HGCA

PROJECT REPORT No. OS5

FEASIBILITY STUDY LOCALISED PRODUCTION OF RAPESEED OIL FOR COMBUSTION

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HGCA OILSEEDS PROJECT REPORT No. OS5

FEASIBILITY STUDY: LOCALISED PRODUCTION OF RAPESEED OIL FOR COMBUSTION

(HGCA Project No. OS13/1/92)

by
R. MORTON

Peakdale Engineering Limited, 17 Spire Hollin, Glossop, Derbyshire, SK13 9BT

Contents

1 Summary

Peakdale Engineering was asked by the Home Grown Cereals Authority to investigate the practical feasibility of a project to demonstrate the extraction of oil from rapeseed in small, localised units. The possibility of burning the oil in heating applications was also to be investigated. The aim being to provide a new market for unrefined rapeseed oil.

The study was organised in three parts:

1. Market Assessment
2. Combustion Feasibility
3. Extraction Feasibility

The products of the investigation are:

A report and presentation describing the findings of the study.

An estimate of capital and operating costs for a typical application.

The feasibility study was authorised on 30th October 1992 and was presented to the HGCA Oilseeds Committee on 1st December 1992.

The conclusions of the study are:

1. A large potential market exists for rapeseed oil as a combustion fuel if it can be sold at a price of about £130/tonne in the UK, or possibly at higher prices in mainland Europe where different tax regimes apply.

2. Combustion of crude rapeseed oil should be feasible but preheating to 65C will be necessary for most burner types. This will increase burner capital cost.

3. Localised extraction of rapeseed oil on farms is technically feasible. The variable cost of processing will be about £13/tonne of seed processed. The capital cost will be about £60/acre of rapeseed under cultivation.

4. An economic assessment is provided which concludes that investment in the equipment required for localised extraction of rapeseed will give a payback time of less than one year. A number of assumptions regarding subsidies and CAP rules are made in this assessment. These rules may be subject to change or variations in interpretation following the GATT negotiations.

Growers will have to judge for themselves the commercial viability of rapeseed oil extraction and combustion given the technical information provided in this report.

2 Market Assessment

In mainland Europe rapeseed oil is finding increasing applications as a substitute for diesel fuel. An esterification process is used to make the oil suitable for burning in conventional diesel engines.

The esterification process means that bio-diesel costs significantly more than fossil fuel diesel to produce.

It can compete on price with conventional diesel if excise duty is applied to the conventional diesel but not to the bio-diesel.

At present the UK Government plans to apply the same excise duty to biofuels as to fossil fuels.

However, the carbon tax proposed by the EC will not apply to biofuels if or when it comes into force.

As a result of these policy considerations there is more enthusiasm in the UK for other technical uses of rapeseed oil which provide niche markets without the complications of road fuel excise duty and the esterification process.

One such niche which merits consideration involves the extraction of rapeseed oil on individual farms or at local grain stores in a form which can be sold directly as a renewable substitute for fossil fuels.

Four possible outlets have been assessed in this study:

1. Crop drying
2. Domestic Heating
3. Industrial Space Heating
4. Commercial Boilers

Other niche markets which have not been investigated because they do not fall within the terms of reference of this study but which may be of interest in the future are:

Biodegradable chainsaw lubricants

Biodegradable hydraulic oils

Power generation by direct combustion of unrefined oil in specially modified diesel engines.

Additives for paints and plastics.

Lubricants for treatment and machining of metals

The export of rapeseed oil as a heating fuel to countries like Italy where a tax is applied to non-renewable heating fuels.

2.1 Potential Uses for Rapeseed Oil

2.1.1 Crop Drying

A typical farm-based crop dryer will consume 5-20 tonnes of gas-oil or diesel per year with the majority of that consumption concentrated in a two month period around harvest time.

Oil may be required before the rapeseed is harvested so the demand profile is not particularly well matched to supply.

Burner capacities lie in the range 400kW (8te/hr dried) to 2200kW (40te/hr dried).

A typical UK price for the fuel in summer is £120/tonne.

Farmers normally buy their fuel at spot prices from local oil distribution companies as required.

There is little incentive at present for farmers to switch to a premium priced 'greener' fuel for crop drying.

However, there is a chance that, in future, legislation may be introduced to control sulphur dioxide and other emissions such as polycyclic aromatic hydrocarbons in direct fired drying of food crops.

2.1.2 Domestic Heating

Farmers are enthusiastic about the idea of using rapeseed oil in domestic heating systems.

Typical annual consumption is 3-4 tonnes per year, concentrated in the winter months from October to March.

This presents an attractive demand profile as it follows immediately after the harvest.

Domestic heating oil is priced higher in winter at about £140/tonne.

Consumers normally buy their oil on a spot basis from local distribution companies.

2.1.3 Industrial Space Heating

There are many applications for space heating in industry. Two agricultural markets are heating of chicken houses and glasshouses.

A typical broiler house heater is rated at 80kW, consuming 240 Kg per day of fuel. Typically two heaters will be fitted per house (Source: Priva UK Ltd).

Glasshouse heaters for frost protection will have a similar rating and fuel consumption. Normally about four heaters per acre are required to maintain a temperature lift of 10C in the UK.

Glasshouses require fuel only in winter if heaters are used for frost protection. However some growers also use burners for CO2 enrichment on high value crops all year round.

Broiler houses require heat throughout the year with the heating rate dependant on the seven week crop cycle. Typical average fuel consumption is 60-70 tonnes per year for a 25000 sq ft house fitted with two burners.

Both glasshouses and broiler houses require fuels with low sulphur and nitrogen contents. In the UK they conventionally burn kerosene at £120-140/tonne or propane gas at about £120/tonne. Propane has a lower heating value per tonne than kerosene.

Rapeseed oil has low sulphur and nitrogen content and should present a viable alternative to kerosene or propane.

Space heating consumers usually place longer term contracts with regional fuel distributors.

2.1.4 Commercial Boilers

Commercial boilers such as those used to heat swimming pools, hotels and large buildings provide an interesting potential market for rapeseed oil as a fuel.

Fuel cost is not always an essential factor. Building managers may be interested in burning a renewable fuel for environmental reasons.

Commercial boilers tend to use more fuel in winter than in summer but will sustain some demand throughout the year. The fuel used is typically gas-oil.

Users place long term contracts with regional supply companies. Purchasing may be carried out by a central buying department.

2.2 Market Size

The consumption of gas-oil as a heating fuel in the UK over the last 3 years was as follows:

('000 tonnes)

Application	1989	1990	1991
Crop Dryers and agricultural space heaters	162	145	154
Domestic Heating	188	184	170
Commercial Boilers	2445	2403	2418
Total, all heating applications	8256	8033	8022

Source DTI, Digest of UK Energy Statistics, 1992.

These figures do not include diesel for automotive use. Total consumption of DERV fuel in 1991 was 10.7 million tonnes.

To satisfy the total UK market for gas oil as a heating fuel using rapeseed would require the cultivation of about 9 million hectares, equivalent to 40% of the total land area of Great Britain. Gas-oil and diesel road fuel combined would require the entire land area of the country.

The area of oilseed rape under cultivation in the UK in 1990 was 321000 hectares.

2.3 Market Summary

Several potential markets have been identified for rapeseed oil as a combustion fuel.

The total size of all these markets is very large compared to the potential supply of rapeseed oil.

In all cases identified here rapeseed oil must compete mainly on price. However in mainland Europe there are some countries where the tax regime favours biofuels in heating applications. In these cases the price level tolerated by consumers will be higher, providing potential for export.

The clean-burning characteristics expected of the oil, it's renewable nature and it's biodegradablity make it more ecologically friendly than conventional fossil fuels. For many consumers the higher capital cost required for burners capable of using rapeseed oil may be tolerable if the fuel price is similar to the non-renewable alternative.

3 Combustion Feasibility

Several companies can supply diesel engines with modified combustion chambers which are able to run satisfactorily on crude rapeseed oil. One engine is the Elsbett diesel which is currently being tested on crude rapeseed oil by the Irish Agricultural Research Institute, Teagasc at Carlow.

Little work has been published on combustion of the crude oil in heating burners.

MAN in Germany has developed a central heating burner which runs on crude rapeseed oil.

3.1 Equipment Required

The relatively high viscosity of rapeseed oil at low temperatures means that for most burners it must be preheated to about 65C before entering the burner nozzle to ensure satisfactory combustion.

The rotating burners used in large industrial boilers should be able to burn rapeseed oil without modification.

Preheat may not be necessary if rapeseed oil is burned in blends with gas-oil.

Preheaters are readily available for most burner types. Tests will be required to establish the heating rates needed.

3.2 Combustion Characteristics

Rapeseed oil has a low sulphur content (0.01%) compared to gas-oil (0.25%). Exhaust gases from rapeseed oil combustion will contain less sulphur dioxide and particulate matter as a result.

The heating value of rapeseed oil per kilo is 15% lower than gas-oil. However rapeseed oil is more dense than gas-oil which means that the heating value per litre is only 5% lower.

In all other respects it is anticipated that, when preheated, rapeseed oil will have similar combustion characteristics to gas-oil.

3.3 Burner Manufacturers

The following burner manufacturers were contacted. They were chosen because they are the UK market leaders in the sectors of interest to this study:

Nu-Way	Domestic and medium sized commercial burners
Hamworthy	Medium to large sized industrial burners
Weishaupt	Burners for crop dryers
Priva	Burners for glasshouses and broiler units

These companies are described in more detail in Appendix A

Both Nu-Way and Hamworthy are keen to participate in the pilot and practical combustion trials which are planned to follow this study.

Weishaupt and Priva do not have test facilities in the UK but would be prepared to participate in the practical trial.

4 Extraction Feasibility

Rapeseed oil extraction is an established technology.

Equipment is available from a number of companies in capacities from laboratory scale to several tonnes per hour.

The maximum extraction capacity considered in this study is 300Kg/hr, equivalent to 1800 tonnes per year of seed. This capacity would consume the output of about 1400 acres of rape.

4.1 Equipment Required

In general, the minimum economic throughput increases as the percentage of oil extracted is increased by the addition of extra processing steps.

The components which may be combined in a small-scale extraction plant are:

- A hammer mill to pre-crush the seeds
- A cooker to help soften and break down the cell walls after milling.
- A screw expeller to crush then press the oil out of the seeds. The expeller performs the separation between the solids and the oil. It produces a crude oil containing about 5% fine solids and a cake containing some residual oil.
- A filter to remove solids from the expelled oil.

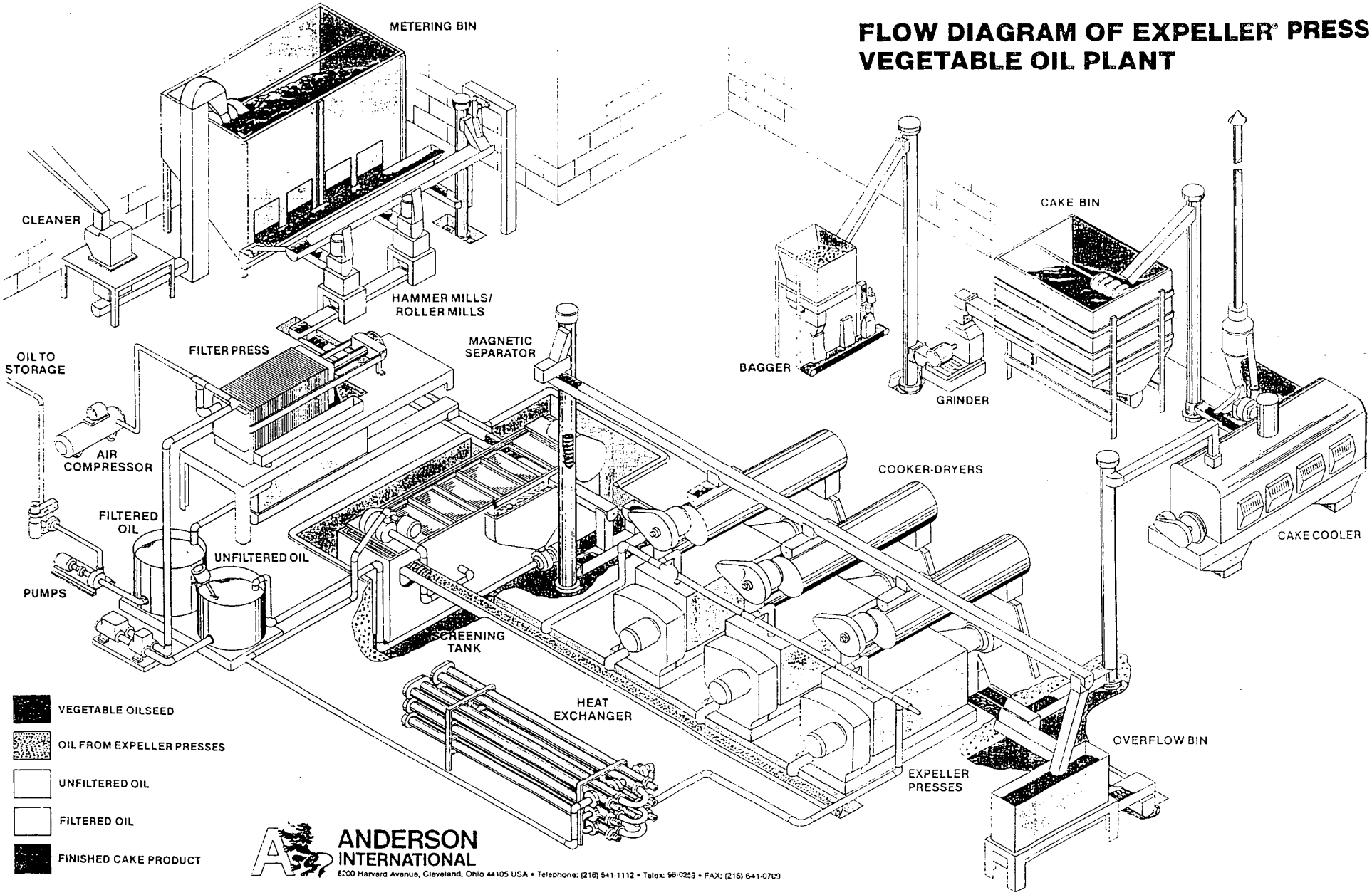
A layout drawing for a typical small oil mill is attached.

Large-scale extraction plants follow the expeller with an expander to further condition the cake and a solvent extraction system to extract the residual oil.

Large plants may also contain flaking rollers before the expeller and de-gumming and bleaching units after solvent extraction.

The smallest expellers, as supplied by DeSmet Rosedown and IBG Monforts process about 35 Kg/hr seed and require very simple seed handling arrangements. Filtration of the crude oil before combustion may not be necessary if the oil can be left to settle for 36 hrs before use.

FLOW DIAGRAM OF EXPELLER® PRESS VEGETABLE OIL PLANT



ANDERSON
INTERNATIONAL
6200 Harvard Avenue, Cleveland, Ohio 44105 USA • Telephone: (216) 641-1112 • Telex: 98-0253 • FAX: (216) 641-0709

The small expellers operate at lower temperatures (35C compared to 80-90C for the larger units) which has the advantage that the amount of phospholipid gums in the extracted oil is much lower at 8-10ppm, compared to 80-100ppm for the larger units. The disadvantage is that a lower percentage of oil is extracted from the seed.

4.2 Extraction Efficiency

There is a significant variation among manufacturers in the extraction efficiencies predicted for their equipment.

However typical efficiencies for the possible combinations of equipment are as follows:

	%age oil from seed	%age oil residue in cake
a) Expeller alone	26	16
b) Expeller and filter	26	16
c) Mill, cooker, expeller, filter	32	10

Source: design figures from Anderson, La Mecanique Moderne, DeSmet Rosedowns, IBG Monforts.

4.3 Quality of Oil

'Double low' rapeseed is the strain chosen for this project. It provides the most suitable feed meal although it can be more difficult to extract the oil efficiently than from 'single low' strains.

Typical 'double low' seed contains 42% oil.

The oil produced is likely to have the following properties:

	Rapeseed oil	Gas-oil
Viscosity @40C:	35.0cs	3.9cs
@100C:	8.1cs	
Specific gravity:	0.92	0.83
Gross Heat Value:	39.4MJ/Kg	46.0MJ/Kg
Sulphur content:	0.12%	0.27%
Solids Content:		
Without filtration	5%	0%
After primary filter	0.1%	0%
After 'polish' filter	100-200ppm	0ppm

Most of the solids may be removed from unfiltered oil by settling overnight and decantation.

Extraction units in developing countries often operate in this way.

Rapeseed oil should be stored in dark containers with minimum air ingress. Anti-oxidants such as BHT or ethoxyquin may be required as additives for prolonged storage.

Sources:

Viscosity: Personal communication, Ethyl Corporation, David Ellis, Tel 0344 420511.

Heating value, sulphur content, specific gravity: 'Oil Crops of The World', Ribbelen, G., Downey, R.K., Ashri,A., McGraw Hill, (1989), pp118-131.

Solids Content: Personal Communication, Europa Crown Ltd, Mr Ken Bell, Tel 0482 844444.

4.4 Quality of Meal

Apart from it's higher oil content, the meal produced will be similar in its nutritional qualities to the 'double low' rapeseed meal produced by large scale extraction plants.

Higher oil content will increase the energy value of the meal.

Rapemeal contains certain toxins which are damaging to pigs and poultry in large quantities. Higher oil content reduces the proportion of toxins in the meal and increases the amount of rapemeal which can be safely included in the diets of pigs and poultry.

It should be possible to use high oil content meal safely at a 10% inclusion rate in feeds for growing pigs, pregnant and lactating sows and broiler chickens.

Typical inclusion rates used in formulations at present are 5% for conventional rapemeal and 20% for full fat rapeseed.

It may be possible to push the inclusion rate to 15% for growing pigs and broilers.

Rapemeal cannot be fed to laying hens because it gives problems with taint in eggs.

At high inclusion rates the hot mustardy taste can make rapemeal unappetising for pigs, particularly lactating sows.

Conventional rapemeal is used in ruminant diets but the high oil-content version may cause problems by interfering with the fermentation process.

Sources:

'The Use of Rapeseed in Pig Diets', Edwards,S.A. and Gill, B.P., Paper presented at conference on 'New Developments in Pig Breeding, Feeding and Nutrition', Northampton, Oct 1990.

Personal Communication, Scottish Agricultural College, Aberdeen, Dr S Edwards, Tel 0224 491989.

4.5 Expeller Manufacturers

Four manufacturers of oil extraction machinery have been contacted in the course of this study. They are:

DeSmet Rosedown
Anderson International
Mecanique Moderne
IBG Monforts

All four make expellers in the size range required for this project.

A fifth company, Krupp was not contacted because it supplies only very large expellers.

The manufacturers are described in Appendix B.

Performance figures for their machines are compared in Appendix C.

5 Economics

5.1 Burner Costs

Operating Costs:

Rapeseed oil burners will cost slightly more to run than conventional pressure-fed burners because they require an electrical preheater to warm the oil prior to combustion.

The power requirement will be 0.04KWhr per litre of oil (assuming 25% heat losses), adding 0.2 pence per litre to the cost of using the oil.

Capital Costs:

It is difficult to estimate the cost of modifying burners to use rapeseed oil without further testing.

However budget comparisons of preheated burners with conventional burners are as follows:

Application	Budgeted Capital Cost	
	Preheated	Conventional
Domestic heating Capacity 60kW	£ 170	£ 140
Commercial boiler or crop dryer Capacity 440kW	£1760	£ 810

5.2 Cost of extraction

The cost estimates made here are based on a 300Kg/hr capacity packaged plant offered by Mecanique Moderne and the simpler 35Kg/hr unit offered by IBG Monforts.

They appear to be the best developed package units currently available. The configuration of equipment chosen for the larger unit is package c) in section 5.2, namely; mill, cooker, expeller, filter. The small expeller is very simple and will be used without a filter.

These units do not have a particularly high efficiency but they are designed to be robust and easy to maintain.

Extraction efficiencies are:

35 Kg/hr plant	28% oil extraction
300 Kg/hr plant	30% oil extraction

Brochures for the two units are attached overleaf. Their performance is detailed in Appendix C.

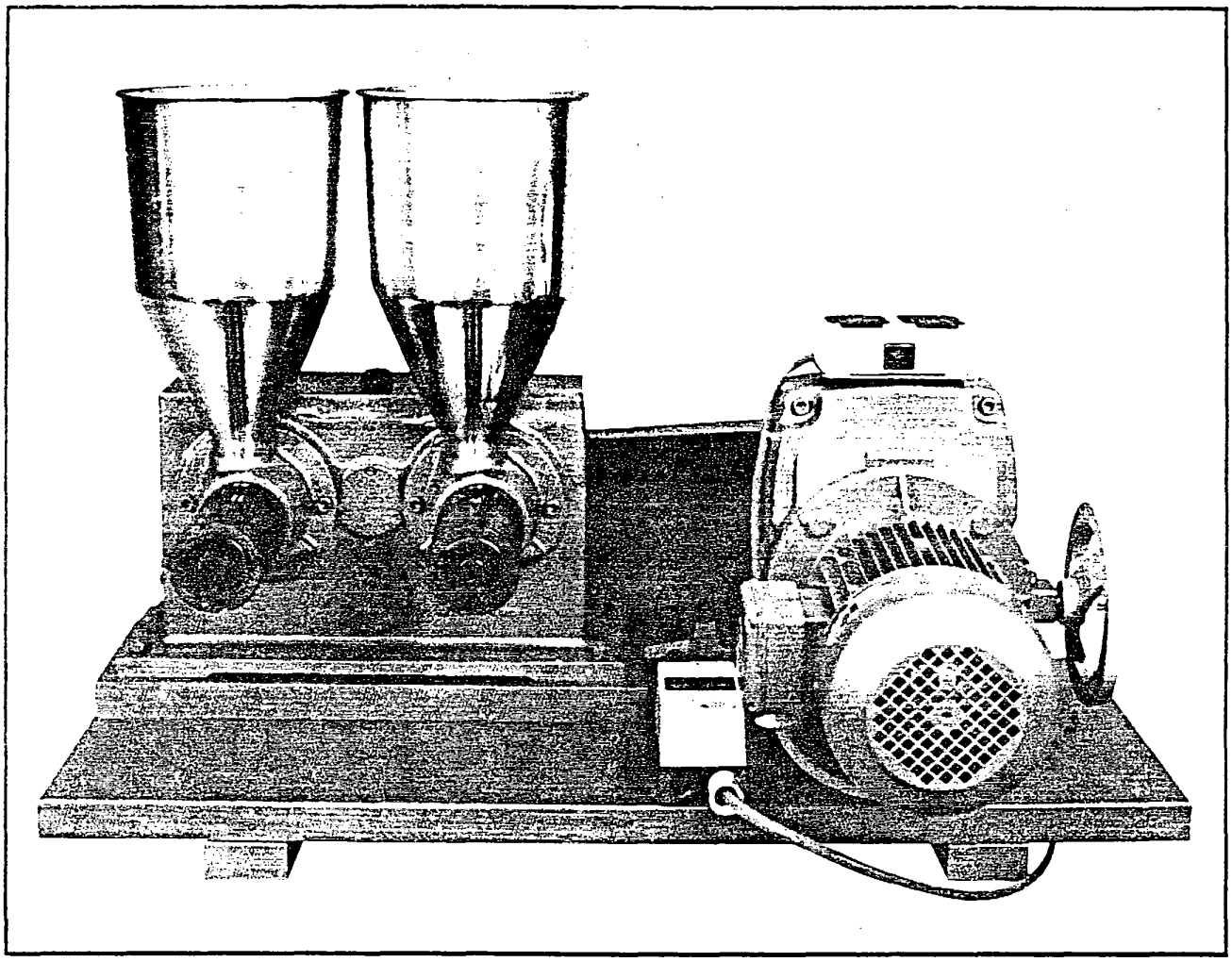
Installed capital costs are:

35 Kg/hr plant	£ 9800
300 Kg/hr plant	£121000

Operating basis - 24 hours/day operation (250 days/year)

Cost estimates:

Plant capacity:	Kg/hr	35	300
	te/yr	210	1800
Percentage oil extracted:		28%	30%
Operating costs: (£/te seed crushed)			
Power		£ 2.77	£ 9.60
Spares		£ 8.48	£ 5.00
Labour		£ 0.00	£ 4.17
Transport		£ 2.00	£ 4.00
Subtotal		£13.22	£22.77
Capital costs: (£/te seed crushed)			
Capital repayment		£ 9.33	£13.44
Interest repayment		£ 3.29	£ 4.74
Subtotal		£12.63	£18.19
TOTAL COST		**£25.85/te**	**£40.96/te**



KOMET Double Spindle Press DD 85

Drive: Two speed electric motor 380 V, 50 Hz, 1.75/3.5 kW, 715/1435 rpm (press spindle speed 29/58 rpm). V-belt drive.
With twin rotors, two spare press spindles, two ring heaters, tools and accessories.
Ready for operation and mounted on a heavy wooden base.
No foundation is required.

Dimensions:

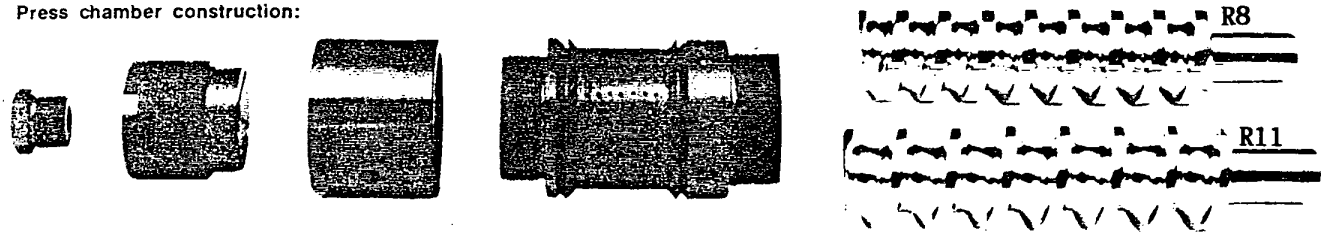
Length:	Width:	Height:
4,13 ft	1,98 ft	1,82 ft
1250 mm	600 mm	550 mm

capacity: 25–70 kg/h
dependant on the type and size of the raw material.
It is possible to drive the unit by petrol/Diesel engine or from a tractor output shaft.

Shipping specification:

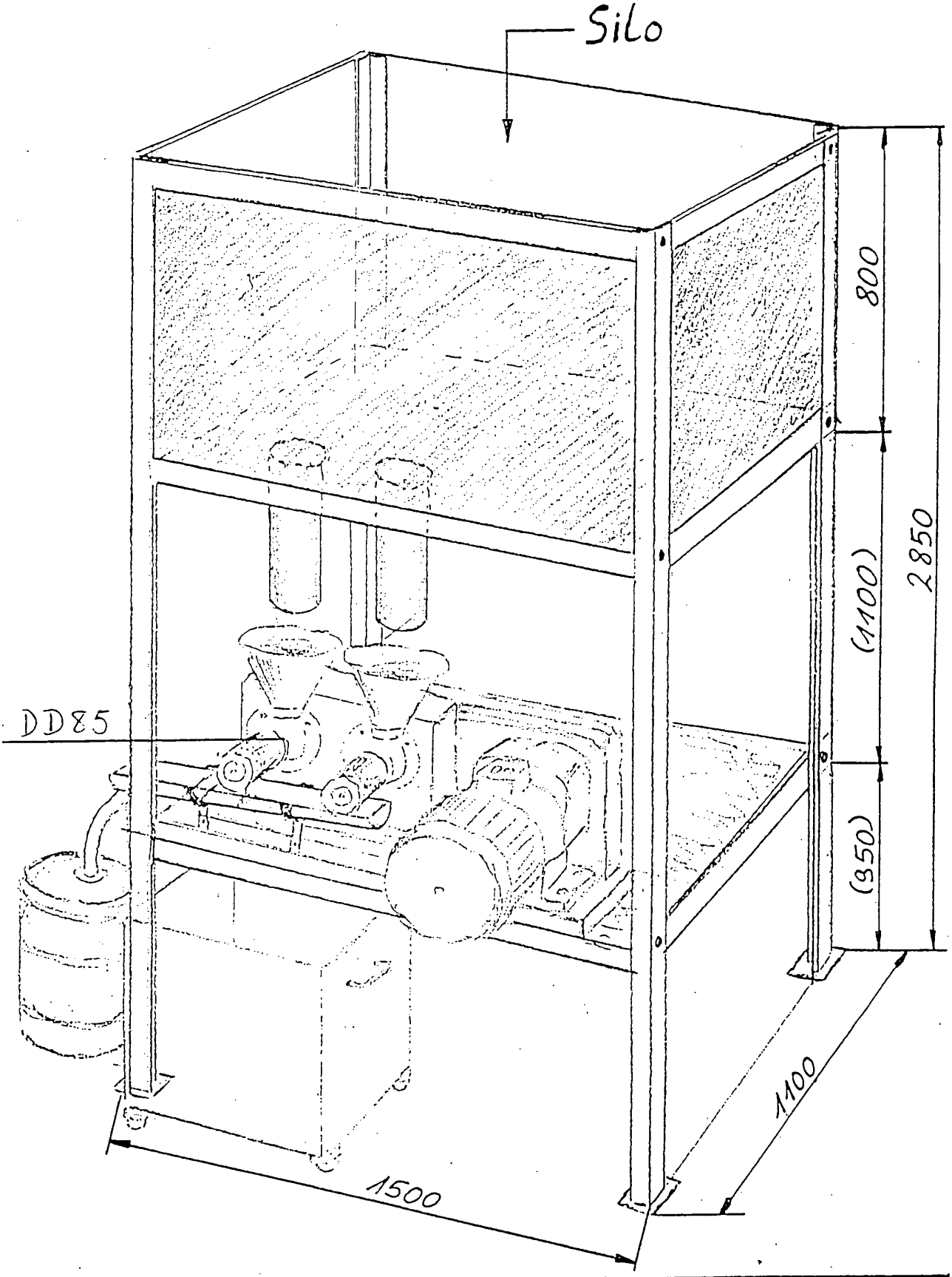
Case size: 4,46 x 2,31 x 2,15 ft (22,15 cbft)
1350 x 700 x 650 mm (0,62 cbm)
Gross weight: 260 kg
Net weight: 210 kg

Press chamber construction:



nozzle press head assembly nut press cylinder press-spindle

IBG MONFORTS GMBH & CO.
D-4050 Mönchengladbach 2 · An der Waldesruh 23 · P.O. Box 200853
☎ 02166/8682-0 · Telefax 02166/868244 · Tx 852592 ibgry



Maßstab: ½		Benennung: DD85-Einheit (Gestell)	Zeichn. Nr. DD85-239
Gez.: Sch	Dat.: 9.11.92		
Gepr.:	Dat.:		
IBG MONFORTS GMBH & CO. D-4050 MÖNCHENGLADBACH 2, POSTFACH 200853			

LA MECANIQUE MODERNE

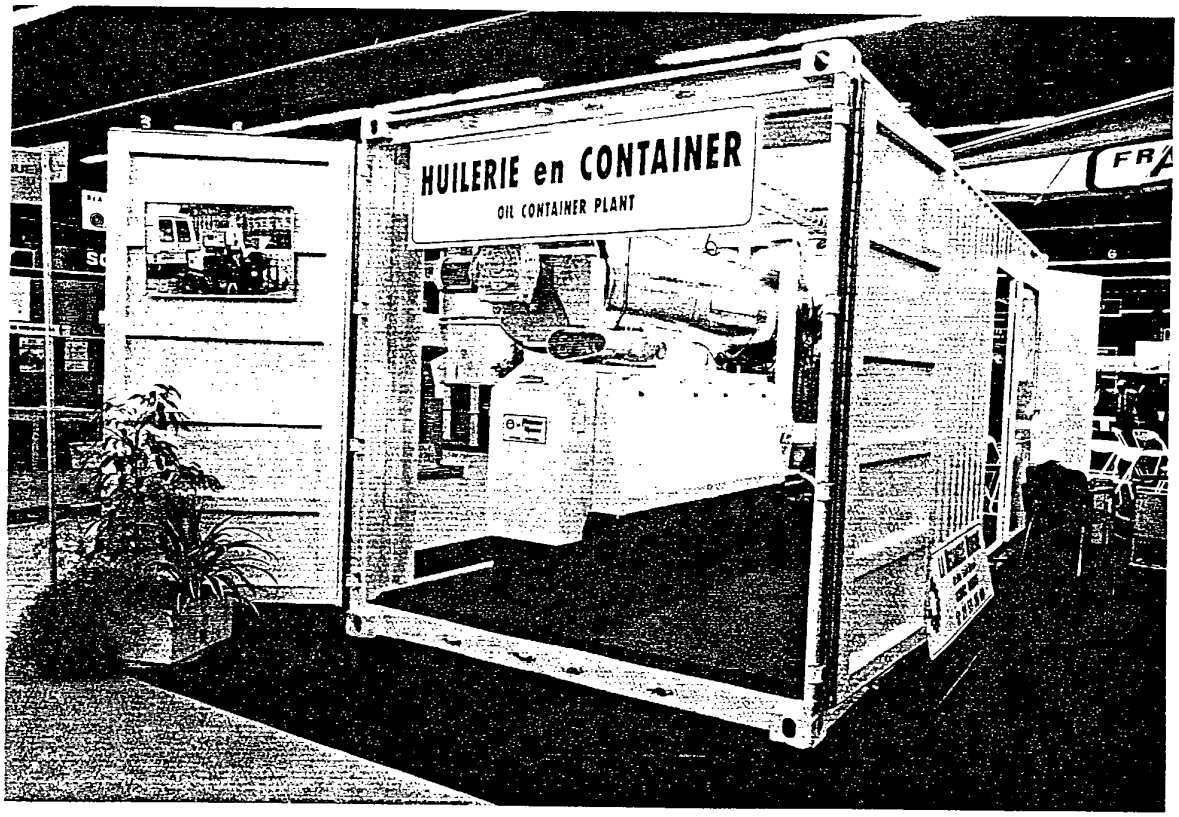
31, RUE SAINT-MICHEL
BOITE POSTALE 103
62002 ARRAS CEDEX (FRANCE)
TELEPHONE 21.55.36.00
TELEX 160890 F
FAX 21.24.04.34

L'HUILERIE EN CONTAINER

CONTAINERIZED OIL PLANT

CONTAINER-ÖLANLAGE

ACEITERIA EN CONTENEDOR



Capacité 350/400 Kg/h

Cette unité s'adresse à des exploitants désireux de produire une huile de bonne qualité dans des zones de faible production ou mal desservies.
L'HUILERIE EN CONTAINER peut être installée dans n'importe quel lieu, même là où les infrastructures sont inexistantes. Aucun génie civil n'est nécessaire.

This unit is addressed to operators wishing to produce high grade oil in areas where production is low or which are badly served.

CONTAINERIZED OIL REFINERIES can be set up anywhere. Even in places devold of all infrastructures. No civil engineering is needed.

Diese Anlage eignet sich für Betriebsunternchmen, die öl guter Qualität in zonen geringer produktion oder mit unzureichender versorgung herstellen möchten.

Die CONTAINER-OLANLAGE lässt sich überall aufbauen, selbstdort, wo es keine Infrastrukturen gibt. Es gind keine Bauarbeiten erforderlich.

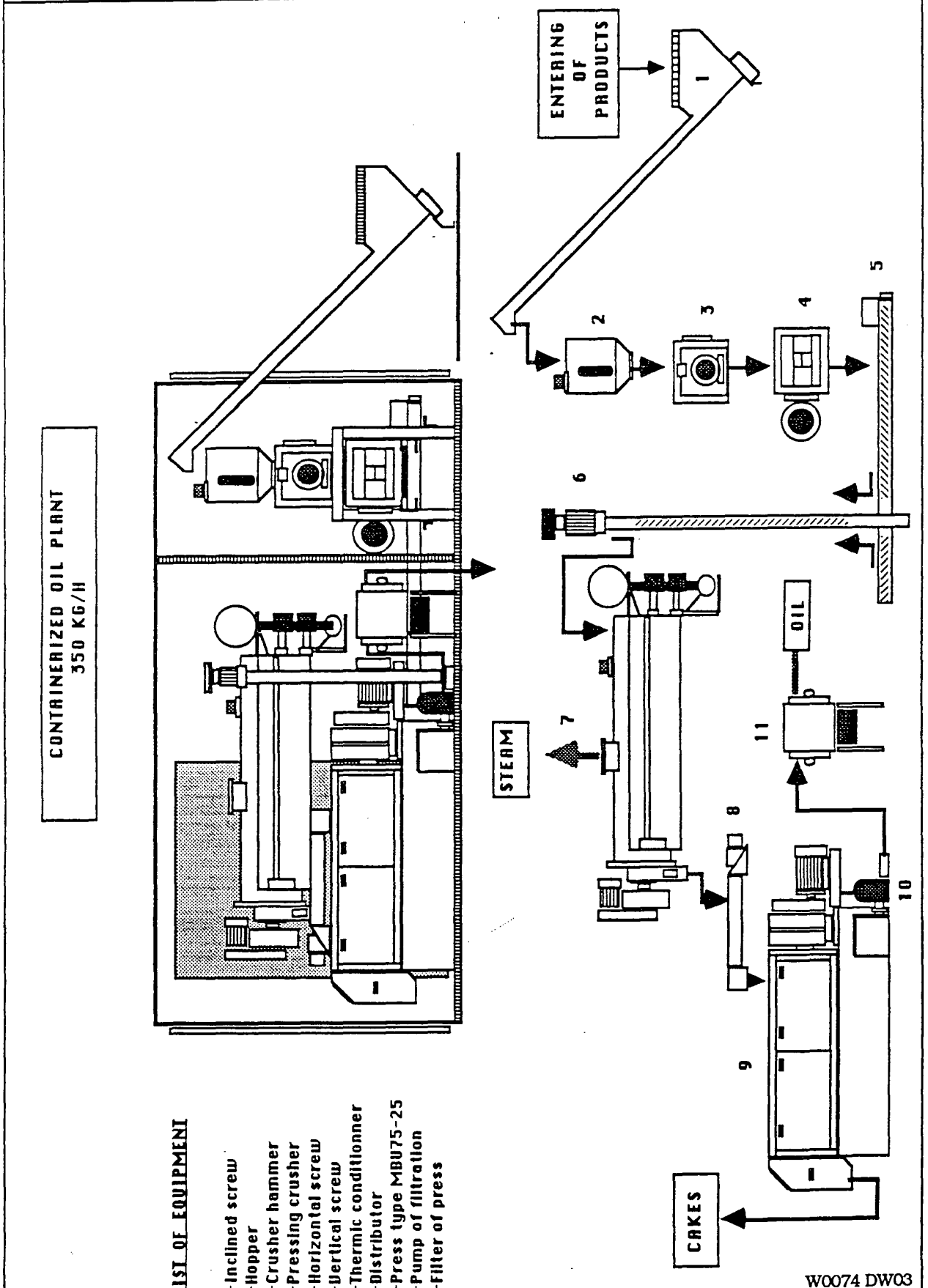
Esta unidad está dirigida a los industriales que deseen producir un aceite de buena calidad en zonas de baja producción o mal comunicadas.

La aceiteria en contenedor se puede instalar en cualquier sitio, incluso en lugares sin infraestructuras. No requiere ningún tipo de ingenieria.

Tel 21 55 36 00
Télex 160 890 F
Fax 21 24 04 34

CONTAINERIZED OIL PLANT HC2B

LA MECANIQUE MODERNE
62000 ARRAS - FRANCE



LIST OF EQUIPMENT

1 - Inclined screw
2 - Hopper
3 - Crusher hammer
4 - Pressing crusher
5 - Horizontal screw
6 - Vertical screw
7 - Thermic conditionner
8 - Distributor
9 - Press type MBU75-25
10 - Pump of filtration
11 - Filter of press

W0074 DW03
9011 DD

Notes:

1. Power is costed at a price of 4.8p/kWhr

2. The manufacturers state that wear will be almost the same in part-time and full-time operation. Start-up and shutdown are the times when greatest wear occurs. For this reason the annual spares cost is assumed to be the same, independent of number of hours operated each year.

3. It is assumed that the 35Kg/hr plant will require no extra manpower when operated on a farm.

   The 300 kg/hr plant has a greater capital cost per tonne processed and requires some supervision. It has a greater extraction efficiency. This plant is estimated to require a quarter of a man's time per shift on a three shift system. the full-time job cost is assumed to be £10000/year.

4. Oil and meal will be removed in bulk. The figures quoted are estimates only. Transport costs will depend on the proximity of users for the products. The smaller plant will draw seed from a smaller area and will be able to deliver it's products more locally than the larger unit.

5. It is assumed that capital will be borrowed at an interest rate of 11% (3% over a base of 8%) and repaid with interest on an annuity basis over five years (Source: National Westminster Bank).

5.3 Estimate of Overall Economics

Assume:

a) Yield of rapeseed is 1.25 tonnes per acre = 125 tonnes seed.

b) Yield of oil from rapeseed is 30% (12% oil in meal)

c) Yield of useful meal from rape seed is 69% (1% waste)

d) Rapeseed is processed in a centralised facility operating at full capacity, 35 or 300Kg/hr, 24hours/day (section 5.2).

e) Oil is sold at the current market price of £130/te.

f) Meal is sold at £100/te

g) Capital costs are: 35Kg/hr - £ 9800
300Kg/hr - £121000

Economic benefits are calculated for the two plants:

Basis: take 200 acres of land into set-aside:

Plant capacity	=	35Kg/hr	300Kg/hr
Variable cost of crop @£96/acre	=	(19200)	(19200)
Set-aside payment for land @£85/acre	=	17000	17000
Process 250 tonnes of seed	=	(3305)	(5692)
Sell meal @£100/te	=	17750	17250
Sell oil @£130/te	=	9100	9750
Operating profit for farmer	=	**21345**	**19108**
Subtract capital and interest components for processing of 250 tonnes rapeseed	=	(3156)	(4547)
Net cash flow to farmer	=	**18189**	**14561**

These estimates demonstrate that extracting crude rapeseed oil for use as a combustion fuel will generate a positive cash flow for the farmer even if the fuel has to be sold at the current UK market price of £130/te.

The return is greater if the oil can be sold at a premium, either by selling it for a non-combustion use or for combustion in a country with a more favourable tax regime.

Sensitivity of operating profit to different oil prices:

Oil price (£/te)		100	130	150	200	250	300
Operating profit/acre	35Kg/hr	97	107	114	132	149	167
(meal @ £100/te)	300Kg/hr	84	95	103	122	141	159

Sensitivity of operating profit to different meal prices:

Meal price (£/te)		60	70	80	90	100	110
Operating profit/acre	35Kg/hr	72	81	90	98	107	116
(oil @ £130/te)		61	70	78	87	95	104

Capital costs are: 35Kg/hr plant: £58/acre
300Kg/hr plant: £84/acre

For a one year payback on investment, the operating profit per acre must be greater than the capital cost per acre.

Current CAP rules state that for an industrial crop to qualify for set-aside payments the value of the part of the crop which is used industrially must exceed the value of the parts of the crop which are used as food. This rule may cause a problem in claiming set-aside payment if the rapemeal is sold as animal feed in the European Community.

6 Conclusion

Rapeseed production for food uses is expected to decrease in 1993 due to changes in the Common Agricultural Policy and the GATT trade agreement.

Growers are therefore urgently seeking new markets for their crop.

Localised extraction of rapeseed oil as a renewable energy source has two advantages:

It is a new market with relatively low entry costs for the individual farmer.

It is a constructive use of otherwise redundant land.

The study concludes that production is likely to be technically feasible and economically viable with an oil price of £130/te, a rapemeal price of £100/te and a land subsidy of £85/acre.

If oil or rapemeal can be sold at higher prices the proposition becomes very attractive.

The second phase of this project has now been authorised by the HGCA. In this phase the practical feasibility of the technology will be confirmed by organising combustion trials in cooperation with a burner manufacturer.

Samples of rapeseed oil extracted using both large and small scale mechanical expellers and oil extracted on a large commercial solvent extraction plant will be tested for their combustion characteristics.

It is planned that this work will be complete by April 1993.

For further information please contact:

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or

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Glossop
Derbyshire
SK13 9BT

Tel 0457 857230
Fax 0457 852655

APPENDICES

Appendix A - Details of Burner Manufacturers

Nu-Way

Address: Nu-Way Ltd
PO BOX 1
Vines Lane
Droitwich
Worcs
WR9 8NA

Contact: Mr Cadwell, R+D Manager Tel 0905 794331
Fax 0905 794017

Nu-Way hold 55% of the market for small to medium-sized burners in domestic and commercial heaters.

They have a test facility at their factory in Droitwich with facilities for burning fuels with preheat in both small central heating-type burners and larger commercial burners with a capacity of 300 KW.

They are keen to participate in this project and have submitted quotations for both the pilot and practical combustion trials.

Hamworthy

Address: Hamworthy Combustion Systems Ltd
Fleets Corner
Poole
Dorset
BH17 7LA

Contact: Mr C Moxham, Technical Manager Tel 0202 665566
Fax 0202 665333

Hamworthy produce larger industrial burners. They have extensive test facilities with a full range of monitoring equipment in their workshops at Poole in Dorset.

The minimum size of burner which they can test with preheat in their test unit has a capacity of 1400 KW, suitable for a medium-sized industrial boiler.

They are also keen to participate in a trial and have submitted a quotation for the pilot phase of the combustion trials.

Weishaupt

Address: Weishaupt (UK) Ltd
Neachells Lane
Willenhall
West Midlands
WV13 3RG

Contact: Peter Vaughan Tel 0902 609841
Fax 0902 633343

Weishaupt are a German company with a UK sales office. They are the market leaders in supplying burners to the crop-drying market.

They have limited test facilities in the UK. They would like to be considered for the practical phase of the combustion trials once the burning characteristics of the oil have been established in detail.

Priva

Address: Priva UK Ltd
Bredon Road
Tewkesbury
Gloucester
GL20 5BX

Contact: Mr J Datson Tel 0684 293081

Priva are a Dutch company, again with a UK sales office. Priva burners are widely used in glasshouses and broiler units for space heating due to their clean-burning characteristics.

They have no UK test facilities but could use their Dutch pilot plant to test rapeseed oil. At present they are not able to participate in the trials.

Appendix B - Expeller Manufacturers

DeSmet Rosedown

Address: De Smet Rosedowns Ltd
Cannon Street
Hull
HU2 OAD

Contact: Mr John Longley Tel 0482 29864
Fax 0482 25887

Rosedowns is an old-established British firm, recently taken over by the Belgian company DeSmet.

The company produces two machines in the size range required, the Mini 40 and Mini 200.

An extraction trial using 1 tonne of rapeseed provided by United Oilseeds Marketing was carried out on a Mini 200 machine located at Hull.

Anderson International

Address: Europa Crown Ltd
2nd Floor
Hallgate House
177 Hallgate
Cottingham
Humberside
HU16 4BB

Contact: Mr Ken Bell Tel 0482 844444
Fax 0482 844944

Anderson is an American company based in Cleveland Ohio. Europa Crown is it's European marketing company.

Europa Crown were able to provide quotations for all the configurations of equipment described in section 4.2.

Anderson's Delta machine has a capacity of 300Kg/hr rapeseed and their smaller Lion 90 has a capacity of 50 Kg/hr.

They have supplied several small packaged oil extraction plants based on the Delta to the countries of the old Soviet Union.

La Mecanique Moderne

Address: La Mecanique Moderne
B.P. 103
62002
Arras
CEDEX
France

Contact: Mr G Delvincourt Tel 010 33 21 55 36 00
Fax 010 33 21 24 04 34

This company produces both large and small expellers including a range of low-tech trailer and container mounted package plants of the type required for this project. They are currently sold mainly to developing countries.

The MBU 20 press has a capacity of 150Kg/hr rapeseed. The MBU 75-25 can process 300 Kg/hr.

Mecanique Moderne have provided quotations for all the configurations required. They are also able to supply an MBU 20 machine on a rental basis for an initial trial.

IBG Monforts

Address: IBG Monforts Gmbh & Co
Postfach 200853
D-4050
Monchengladbach 2
GERMANY

Contact: Mr Dimpker Tel 010 49 21 66 86 82 0
Fax 010 49 21 66 86 82 44

Monforts have supplied many of their Komet DD85G expellers to the Austrian biodiesel companies.

Rather than manuacturing several sizes of machine, Monforts have standardised on a single simple, low-cost device with a standard throughput on rapeseed of 35Kg/hr.

If a customer requires increased capacity he must purchase a number of identical machines.

Appendix C - Comparison of Expellers

Performance figures and costs for the packaged plants offered by the four manufacturers contacted in the course of this study are tabulated here.

The package units described are as follows:

a) Expeller alone

b) Expeller, filter, oil collection tank

c) Hammer mill, cooker, expeller, filter, oil collection tank, some handling equipment

There are wide variations in the specifications for these packages. The prices and performance figures must be taken as a guide only.

Manufacturer	Rosedown	Anderson	Mecanique	Monforts
Model	Mini 40	Lion 90	MBU 20	DD85G
Capacity (kg/hr)	35	60	150	35
Annual capacity (te/yr) 24hrs/day, 250 days/yr	210	360	900	210
Cost for package a)	5600	14100	13100	9300
Spares (£/yr)	3550	5750	3200	1780
Power (kW)	4	6	8	2
Oil in cake (%)	14	15	16	14
Cost for package b)	17600	34500	32100	none
Spares (£/yr)	3800	6000	4400	
Power (kW)	4	6	8	
Oil in cake (%)	14	15	16	
Cost for package c)	none	none	44500	none
Spares (£/yr)			5600	
Power (kW)			35	
Oil in Cake (%)			14	

Manufacturer	Rosedown	Anderson	Mecanique
Model	Mini 200	Delta	MBU75-25
Capacity (kg/hr)	200	300	300
Annual capacity (te/yr) 24hrs/day, 250 days/yr	1200	1800	1800
Cost for package a)	19400	46000	none
Spares (£/yr)	3860	6000	
Power (kW)	8.5	22	
Oil in cake (%)	14	15	
Cost for package c)	none	96000	121000
Spares (£/yr)		8500	9000
Power (kW)		55	60
Oil in cake (%)		11	12

No cost is given for case b) because the larger capacity machines (150 Kg/hr plus) are not normally used without pre-milling and heating of the seed. The cost of the additional equipment is offset by the improvement in yield which is achieved.

Appendix D - Other Useful Contacts

Other individuals and organisations who are active in the field of industrial uses for rapeseed in the UK are:

Dr Kerr Walker or Dr Garth Entwhistle
Scottish Agricultural College
Agronomy Department
581 King Street
Aberdeen
AB9 1UD
Tel 0224 480291
Fax 0224 276962

Mr Richard Matthews
United Oilseeds Marketing Ltd
'The Cedars'
Bath Road
Devizes
Wiltshire
SN10 2QS
Tel 0380 729200
Fax 0380 729186

Mr Ralph Metson
NFU Industrial Crops Committee
Pooty Pools Farm
Roxwell
Chelmsford
Essex
CM1 4NW
Tel 0245 248425
Fax 0245 248043

Mr David Richardson
Sentry Farming Group
St Aubins
2 Wellington Street
Newmarket
Suffolk
CB8 0HT

The following people are active in the Austrian industry, making biodiesel from rapeseed oil:

Dipl Ing Werner Korbitz (Consultant on biodiesel marketing)
Graben 14/3
Postfach 97A-1014
Wien
Austria
Tel 010 43 1 53 5 56 33
Fax 010 43 1 53 4 56 38

Ing Gunter Alfort
(Manager of company building new biodiesel plants)
Vogel and Noot GmBh
Ruthardweg 17
Graz
8055
Austria
Tel 010 43 316 29 69 90 24
Fax 010 43 316 29 69 10

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