vegetable oil.
11 Three 'G' Type presses processing Sunflowerseed at one of the most modern pre-press/solvent extraction plants in Europe.

Page 11

(Background) The unique shallow bed, vertical loop extractor like this 1500 tons/24 hour soyabean installation in North America can now be supplied by Simon-Rosedowns.
12 Another American example of the Rosedowns/Crown extractor which is now available worldwide as part of a complete extraction system.
13 The traditional continuous rotary extractor, like this unit in Yugoslavia, is still available for specific duties.

Page 12

14 A 60' high, 30,000 lbs/hour Semi-Continuous Deodoriser, the largest unit ever supplied by the company, being installed in Australia.
15 Precision installation in an existing building presents no problems.
16 Two 20,000 lbs/hour Semi-Continuous Deodorisers leaving Hull for a major margarine factory in the U.K.
17 A composite programmable logic control panel for a complete Bleaching and Deodorisation system.

Page 13

(Background) Single-piece shipment of complete extractor for ease of installation.
18 Scale models of all types of plant can be supplied including the Rosedowns/Crown solvent extraction plant featured here.
19 The Rosedowns/Crown 1 ton/hour pilot plant is typical of the special project service offered by Simon-Rosedowns.

Page 14

20 A twin screw dewatering press handling green crops in the U.K.
21 Universal meat meal presses processing animal by-products in the U.K.
22 A Mark 3M screw press on display at the British Meat Trades Fair.

Note: The Company's policy is one of continuous development of its products and the right is, therefore, reserved to supply products which may differ slightly from those illustrated and described in this publication.

Publication No. 822

Suppliers of Plant and Equipment to over 100 countries.

ROSEDOWNS

Simon-Rosedowns Limited
Cannon Street, Hull, England
Tel: 0482 29864 Telex: 592226
Cables: Rosedowns Hull

FOOD

The Simon Food engineering group is a major industrial group engaged on a world-wide basis in the design and supply of machines, plant and contracting services operating in the fields of:-

Vegetable Oil Extraction & Processing Plant	Simon-Rosedowns Ltd, Hull
[illegible] Plant	Simon-Johnson Kansas City and Gloucester
[illegible] Activities	Simon-Barron Ltd, Gloucester
[illegible]	Simon-Iwel Ltd, Gloucester
[illegible] Process Equipment	Simon-Solitec Ltd, Gloucester
[illegible] By Products Processing	Simon-Douglas, Kansas City and Gloucester
[illegible] the Food Industry	Simon Food Engineers Ltd, Stockport
[illegible]	Henry Simon Ltd, Stockport
[illegible]	Simon-Vicars Ltd, Newton-le-Willows
[illegible]	Simon-Greer Ltd, Newton-le-Willows
[illegible]	Simon-Oakes, Newton-le-Willows

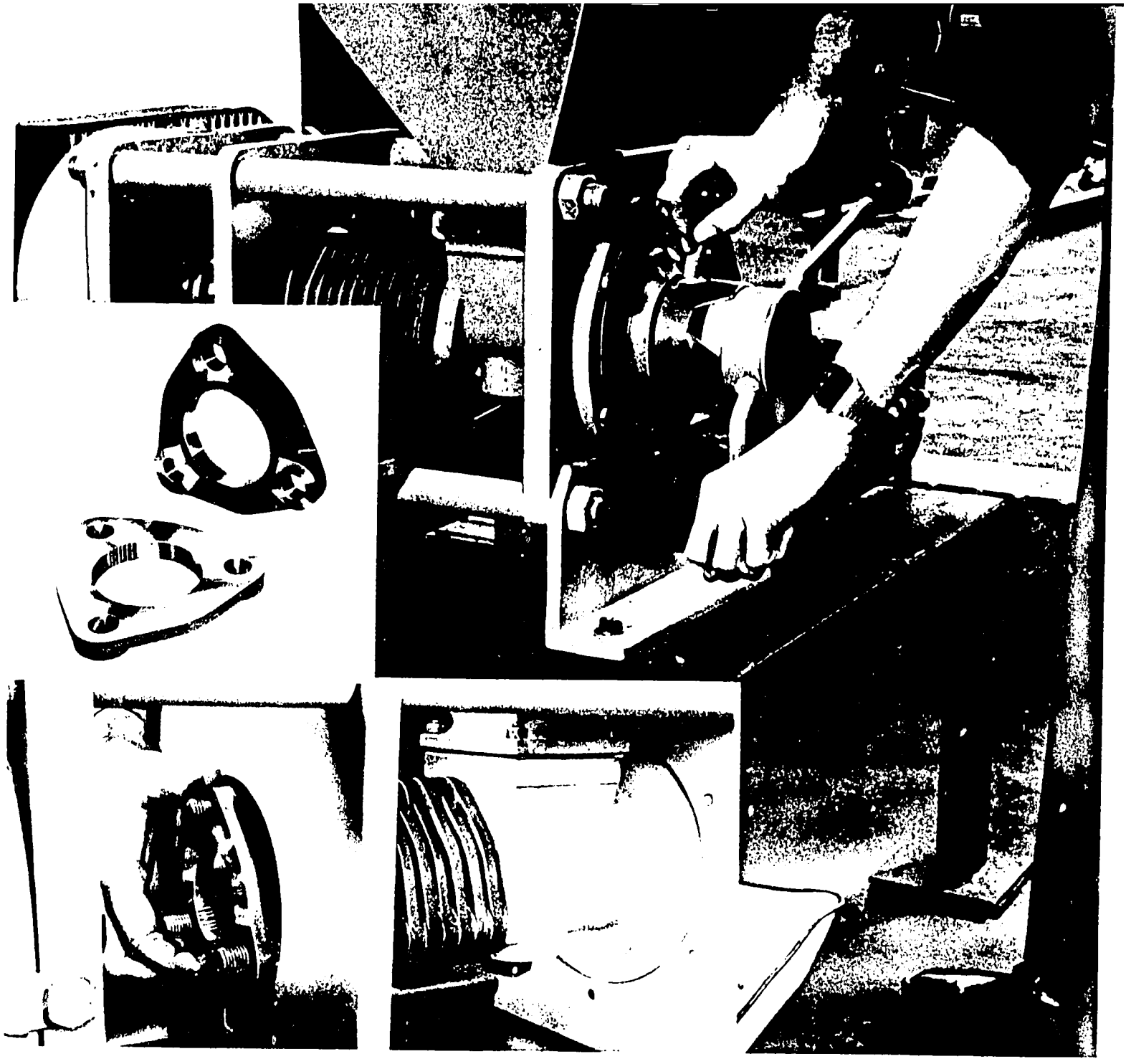
In addition to the business units shown left the following companies, regional and representative offices of Simon Food are serving our clients in all parts of the world

Companies

Simon-Heesen B.V.	Holland
Simon-Heesen GmbH.	W. Germany
Simon S.A.	France
Henry Simon Australia	Australia and New Zealand
Simon-Barron Ireland Ltd	Ireland
Gordon Johnson Iberica S.A.	Spain
Henry Simon Inc.	U.S.A.

Regional/Representative Offices

Simon Food (S.E. Asia)	Singapore
Simon Food (Latin America)	Venezuela
Simon Food (South America)	Chile
Nagata Simon-Vicars Co. Ltd.	Japan



Mini 40 Screw Press

SIMON-ROSEDOWNS

The compact solution to oil seed processing

The Mini 40 has been developed to meet an increasing demand for a relatively simple, small capacity screw press, suitable for village/cottage industry or on-farm applications.

The screw press design enables all cold seed, with the exception of copra, to be processed without pre-treatment, the breaking and cooking operation being performed by the action of the wormshaft within the barrel of the unit. Copra should be reduced to some 10/12mm pieces before feeding into the press.

The Mini 40 has a nominal input capacity of approximately 40 kg per hour for softer seeds such as sunflower, rapeseed and linseed and capacities of about 60 kg per hour on hard seeds such as palm kernels and copra.

Residual oil in cake will be in the range of 12 to 15% but on low oil content seeds, for example soya and whole delinted cotton seed, residual oil figures of 10% are achievable.

The 62mm diameter, 150mm-long drainage barrel is formed by 12 hardened mechanite rings located on 3 bars extending from the feed casting. Rings are spaced apart by shim washers so that the width of the drainage slots may be varied along the length of the barrel.

The wormshaft is case-hardened manganese chrome steel with the flight cut integrally with the shaft. Pressed "cake" is discharged through a hardened high-carbon steel discharge ring. The thickness of the cake is adjusted by moving the shaft axially along the barrel by a simple screw and lock-nut system.

Seed is fed to the screw press via a rectangular feed hopper with shut off slide.

Standard power source for the Mini 40 is a 2.2 kW (3 HP) three phase, electric motor. Alternatively it can be driven from a 4.7 kW (6.3 HP) single cylinder diesel engine with a suitable Vee rope drive to give a screw press wormshaft speed of approximately 120 rpm. Included in the standard supply is a fabricated steel baseplate giving an integral mounting for the screw press and electric motor or alternative diesel engine.

ADVANTAGES OF THE MINI 40 SCREW PRESS

1. Because the action of the wormshaft results in the breakdown of the seed and the generation of frictional heat, separate heating and breaking equipment is not generally required.
2. As heating is not required there is no need for a steam boiler.
3. This press can be used intermittently, whereas conventional presses need to be run continuously.
4. The provision of a diesel engine means that the press can be operated independently of a power supply.
5. The yield of crude oil, although small in comparison with a conventional press, can in some cases be of better quality in terms of acid value, colour, sulphur and phosphorous contents.
6. All that is needed to commence operation is a power source i.e. electricity or diesel fuel, together with a supply of new material and containers for the crude oil and pressed cake.

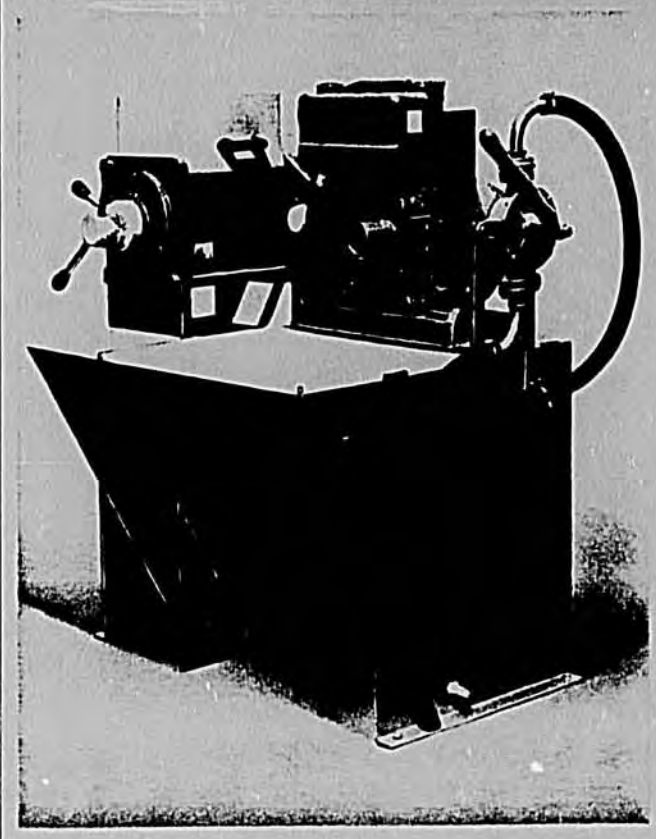
APPROXIMATE SHIPPING SPECIFICATION

Press, Electric Motor & Spares

Weight		Dimensions
Gross	Nett	
296 kgs	250 kgs	1250 x 960 x 760mm

Press, Diesel Engine & Spares

Weight		Dimensions
Gross	Nett	
464 kgs	414 kgs	1300 x 960 x 920mm



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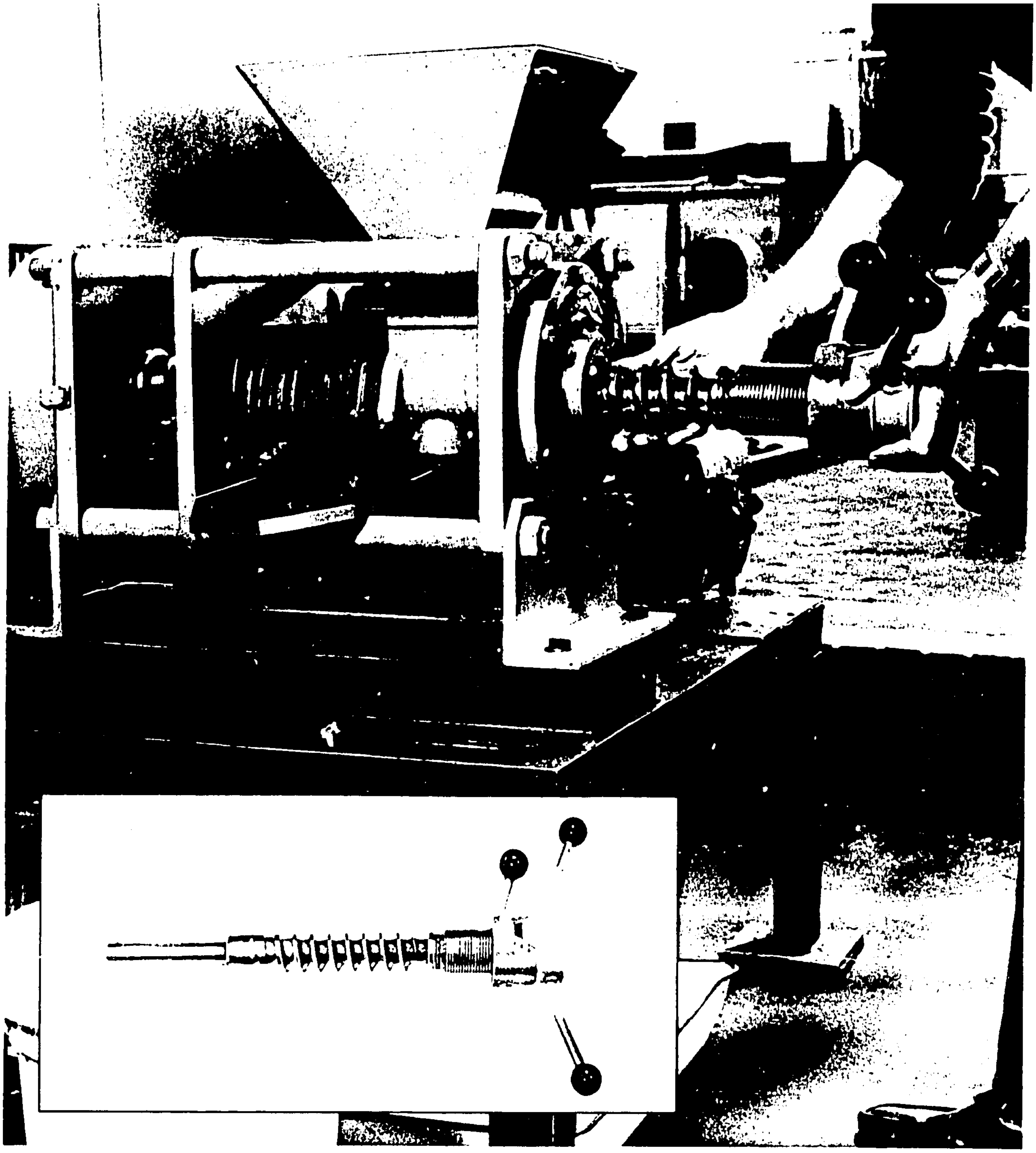

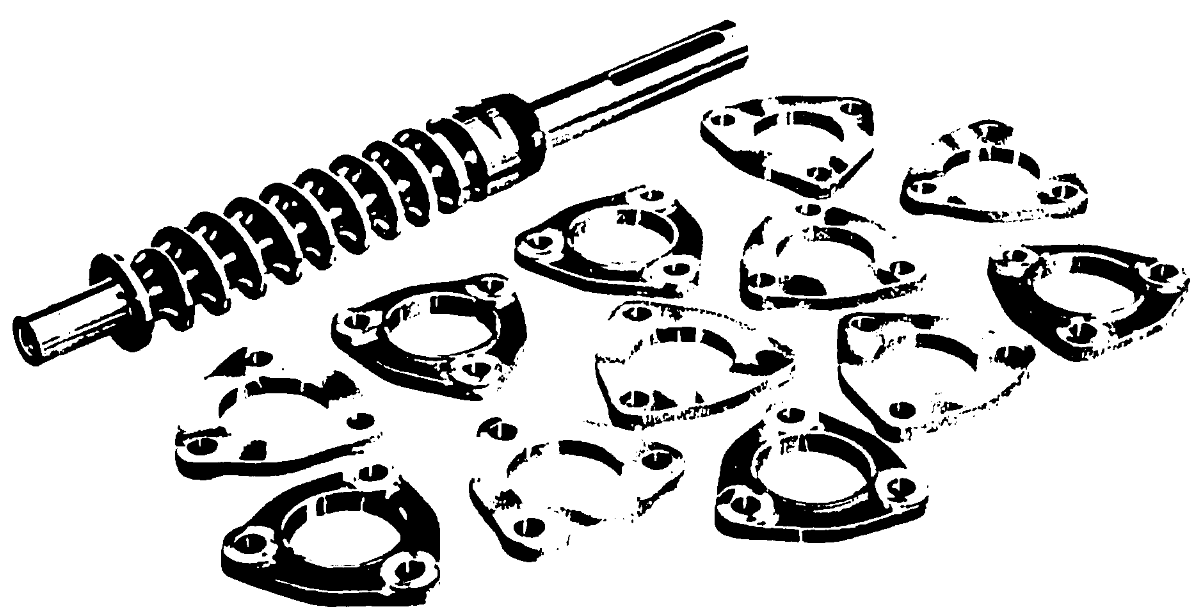

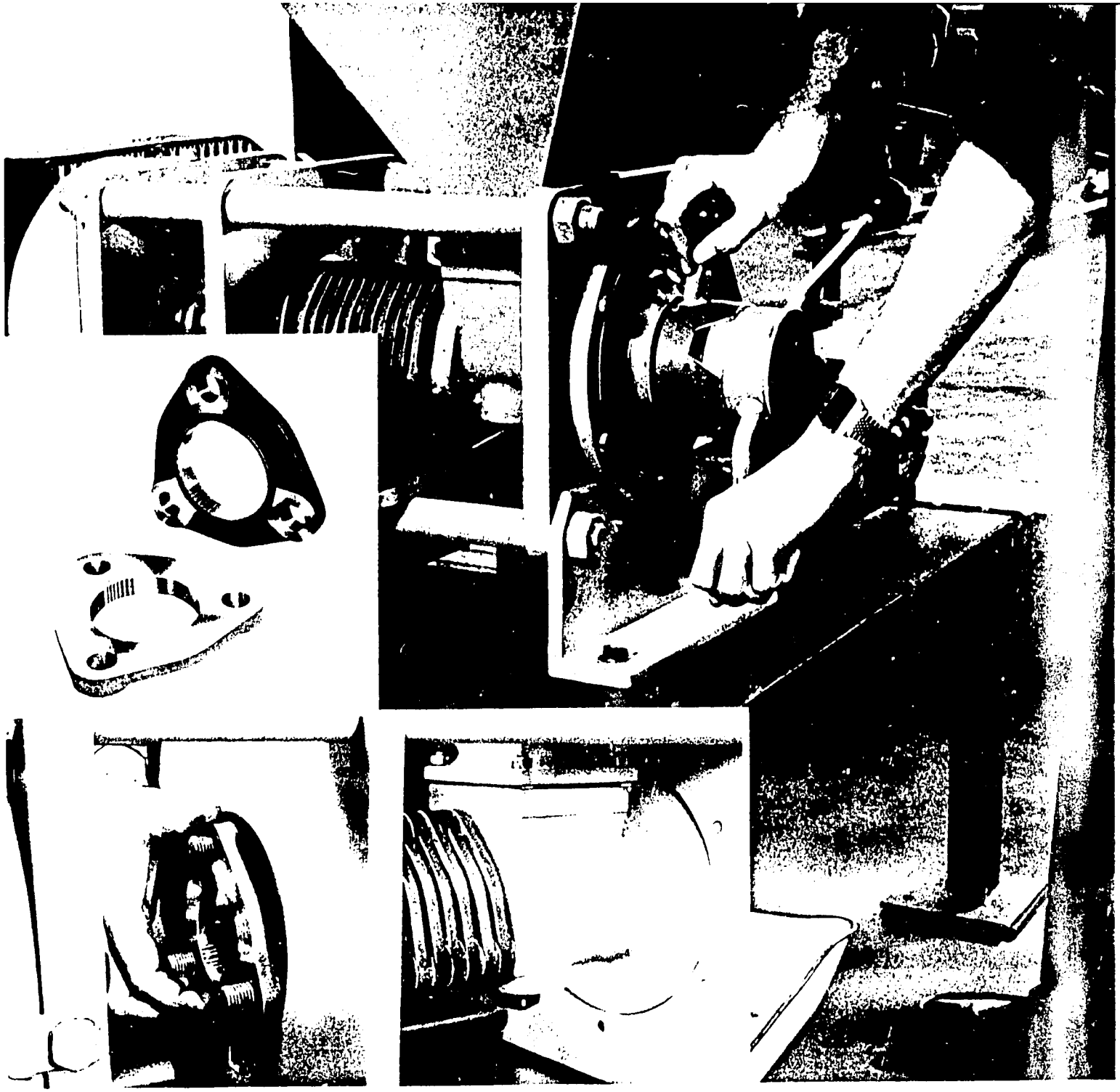

SIMON-ROSEDOWNS

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Cables: Rosedowns Hull

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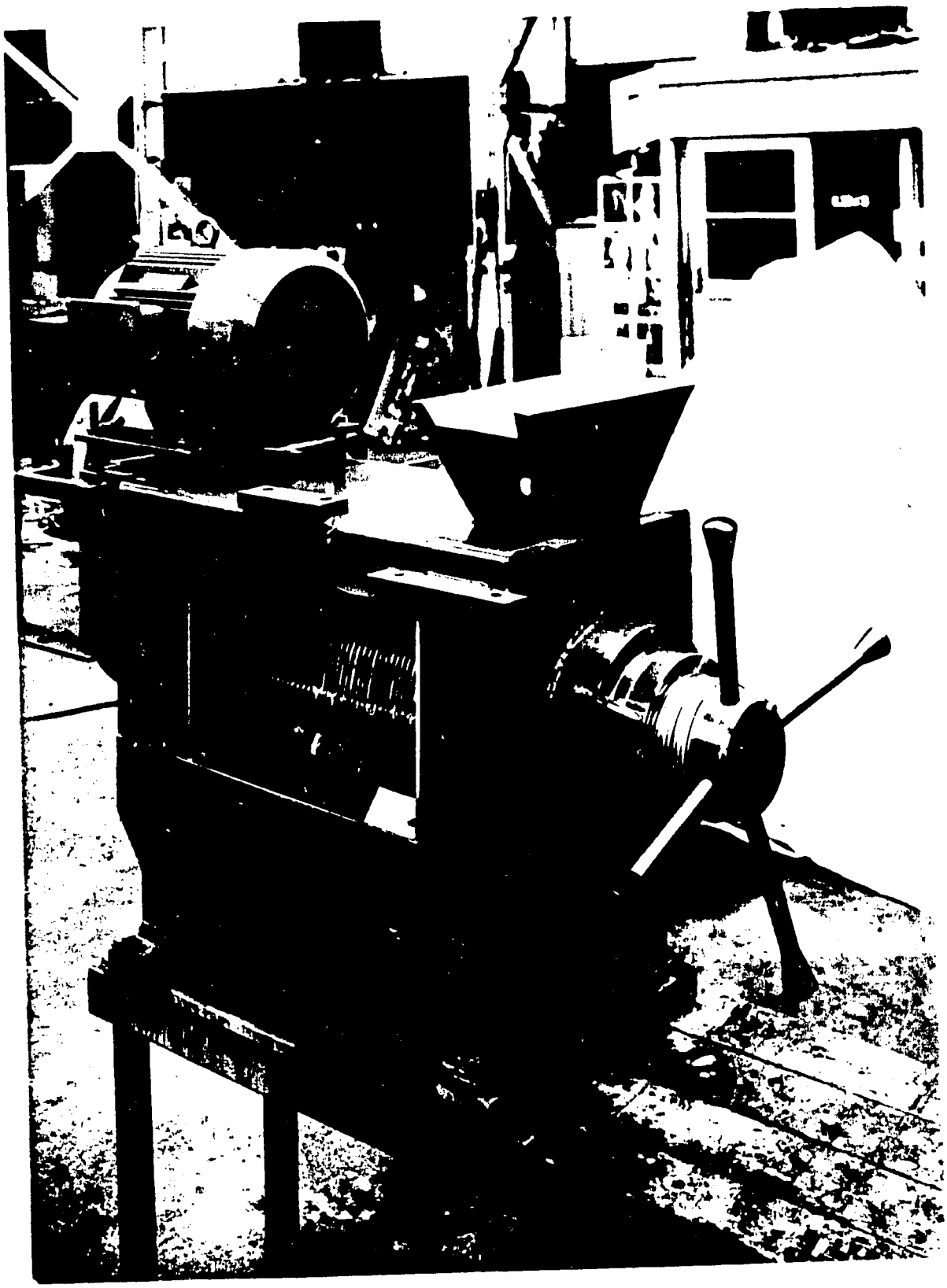
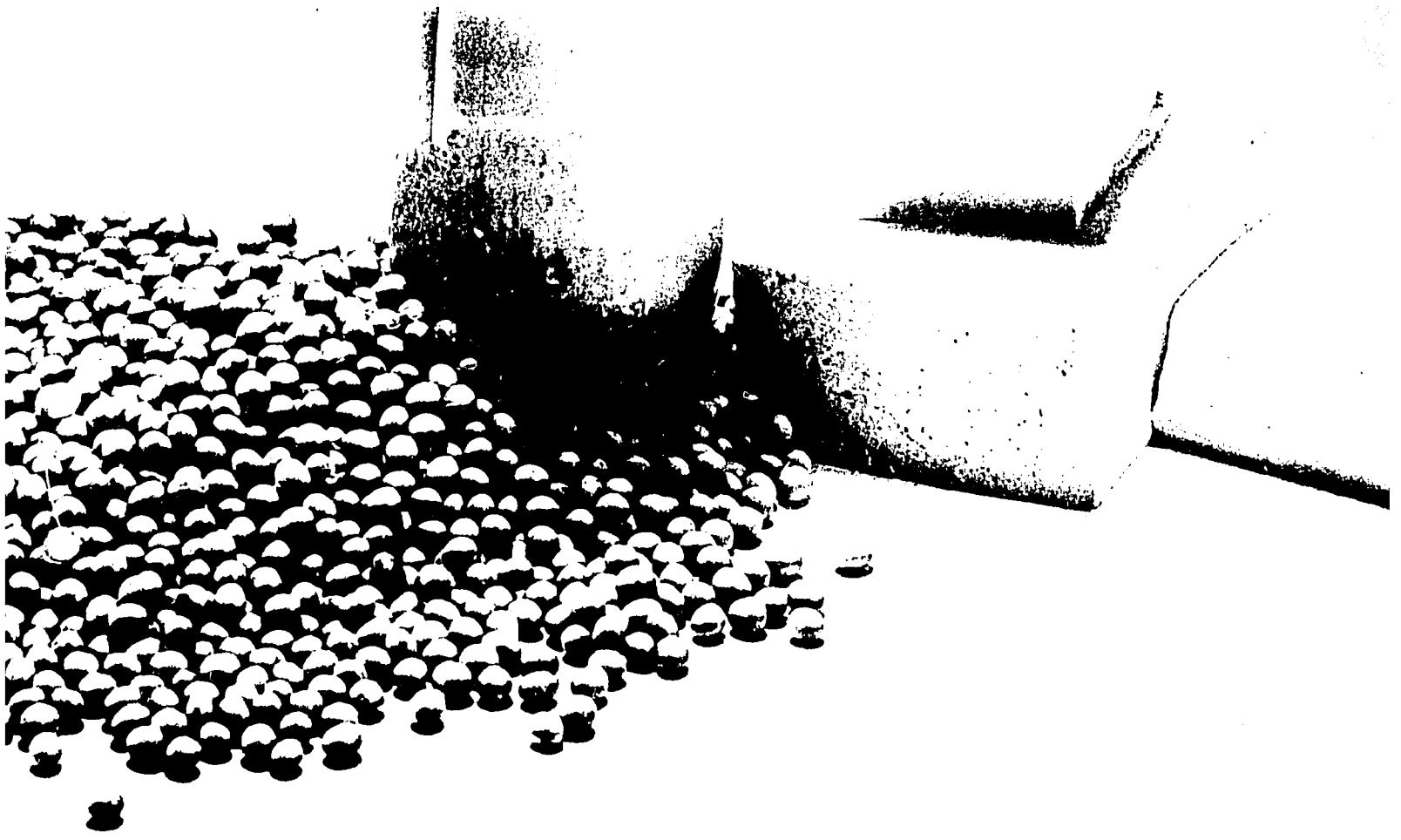
Publication No. 1051



ALFA-LAVAL

Soy milk
—product and process



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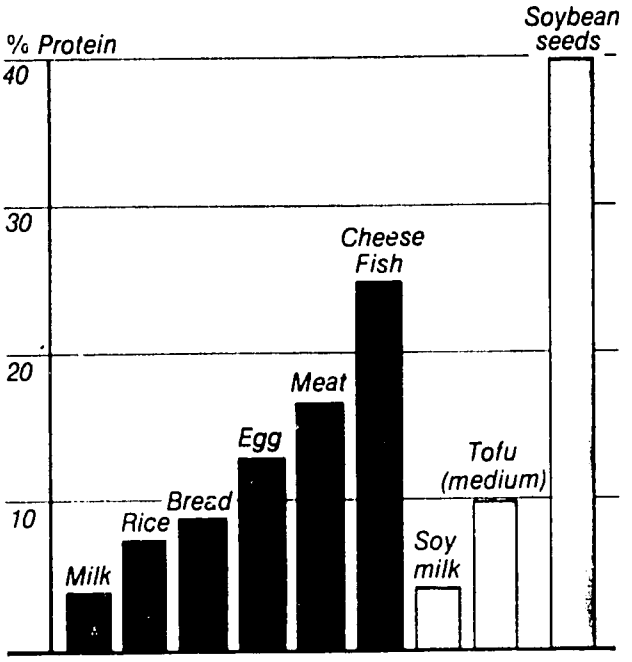
Foreword

Since the first edition of this booklet was published, much has happened in the soy milk field. Technological and commercial development is rapid, and information quickly becomes out-dated. This new edition has been extensively revised and brought up to date.



Protein contents of common food products.

Soybeans – Background

Soybeans have been grown in the East from times immemorial. The earliest written records show that the plant was cultivated in China nearly 5000 years ago. As early as 1804, soybeans were brought to the United States, as ballast in a ship, but it was not until 1908 that soybeans were first shipped to Britain and received world-wide attention.

Soybeans have today become one of the world's major sources of vegetable protein and vegetable oil and are thus of immense importance to the world food economy.

One of the potentially most important soy products is a milk-like beverage commonly referred to as soy milk, or soybean (soya bean) milk.

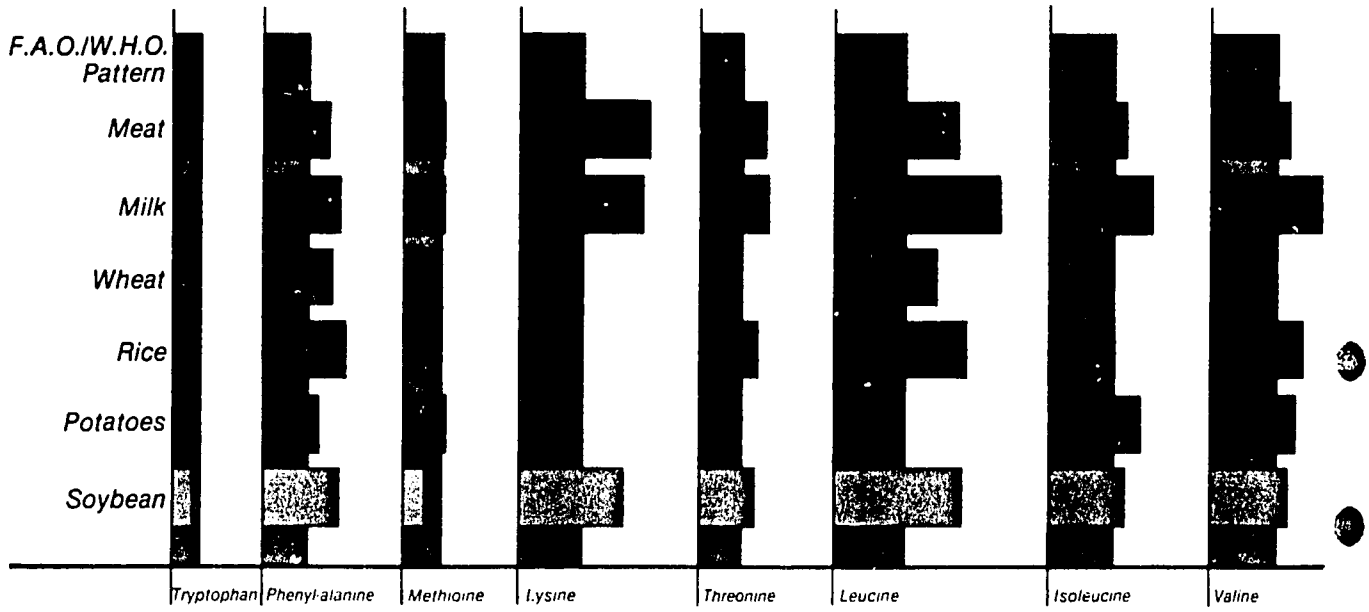
Soy milk is in no way a new product. It has been drunk, locally manufactured or home-made, almost as long as soybeans have been cultivated.

The composition of soy milk is varied within a broad spectrum in accordance with demand and preferences on the different markets where it is sold. For instance, in industrial countries with temperate climate, such as Japan, where soy milk is an alternative to, and in competition with, cow's milk, it is given the same composition and protein content as cow's milk. In tropical and subtropical countries, on the other hand, soy milk is mostly sold as a thirst-quenching, refreshing drink and is consequently given a much less rich composition, with less protein and fat. Similarly, sugar content and flavouring vary according to consumer taste.
Consequently, it must be born in mind that there is no such thing as a standard, or average, soy milk, only a large number of widely varying, more or less locally typical soy drinks.

Soybeans are now cultivated throughout the world for a multitude of purposes, which include the production of flour, soy sauce, soybean curd, soy milk, bean sprouts, and edible oil. One of the very important fields of use is cattle feed. However, soybeans are not only used as food, or the basis for food products, but also as raw material in a variety of non-food industrial products, including fertilizers.

Soybean strains have been developed that can grow and give good crops even in quite cold climates, such as northern Europe, Siberia, and Canada.

Soy milk is widely consumed, mainly in East Asia, but it is steadily spreading westwards. Quite a lot is drunk in the Americas, and more plants for soy milk production are also starting up in Europe.



Vital amino acid contents of common food products compared with ideal FAO/WHO pattern (source: FAO).

Nutrition

Protein is a vital component of human nourishment. Traditionally, in many parts of the world, particularly in the industrialized countries, protein is supplied through products of animal origin, such as beef, pork, poultry, eggs, milk and milk products, and fish.

However, protein is also supplied through vegetable products, such as peas, beans, lentils, and cereals.

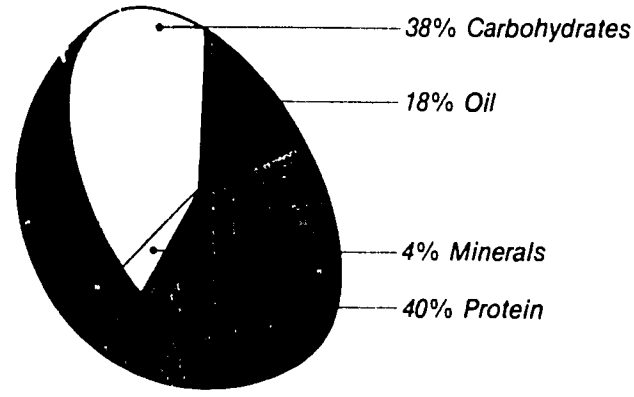
In the biocycle, certain vegetable substances, notably cellulose, are converted into protein, fat, etc by herbivores. Thus protein for human consumption is provided from vegetable as well as animal sources.

Growing bodies, i e children and adolescents, need more food, more protein, in relation to their body weight, than adults do. A rule-of-thumb daily intake figure would be 1 gramme of protein per kilogramme of body weight for an adult and up to 4 grammes for a child. The average adult requires in the magnitude of 70 grammes of protein per day, and he requires it each and every day, as protein, unlike fat, cannot be stored by the body.

One of the richest sources of protein is soybeans. Their content of protein is in fact outstanding, as the diagrams show. In the Orient, soybean products have been staple food for many, many centuries, providing protein to humans in a cycle that by-passes the animal stage.

Fundamentally, vegetable protein is in no way different from animal protein, and the human organism digests and utilizes both in the same manner. The diagram shows for various food product categories the content values of those eight vital amino acids that the human body cannot produce itself. As a reference is shown an ideally balanced nutritional pattern or profile as drawn up by the FAO/WHO.

All these products contain not only protein but also fat. It is a point in favour of most vegetable product, soy milk being one, that their fat contains much less



Composition of soybean (may vary with climate, soil, weather (harvest), strain, etc)

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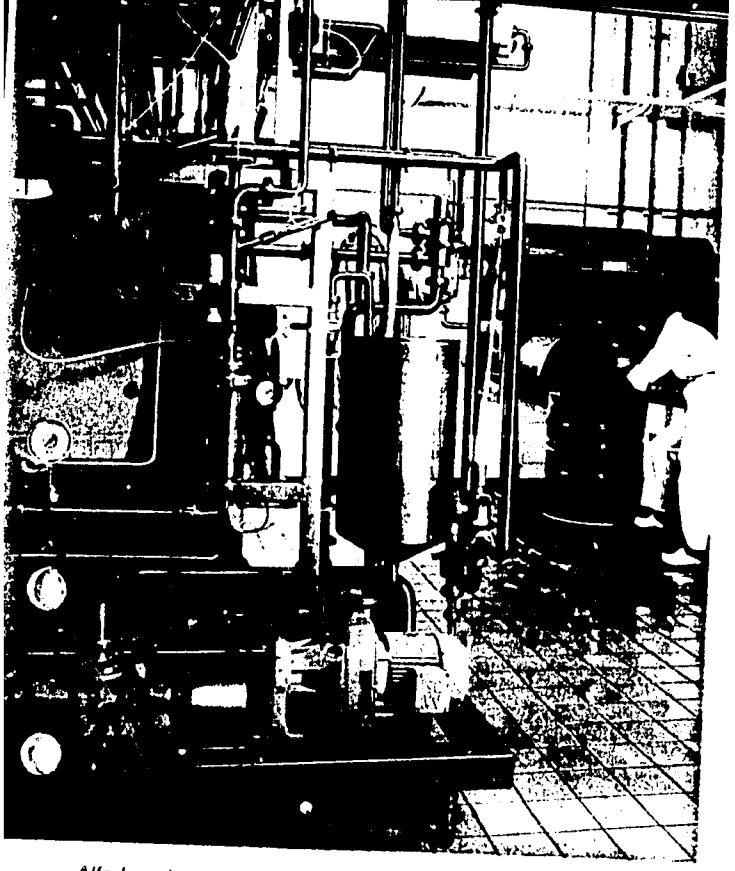
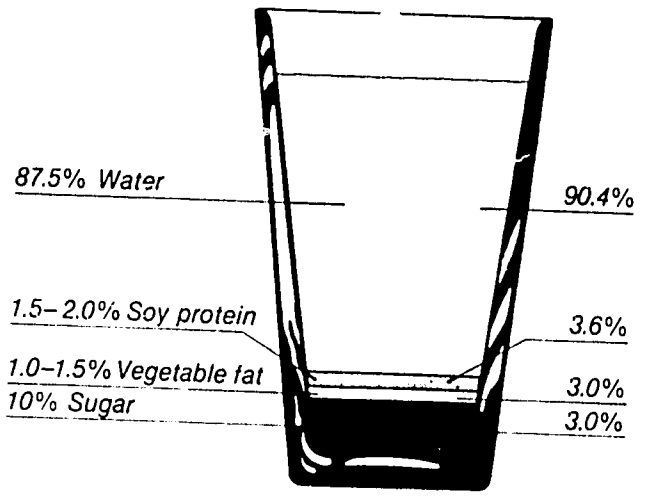


Alfa-Laval soy milk lines produce a tasty and wholesome soy milk



Main components of two typical kinds of soy milk

cholesterol and saturated fatty acids, but more polyunsaturated fatty acids, than most animal fats. The combination of fat components in soy products reduces the production of special fat protein particles in our blood. A high level of such particles may be one of the most important risk factors that lead to coronary heart diseases.

Another feature in favour of soy products is that they do not contain lactose. Consequently, lactose-intolerant persons, i e those that lack lactase in their system, can enjoy and utilize soy milk without detriment, whereas this is not the case with cow's milk. It should be added that lactose-intolerance is very widespread, mainly in the Third World.

Soy milk – the Product

Soy milk is one of the most important, although far from the only, soy product.

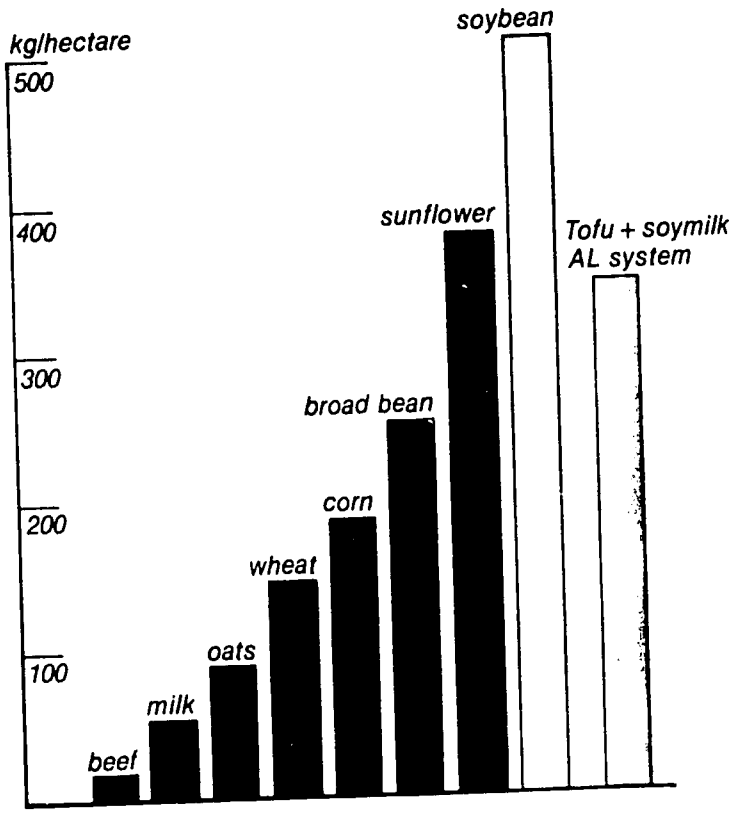
Manufactured in the traditional, non-industrial way, soy milk suffers from a number of draw-backs, notably that it has a strong and to most consumers unpleasant smell and taste and is also difficult to digest.

The smell and taste are caused by the action of an enzyme contained in the bean – lipozygenase. As soon as the bean is crushed and mixed with water, this enzyme gives rise to the characteristic bean odour and flavour.

Modern processing methods have, in the last decade or so, been developed making it possible to produce soy milk and soy milk products that are easy to digest and have a generally and widely acceptable taste and smell. In this development, Alfa-Laval plays a prominent part, particularly when it comes to supplying commercial production plant and equipment. Thus a vast new source of nourishment has now become much more readily available to the world, bringing great opportunities and social benefits to producers, communities, and consumers alike.

Backed by the solid experience and know-how gained during more than a century of achievement in food processing and hygiene, the Alfa-Lafal soy milk lines produce a tasty and wholesome high-quality soy milk. The processes allow full use of the raw materials, either untreated virgin soybean seeds or full-fat enzyme-activated soy flour. All the nutritive elements (carbohydrates, protein, fat, etc) of the raw material are retained with a very high yield.

The composition of the soy milk produced can, of course, be varied to provide exactly the kind of product local consumers prefer.



Protein of common food products.
(source: American Soy Association).

Cultivation and Yield

Soybeans offer growers a very high yield in terms of protein, as the diagram indicates. It must also be born in mind that in certain regions, climatic and other conditions are so favourable that, in addition to one annual crop of soybeans, one or even two crops of rice or cereal may be taken off the same field.

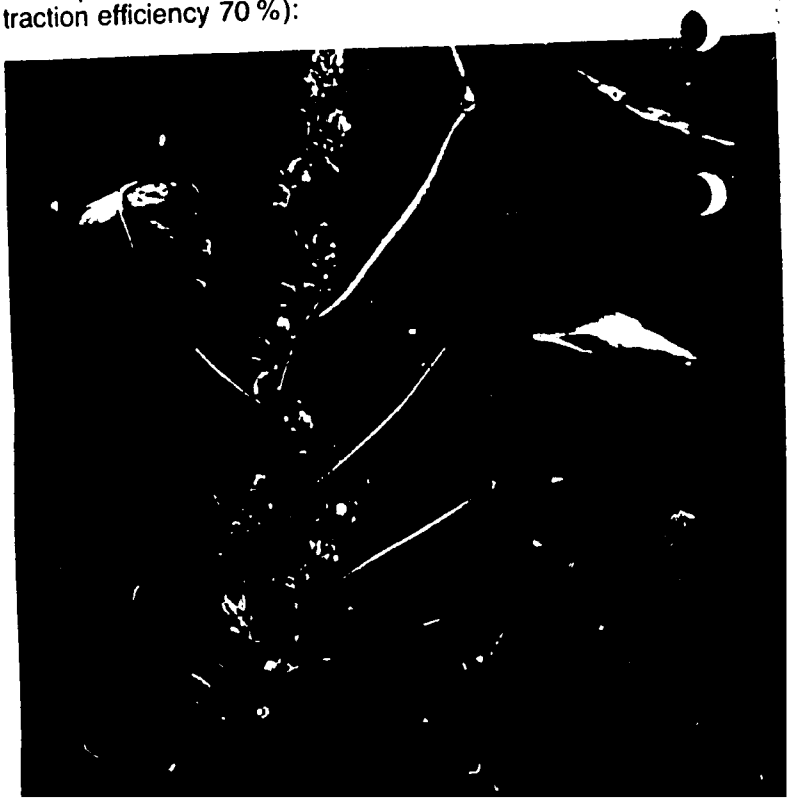
Soybeans contain 35–45 % protein. Thus the production of one litre of soy milk presents the following picture (70 % extraction efficiency is assumed):

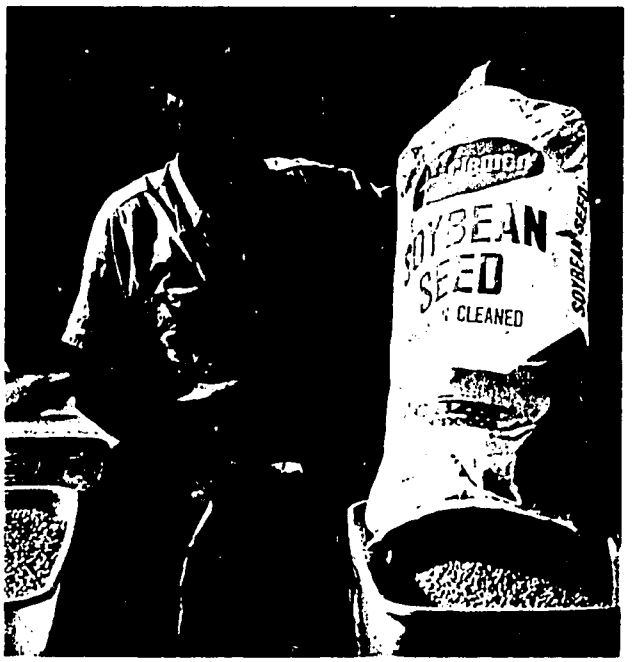
Bean protein %	Soy milk protein %	Beans g/l	Gross protein g/l	Net protein g/l
35	3.6	147	51.4	35
40	3.6	129	51.4	35
35	1.5	61	21.4	15
40	1.5	54	21.4	15

One litre of rich (3.6 % protein) soy milk thus provides roughly half the daily protein requirement of an adult or a child weighing 15–20 kg, as well as 500–600 kcal of nutritive energy.

Soybean yield per hectare naturally varies widely depending on local conditions – soy bean plant strain, precipitation, temperature, sun exposure, soil fertility, etc. In round figures, the annual yield can be put at 1500–2500 kg per hectare.

Calculating with two different yield figures, 1500 and 2000 kg/ha, and two soy milk types with 3.6 % and 1.5 % protein, the following figures will emerge (extraction efficiency 70 %):



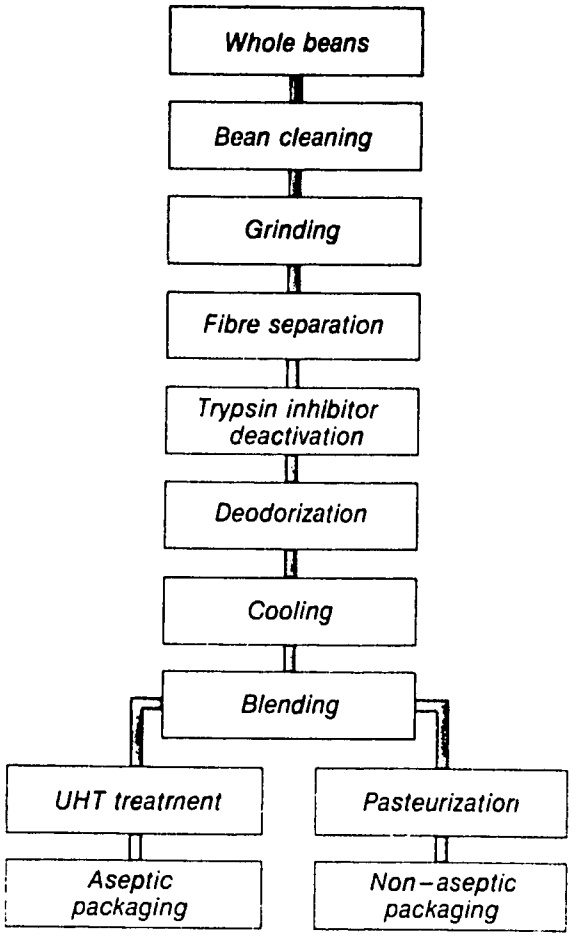


Soy milk protein %	Bean protein %	Yield kg/ha	Net protein kg/ha	Soy milk l/ha	Persons provided with one l/day
3.6	35	1500	367	10200	28
3.6	40	1500	420	11700	32
3.6	35	2000	490	13600	37
3.6	40	2000	560	15600	43
1.5	35	1500	367	24500	67
1.5	40	1500	420	27000	77
1.5	35	2000	490	32700	89
1.5	40	2000	560	37300	102

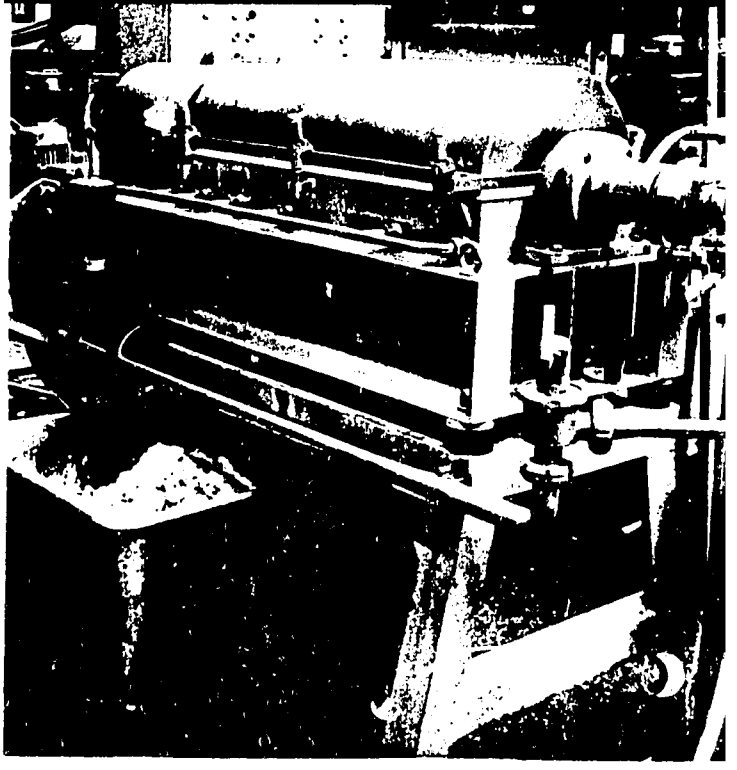
The last column of the table simply lists the litre-per-hectare figures divided by 365 to arrive at a tangible illustration of what a hectare on which soybeans are grown can provide – to which should be added a possible second and maybe third crop of, say, rice.

However, there are many other factors as well, factors that in many regions make cattle-breeding the preferable, or even the only feasible, alternative. Climate, density of population, availability and nature of land and whether it is well suited for cultivation or only usable for grazing – these are some of the determining elements. Also, in some cultures, religious and ethnic factors play important roles.

Nevertheless, with a growing world population, soybeans can in many regions, and not only in traditionally soy-growing SE Asia, provide alternative protein products that are highly economical to produce and consume – and at least equally nutritive.



Block diagram representing an Alfa-Laval soy milk production process starting with whole or dehulled beans



Decanter centrifuges are corner-stones in continuous manufacturing lines for soy milk.

Processing

The raw material used in soy milk manufacture, soybean seeds (but also full-fat enzyme-active soy flour), as well as the final product determine the make-up of the process and the equipment required. Alfa-Laval soy milk processing plants are versatile and adaptable to either category of raw material and to whatever soy milk variety that is wanted. The plants can also, if necessary with certain additional units, be used in the manufacture of other products, such as fruit juice, recombined or flavoured cow's milk, herbal tea, sugar cane juice, tofu, etc.

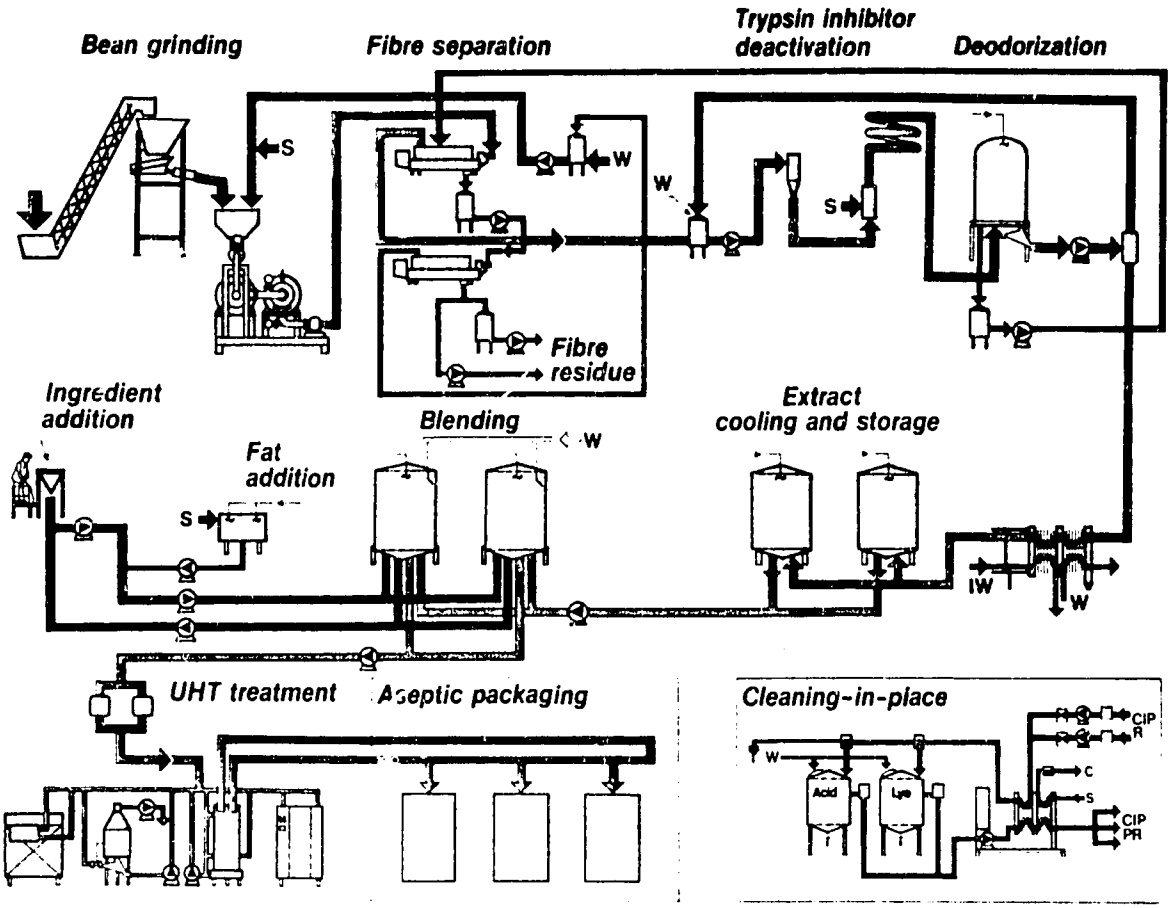
A salient feature of all Alfa-Laval equipment is the meticulous care and attention given at all stages of the process to the hygienic and sanitary standard. A greater number of lines for continuous sanitary processing of liquid food have been built and installed by Alfa-Laval than by any other supplier anywhere. This vast experience gained over more than a century will now benefit prospective soy milk manufacturers all over the world.

A whole array of related products may be manufactured starting with the basic soy milk. Such products include:

- White milk (plain, unflavoured)
- Flavoured milk (fruit, chocolate, caramel, brandy, and many others, with or without added sugar)
- Cultured milk products such as youghurt, soybean curd (tofu)
- Ice cream mix base
- Soups
- Substitute for animal milk solids in sweetened condensed and evaporated milk
- Cow's milk replacer in calf food.

Local consumer preferences determine to what extent the original soy bean taste character is to be retained in the various products. Generally, products retaining the bean flavour find favour only in certain traditional soy markets in the Orient. The Alfa-Laval processing plants are capable of producing soy milk with no trace whatsoever of disagreeable bean flavour.

The Alfa-Laval soy milk plant used for the process represented in the block diagram above is shown in some detail in the flow chart below.



Production line for non-bean-flavour soy milk, using whole beans

Processing lines are normally made for capacities from 1000 to 6000 litres per hour, but lines for higher capacities can also be designed, if required.

Soybean seeds, removed from their pods but still in their hulls are cleaned and then ground with water to make a slurry.

After centrifugal separation of the slurry to remove fibre residue (commonly known as 'okara'), the clarified soya base that has been extracted goes on to deactivation of residual enzymes and trypsin inhibitor, and from there to deodorization.

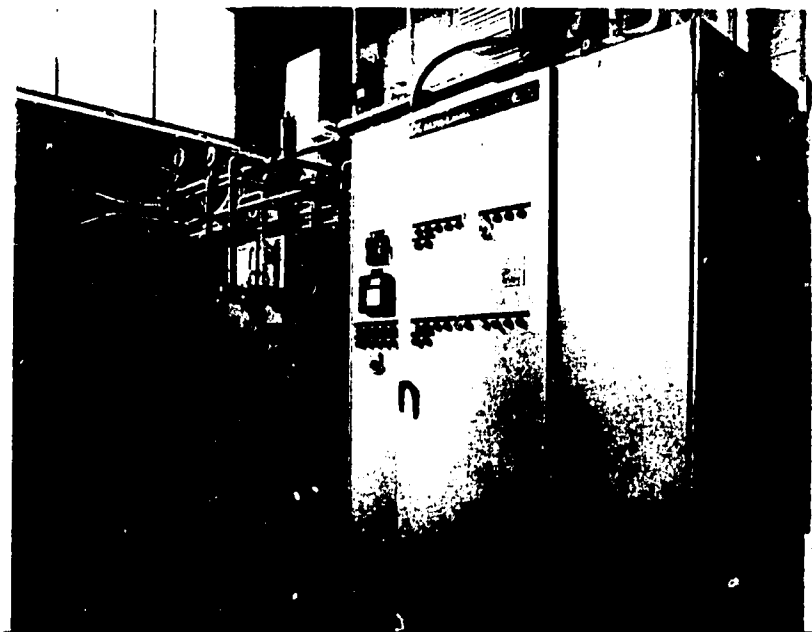
In the blending section, sugar, fat, flavouring, colouring, etc are added to give the product its character and final composition.

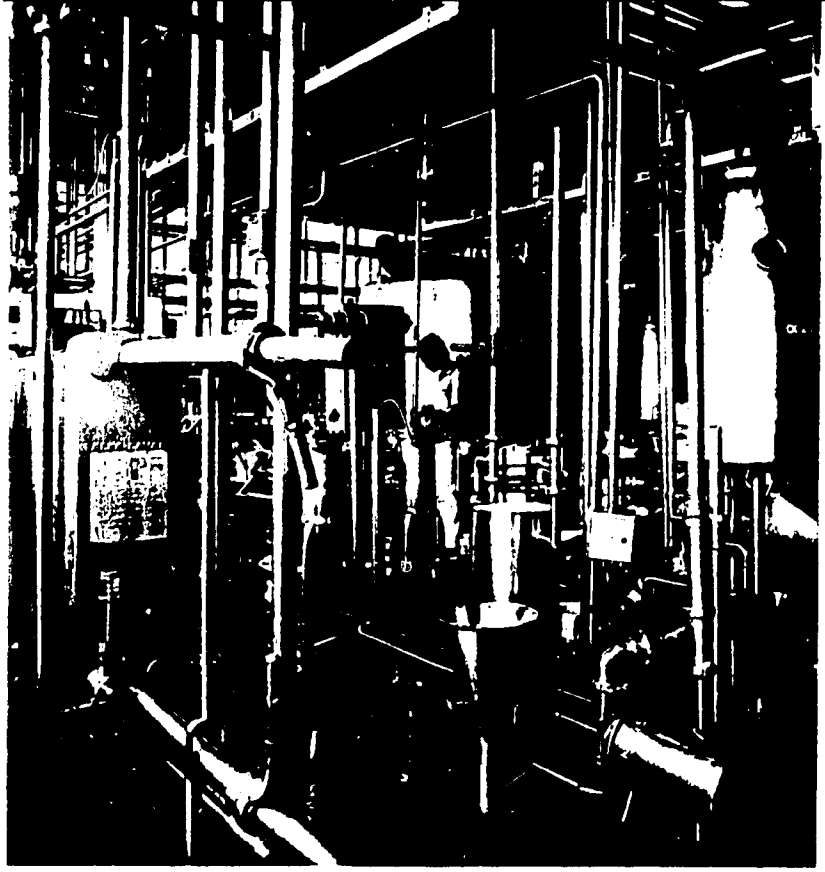
After UHT treatment, which includes homogenization, the product is finally packaged, ready for distribution.

(If soy flour instead of whole beans is used as raw material, the grinding section is omitted, and the line begins with a slurry mixer. Otherwise the process line is similar.)

The processing line briefly described here is an example of a typical design. But whatever the exact nature of the product, there is an Alfa-Laval processing line for it, a line largely composed of well-tried standard components, allowing the processor to manufacture the kind of product his markets demand, and to adapt his plant to market trends as they occur, with a minimum of delay and expense.

UHT treatment in the Steritherm plant, together with aseptic packaging, gives soy milk a shelf-life of several months.





Alfa-Laval soy milk lines offer excellent economics.

Salient features of the Alfa-Laval soy milk process lines

- High protein yield
- Elimination of bean flavour and odour by deactivation of the enzyme lipogenase
- Truly continuous production
- Manual through fully automated and computerized control options
- Precise process parameter control
- High-tech UHT treatment plant
- Cleaning-in-place
- Low energy consumption in heating and cooling
- Excellent operating economics
- Versatile with very wide option of products (with a few extras, non-soy products as well)

Packaging

Soy milk, just like cow's milk, is a fresh, perishable commodity when manufactured in the basic processes. With no other heat treatment than pasteurization and distributed in bulk, its shelf-life may be measured in hours in tropical climates and can extend to a few days in cooler regions.

Packaging in cartons or bottles without further heat treatment only improves the shelf-life marginally, unless distribution employs refrigeration.

UHT treatment, on the other hand, in combination with aseptic packaging in cartons, gives soy milk (and cow's milk) a shelf-life of several months without refrigeration and irrespective of climate. This, however, increases in-factory costs while at the same time reducing distribution costs.

Local market conditions and consumer habits determine what kind of heat treatment should be chosen, and also the selection of packaging to be used:

- UHT treatment and aseptic packaging in paper/plastic cartons, plastic bottles, or plastic pouches
- filling in glass bottles and in-bottle sterilization
- pasteurization and packaging in paper/plastic cartons, plastic containers, bottles, or pouches
- pasteurization or no heat treatment and distribution in bulk from the factory.

Economy

The economy of the growing of soybeans and the manufacture of soy milk is of course subject to immense variations depending on where and how the processes take place. In general, though, soy milk manufacture can be made viable virtually anywhere, and very broadly speaking, the cost of producing soy milk is between one third and two thirds of the cost of cow's milk, without taking the cost of packaging and distribution into account in either case.

For customers and prospective customers, Alfa-Laval is in a position to compile detailed costings, starting with a viability study, of actual projects.

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