Current Equipment for Mechanical Oil Extraction

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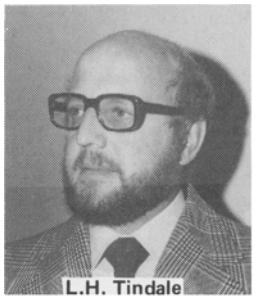
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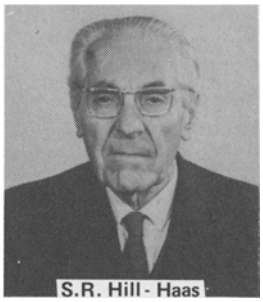
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ABSTRACT

This paper describes the range of screw presses available to processors and lists technical features which have been brought to the authors' attention. The range of equipment is discussed manufacturer by manufacturer, starting with the smallest available equipment and progressing to the largest. The manufacturer's rated capacity is used as the measure of size. As most manufacturers prepare their information in a variety of ways, this paper, in an attempt to compare machines on a uniform basis, has based all throughputs on 2,000 lb/ton, with meats from "whole cottonseed" (with an assumed hull content of 8-10%) at 24 hr/day. For this reason, the figures given in this paper will not always agree with figures published by manufacturers. Throughputs on other material should be discussed with the equipment manufacturers, who generally have available data on most commercially processed oil-bearing seeds.

INTRODUCTION

It is not intended to deal with the various methods and requirements for the preparation of the numerous oilseeds commercially processed throughout the world, as this subject is covered by other speakers in papers presented at this Conference. It is sufficient for me to say that the importance of correct preparation, such as cleaning, delinting, dehulling, decorticating, breaking or flaking, and cooking conditioning, cannot be stressed too strongly; for without correct preparation, mechanical equipment used for the extraction of oil from raw materials cannot obtain the required results.

Very often the manufacturers of equipment have been informed by clients that they are having problems with a screw press, such as oiling up, heavy footing, high oil in cake figures, and excessive wear, only to find on investigation that the preparation of the material prior to feeding into the press is the main cause of the poor results.

The manufacturers, however, have come a long way since the first successful use of the mechanical screw press back in 1906. Generally improved materials of construction and manufacturing methods, research and development, together with data obtained in the field, have increased efficiency, with the result that the range of screw presses presently offered to the oil milling industry can meet the requirement, whether it be capacity or residual oil, of most processors.

With regard to capacity, the equipment is separated into dual purpose equipment, i.e., that capable (with changes to the shaft assembly, spacer settings, and shaft speeds easily carried out) of single/straight or pre-pressing duties on oilseeds and that designed specifically for pre-press duties prior to a solvent extraction plant. Within this latter category are included those machines which are used as fore-presses, which, while giving a cake with an oil-in-cake figure too high to be generally accepted for duty before a solvent extraction plant, are accepted practice in some countries for first pressing of material of high oil content, such as peanuts and copra.

In preparing this paper, the following manufacturers of equipment have been approached: Anderson IBEC (USA), Damman-Croes (Belgium), The French Oil Mill Machinery Co. (USA), Hander Oil Mill Machinery (Japan), Krupp Maschinenfabriken (West Germany), Reinartz (West Germany), Simon-Rosedowns (England), Speichim (France), and Stork-Amsterdam (The Netherlands).

This paper is based principally on information supplied by these companies, and brief descriptions of a particular manufacturer's range do not necessarily indicate a lack of technical features but rather the authors' lack of expertise in eliciting this information.

There are additional manufacturers of mechanical extraction machinery not covered in this paper. It was not the intention of the authors to ignore these companies. However, if a company is not covered, it is either due to the regional scope of its activities so that its presence or existence was unknown to the authors or to lack of response to inquiries from the authors.

CURRENTLY MANUFACTURED SCREW PRESSES

Anderson IBEC

This company was the first to manufacture and market a continuous screw press, called an expeller. In 1906, a machine went into commercial operation in a mill processing flaxseed.

The Anderson IBEC range comprises four machines—the Red Lion; Model 33 and Model 55, which are duo purpose machines; and the 11-66 pre-press.

The smallest of the range, the Red Lion, is stated as having a capacity of 5 tons. This machine has a single pressing cage/barrel of ca. 33 in. length and is driven by a 20 HP motor through a V-belt drive. The wt of this very durable little machine is ca. 4 short tons (hereafter in all cases referred to simply as *tons*).

Model 33 is the next in the range, with a stated capacity of 40 tons. This machine has two pressing cages/barrels—the first in the vertical position, this being 25.6 in. long, and the other 33 in. long in the horizontal position. The shafts through these barrels are driven by separate motors, each of 40 HP, through sets of gears. This model can also be supplied for pre-press duties with a stated capacity of 90 tons/day.

Based on the Model 33 is the Model 33 Duplex, which is a heavier machine for processing fibrous material such as copra and palmkernels. The motor driving the main horizontal shaft is increased to 50 HP, and the machine is fitted with extra heavy thrust bearings and special gearing and is supplied with a water cooled main shaft. The wt of the Model 33 is ca. 10 tons.

The Model 55 has the same configuration as the Model 33, with the horizontal cage/barrel having a length of 55 in. The shafts are again individually driven, motors of 50 HP and 75 HP being fitted. The wt of this machine is ca. 11.5 tons, and the stated capacity is 50 tons/day on high pressure pressing and 110 tons/day on pre-pressing.

All the Model 33 and 55 machines have integral oil/foots conveyors and adjustable choke mechanisms, and these can be motorized if required. Also available is a cage cooling/

flushing system using recirculated oil which is cooled through a heat exchanger.

The largest of the Anderson machines is the 11-66, which is used purely as a pre-press prior to a solvent extraction plant. This press uses a single horizontal main worm shaft which runs through a 66 in. long by 12 in. diameter barrel. This machine comes complete with a motor driven choke mechanism, and its stated capacity is 200 tons/day.

The wts quoted for the Anderson IBEC range of screw presses include a 9 in. feeder.

Damman-Croes

This company, which has been involved in the oilseed industry for 100 years, has recently introduced two screw presses into its list of equipment, the dual purpose machine being the SP50 DUAL, the pre-press being designated the PP125.

The SP50 DUAL screw press has the first cage in the vertical position, this being 48.03 in. in length with a diameter of 8.86 in.; the horizontal cage is 74.01 in. long by 7.87 in. diameter. Each shaft has a separate drive motor which drives the gearbox through V-belts; the vertical shaft motor is 40 HP and is mounted on a rotatable baseplate on top of the machine; the horizontal shaft is driven by a 100 HP motor which is mounted on top of the gearbox; again drive to the gearbox is by V-belts.

The rated capacity of this machine, which weighs 18.7 tons, is ca. 65 tons.

The horizontal shaft is bored for water cooling, and the machine is fitted with an oil cooling/flushing system. An hydraulically controlled choke mechanism with fingertip positioning control is also fitted.

The pre-press, the PP125, is based on the design of the SP50, the drive motors and cage lengths being the same for both machines. The cage diameters are 9.84 and 8.66 in. for the vertical and horizontal, respectively.

Capacity of this machine is ca. 160 tons, and the PP125 weights ca. 20 tons. Both machines are fitted with hydraulic lifting units for the horizontal cage; the vertical cage can be removed by hoist through the top of the machine. The oils/foots conveyor is positioned in the base of the press and can be arranged to discharge at any point along its length.

A cake breaker is fitted below the cake discharge point. A flap arrangement is used for directing the cake to either the normal or reject cake conveyors. This flap is also used as a sampling point.

The French Oil Mill Machinery Co.

This company has the largest range of mechanical screw presses available from any manufacturer, and, if the Model F44 with its ability to be extended to a larger machine is taken into account, then the range comprises 16 different machines.

The basic dual purpose machines are the Models F and D, these being designed around 150 HP and 250 HP gearboxes, respectively, and have a 7 in. diameter barrel with two bottom-hinged main cages made up of 11 in. screen bars in various combinations of three- and four-section cages. It is not necessary to remove the cages for relining with screen bars, as these are attached to the water cooled inserts which are easily removed by removing two cap screws on each insert. This feature, the manufacturer states, reduces maintenance downtime and decreases spares inventory.

It appears that this company alone is offering this system of cage cooling, which can also be used to heat the press on startup, using steam. Once the press is producing cake, the steam can be turned off and cooling water introduced.

The makers claim that further advantages of this method of cage cooling, as opposed to the oil flushing method, are that the operator can readily see if foots are being produced and that the oil is flowing from the cages correctly, although the oil screen should enable the operator to observe whether excessive foots are being produced with either method of cooling.

Another innovation used by French is the two speed water cooled main shaft. The shaft, which rotates faster at the feed section than at the pressure section, is driven by a single gearbox and motor. It is claimed that this system, which provides straight line force feeding, is more efficient and reduces the foots produced in the feed section.

As with most screw presses being marketed, the shaft is removable without disturbing the gears, and the worms can be reversed on the shaft when they become worn on one side, doubling the life of these parts.

This manufacturer also puts forward a motorized or mechanically adjustable choke which is fitted on the extreme end of the press, enabling the cake being discharged to be viewed by the operator.

The patented French Change-O-Speed motor mount is a standard feature on the range of presses being discussed and permits changing the shaft speed of the press. By loosening the clamp nuts and using the jacking screw to lift the motor, the motor pinion can be changed quickly and easily, so when the throughput decreases as the worms wear, the speed can readily be increased to compensate.

The main drive motor supplied with the presses has a built-in high capacity blower which is arranged for piped ventilation using cool, dust free air from outside the building.

Another feature of this range of screw presses is the variable speed feeder and nonclogging revolving downspout. The feeder is directly mounted over the press and delivers the feed from the cooker to the press at a rate which can be varied depending upon the material being processed and the purpose of processing.

The full range of D and F model presses is given in Table I.

The largest dual purpose screw press manufactured by French is their model C3300 (Fig. 1), which has a 10.25 in. inside diameter by 102 in. long drainage cage/barrel and is built for extra rugged duty. This press is fitted with all the features applicable to the D and F model ranges and has a claimed capacity of over 110 tons/day with an oil-in-cake figure in the 3-3.5% range.

This press is driven by a motor in the 250-300 HP range, and the wt of the press is ca. 21 tons.

All the aforementioned screw presses can be changed for pre-press duty, which in most cases doubles the capacity.

French manufactures three pre-presses, of which the B1500 and B2100 are single speed machines. The capacities of these machines are 100 and 170 tons/day with a wt of 15 and 18 tons, respectively. Both are fitted with cage clamps instead of the usual cumbersome through bolts, and this arrangement reduces the takedown time to one-sixth of the time taken on the more usual arrangement. As standard equipment, this range of screw presses is supplied with a motorized choke mechanism, water cooled shaft and cage inserts, and 9 in. variable speed screw feeder. On both machines is a fabricated steel splash lubricated gearbox with 260 HP herringbone gear which, in the case of the B1500, is driven by a foot mounted 75 or 100 HP main motor, and by a 200 HP motor in the case of the B2100. The B1500 has a 7 in. diameter by four-section main cage with an 8.5 in. diameter by one-section auxiliary cage, whereas the B2100 has a 10.25 in. diameter by four-section main cage and a 12 in. diameter by one-section auxiliary cage. In both cases, the integral feed hopper and drainage cage are split on the vertical centerline and pivot on long integral hinge lugs, allowing complete opening of the cage to permit easy replacement of the screen bars when necessary.

The largest in the range is the H2-6600, which has a rated capacity of 460 tons/day and is driven by a 600 HP

TABLE I

Descriptions of Screw Presses

Company	Model	Wt (tons)[a]	Capacity (tons)	Drive (HP)	Cage diameter (in.)	Cage length (in.)	Wt:Capacity (ton:ton)	Capacity:Cage length (ton:in.)	Capacity:HP (ton:HP)
Anderson IBEC	Red Lion	4	5	20	-	33	1:1.25	1:6.6	1:4.00
	Model 33	10	40	80	-	58.625	1:4.00	1:1.47	1:2.00
	Model 55	11.5	50	125	-	83.625	1:4.35	1:1.61	1:2.50
	11-66	-	200	-	12	66	-	1:0.33	-
Dammon-Croes	SP 50	18.7	65	140	8.86 x 7.87	122	1:3.48	1:1.87	1:2.15
	PP 125	20	160	140	9.84 x 8.66	122	1:8.00	1:0.76	1:0.87
French Oil Mill	F44	9.5	22	75	7	44	1:2.31	1:2.00	1:3.41
	F44 with 2x11 in. extension	11	42	125	7	66	1:3.00	1:1.57	1:2.98
	F66	10.5	36	125	7	66	1:3.42	1:1.83	1:3.47
	F77	12	42	125	7	77	1:3.50	1:1.83	1:2.98
	F88	13.5	42	125	7	88	1:3.11	1:2.09	1:2.98
	D66	13	42	200	7	66	1:3.23	1:1.57	1:4.76
	D77	15	50	200	7	77	1:3.33	1:1.54	1:4.00
	D88	17	65	200	7	88	1:3.82	1:1.35	1:3.08
	C3300	21	110	300	10¼	102	1:5.24	1:0.93	1:2.72
	B1500	15	100	100	8¼ x 7	55	1:6.67	1:0.55	1:1
	B2100	18	170	200	12 x 10¼	55	1:9.44	1:0.32	1:1.18
	H2 6600	21.25	460	600	16 x 14	99	1:21.65	1:0.24	1:1.3
Krupp Maschinen	L.P.	11.5	46	125	7.874	59.055	1:4.00	1:1.28	1:2.72
	S.V.P.	10.25	190	180	12.598 x 10.24	76.063	1:18.54	1:0.40	1:0.95
Simon-Rosedowns	Mk 2A	7.7	20	50	6	66	1:2.59	1:3.30	1:2.50
	Mk 3A	8.4	33	75	6	88	1:3.93	1:2.67	1:2.27
	"E" type	13.4	80	200	7	103	1:5.97	1:1.29	1:2.50
	"G" type	13.1	190	240	9.84 x 8.98	109.84	1:14.5	1:0.57	1:1.26
Speichim	301	7	22	40	8.66	55.12	1:3.14	1:2.51	1:1.82
	400	12	38.5	75	9.45	72.83	1:3.21	1:1.89	1:1.95
	500	17.5	143	125	11.02	88.58	1:8.17	1:0.62	1:0.87
	500L	21	175	150	11.02	110.23	1:8.33	1:0.63	1:0.86
Stork-Amsterdam	R400	4.25	45	40	-	-	1:10.59	-	1:0.89

[a]In all cases, short tons.

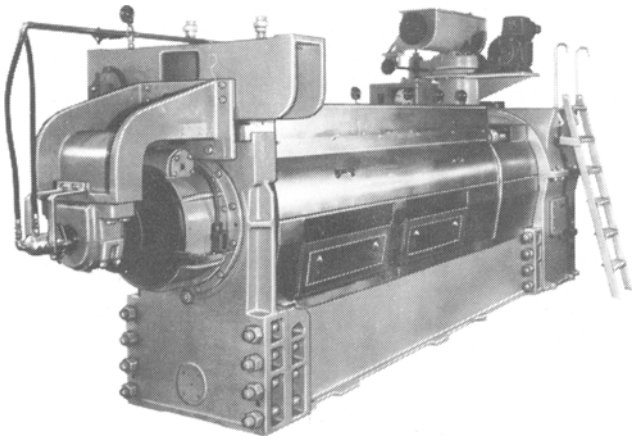

FIG. 1. C3300, 300 HP, full pressing screw press by French.

motor. This pre-press has a 16 in. diameter feed section and two 4-section main cages of 14 in. diameter. The two 4-section 14 in. cages have water cooled inserts which contain the screen bars; the main shaft is also water cooled. The single speed shaft is driven from the discharge end. The drive motor is a French flange mounted type, which permits easy changing of the motor pinion to adjust the main shaft speed.

The cage contains one fixed restrictive orifice near midpoint and a variable orifice at the discharge, called a vented cone mechanism. This is driven by a limitorque motorized gear with integral limit switches and a cone position indicator permitting the cone to be operated or adjusted either at the machine or from a remote location while the press is in operation.

The shaft arrangement consists of a 16 in. feed screw of case hardened cast steel with carbon steel pressing worms and collars hardcoated with Stellite. The shaft has several patented notch worms placed near the discharge end that masticate as well as press the seed.

The wt of this press is ca. 21.25 tons.

On most of French's new range of screw presses, wedge bars have been discarded, which gives an increase in the drainage area available.

Krupp Maschinenfabriken

This company entered the screw press field originally manufacturing under license the original V.D. Anderson expeller. However, for some years they have designed and built their own screw presses. Only two models are presently manufactured, these being the LP, a dual purpose machine, and the SVP, which is only used for pre-pressing.

The LP press has a rated capacity of ca. 46 tons/day; this throughput virtually doubles when it is used as a pre-press. It weighs 11.5 tons without motor. This press has two pressing cages—the first in the vertical position, this being some 23.62 in. made up of two 11.81 in. long sections, and the second being in the horizontal position and having five 11.81 in. sections. The inside diameter of both cages is 7.87 in.

The vertical shaft is driven by a 25 HP geared DC motor of infinitely variable speed, the direct current required for the operation of this motor being produced by a rectifier built into the switch panel, which is generally supplied with the press.

The horizontal shaft is bored to permit water cooling and is driven by a 100 HP motor with a V-belt drive through a gearbox which is designed for a maximum torque of 44,145 Nm. The gears and bearings are lubricated by an integral gear pump which is driven from the drive shaft.

At the discharge end there is an hydraulically operated choke mechanism which can be adjusted while the press is in operation.

This machine is extremely robust, with the cages being of cast steel. There do not appear to be any wedge bars used in the cage assembly, and it is assumed that the breaker/knife bars take over this function.

The SVP, as previously mentioned, is used exclusively as a pre-press. This press has a single straight through shaft bored for water cooling and is driven by a motor of ca. 180 HP, with V-belt drive, through the same type of gearbox as that used for the LP screw press. The rated capacity of this machine, which weighs ca. 10.25 tons without motor, is ca. 190 tons/day.

The cage of this machine is made up of seven sections, each being 10.87 in. long, the first three sections being 12.60 in. diameter while the remaining four sections are 10.24 in. diameter. The cone mechanism is manually adjustable.

Simon-Rosedowns

This company makes six screw presses. The smallest of the range, the Maxoil will not be discussed. Over 2,000 have been sold throughout the years, and it is still being manufactured together with the "LC" (Large Capacity), which was primarily manufactured as a fore-press for high oil content seeds.

The first press in this manufacturer's range of dual purpose machines is, therefore, the Mk 2A. This machine is a redesign of Rosedowns' Mark 2 machine which was introduced in the 1960s; the redesign is based on their Mark 3 screw press. The capacity is ca. 20 tons/day, and it weighs ca. 7.7 tons.

With a main cage 44 in. long and a primary cage 22 in. long, total cage length is 66 in., the inside diameter of the cage being 6 in. Mechanically assisted lifting and lowering equipment is supplied for the main cage.

The motor, generally 50 HP, is mounted on top of the gearbox. An additional geared type motor fitted on the base of the press drives the oils/foots conveyor. This discharges at about midpoint of the base of the press using left and right hand flights.

The main worm shaft is driven from the discharge end and, through a gear arrangement at the feed end, it drives in turn the auxiliary feed worm which is mounted above and to one side of the feed section of the main worm shaft. The main worm shaft is tapered in steps towards the feed end and can be easily removed from the press without disturbing the gearbox or drive in any way. This shaft is also bored to facilitate cooling. The cooling water enters the shaft via a water pipe inserted in the bore and returns down the bore to discharge from the same end of the machine.

Cake thickness at the discharge end of the main cage is controlled by a manually operated choke mechanism. Cake thickness can be adjusted during press operation. The press is fitted with a cake cutter which is removable and with separate outlets for reject and normal cake discharge, the outlet served by a flap arrangement.

The next screw press in the range is the Mk 3A screw press, which is again a redesign of the original Mark 3 screw press. The capacity of this machine is ca. 33 tons/day. This capacity virtually doubles when used as a pre-press. The press weighs ca. 8.4 tons.

The Mk 3A has a main cage length of 66 in. in two 33 in. sections, with a primary cage length of 22 in. and an inside diameter of 6 in. Again, mechanically assisted cage lifting and lowering equipment is provided for the two main cages. The main drive is by electric motor of 75 HP mounted on top of the gearbox. All the features of the Mk 2A are incorporated into this screw press, and an oil cooling/flushing system can be incorporated if required.

The largest of the Rosedowns dual purpose machines is the "E" type (Fig. 2) screw press, with a capacity of ca. 80 tons on single pressing and double this when used as a pre-press. This machine weighs ca. 13.4 tons. The

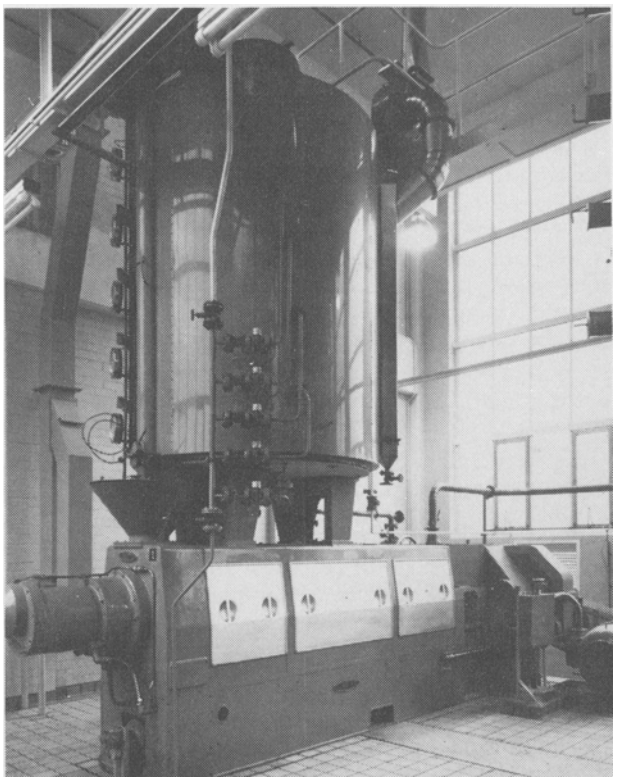

FIG. 2. "E" type press with six-stage cooker by Simon-Rosedowns.

150-200 HP motor is floor mounted. There are three cages, the primary cage 26 in. long and the two main cages 33 in. and 44 in. long, giving an overall cage length of 103 in. The cage diameter of this machine is 7 in. The basic design of this machine is on the same principles as the Mk 2A and Mk 3A, with the stepped main shaft, mechanically assisted cage lifting and lowering equipment, choke mechanism, and water cooled shaft. This machine can also be fitted with an oil cooling/flushing system.

The final screw press in this manufacturer's range is the "G" type, which has been specifically designed for pre-pressing duties and is capable of pre-pressing the meats from ca. 190 tons of cottonseed. The wt of the press is ca. 13.1 tons. The main drive motor, which is floor mounted and up to 240 HP, drives the gearbox through V-belts. The total cage length of this machine is 109.8 in., made up of three cages: the cage diameter of the first 44.1 in. being 10 in. and the remaining 65.7 in. being 9 in.

All Rosedowns's features previously mentioned for the Mk 3A are also incorporated into this press. The cake conveyor of this machine has a slightly different arrangement to the others, inasmuch as this extends from the base of the screw press and has two outlets, one for reject, the other for normal cake discharge, instead of the flap arrangement used in the previous models. Manual closure of a slide in the first outlet passes the cake to the second. The feed arrangement on this press is different from the others as, instead of having a compressor worm which is generally driven from the overmounted cooker drive, it has a short screw conveyor extending from the side of the machine on the centerline of the main worm shaft. This conveyor is driven by a geared motor unit through a chain drive.

Speichim

This company manufactures a range of four screw presses for use in the oilseeds industry, plus an additional five machines specifically designed for palm oil extraction.

There are two dual purpose screw presses, the 301 and the 400. The stated capacity of the 301 press is 22 tons/day, and it weighs ca. 7 tons. The cage length is 55.1 in. with a diameter of 8.7 in. The drive motor is 40 HP.

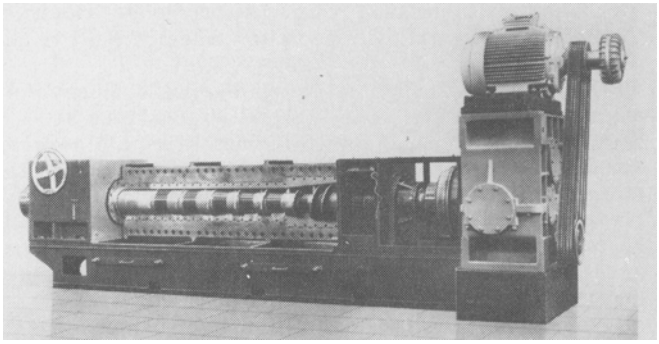

FIG. 3. SG500L press by Speichim.

The 400 press is rated for a throughput of 38.5 tons/day, and the press weighs ca. 12 tons. Cage diameter of this machine is 9.45 in. with a length of 72.8 in., the installed power of the press being 75 HP.

The two pre-presses are the 500 and 500L, the 500 being rated at 143 tons/day with a cage diameter of 11.02 in. and a length of 88.58 in. The drive motor is 125 HP, and the wt of the machine is ca. 17.5 tons. The last of this range is the 500L (Fig. 3), with a rated capacity of 175 tons and a wt of 21 tons. The cage diameter is the same as the 500 press, but the length is increased to 110.24 in., an increase in installed power to 150 HP.

Speichim has also obtained a license to manufacture and market, in the Common Market and in French-speaking areas of the world, the French Oil Mill pre-presses of the B series and the H-2 series previously mentioned.

In the range of presses specifically designed for palm fruit, it appears that all machines have discharge cones, adjustment being by an hydraulic device. Also, the shafts at the high pressure discharge end have a perforated cylinder mounted on them, into which steam is injected to assist in the final extraction of the oil. The cages in these machines differ from the general oilseed screw presses in that they are made from perforated steel. The worm assembly differs also, although again the basic principle of volumetric reduction is used, the worms apparently being arranged to form a continuous flight with no breaker/knife bars inserted to prevent the rotation of the material.

There are two single screw press machines, the first being the M40, which is rated for 5 tons of fresh fruit bunches (FFB) per hour and weighs ca. 2.8 tons, with installed power being 15 HP. The cage length of the M40 is 39.37 in., with a diameter of 11.02 in.

The M50 has a stated capacity of 12 tons FFB/hr with a cage length of ca. 51.2 in. and a diameter of 15.7 in., the installed power being 40 HP and the wt of the machine being 7.4 tons.

Speichim also manufactures three machines using dual screws, the 3000, 5000, and 6000.

The 3000 has a capacity of 7.5 tons FFB/hr. The installed power is 25 HP, and the machine weighs ca. 5.5 tons. The cage length and diameter are the same as in the M40.

The next in the range is the 5000, which has a capacity of 12.5 tons/hr, with a cage length of 39.37 in. and a diameter of 13.8 in. The machine weighs ca. 6.8 tons and has a 35 HP motor.

The 6000 press is rated for 20 tons FFB/hr and weighs ca. 7.4 tons. The motor is 45 HP. The cage diameter is 16.5 in., the length being the same as the 3000 and the 5000.

Stork-Amsterdam

This company manufactures the type of equipment under discussion, mainly for the palm oil industry and has

over the years installed over 140 complete factories throughout the world, with capacities ranging from 1 to 60 tons of FFB/hr.

The present machine marketed by this company for palm oil extraction is their twin screw press type S10-15 with a nominal capacity of 10-15 tons FFB/hr. However, the makers claim that the throughput can be reduced to 6 tons/hr or increased up to 20 tons/hr.

Although for the purpose of this paper the S10-15 will be discussed, it is apparent that, with the capacities of some of the plants recently installed, other sizes of equipment are available.

The S10-15 screw press is of a twin screw arrangement with the screws rotating in opposite directions in a pretzel shaped, perforated press cage of vertical longitudinal axis. Oil drains through the press cage, which consists of renewable chromium steel segments. The press is supplied with feed material by an independent variable speed reducer driven horizontal feed screw, and it is possible to match the speeds of the feed screw and main screws, depending on the characteristics of the material being processed. The speed of the main screws is adjusted by changing the driving and/or the driven pulleys. This press is fitted with a torque limiting device to prevent breakage or overload in the event of foreign material entering the press. The cone adjustment is carried out automatically and is controlled by the power absorbed by the main screws. The power absorbed by the main screws can be adjusted by the operator to take into account various operating conditions. The two main screws are cast from special, tough, and water resistant steel.

The only other press designed by Stork for the oilseed industry is the Rotopress R400, which has been designed for the pre-pressing of high oil-bearing seeds such as copra, peanuts, rapeseed, and sunflower seed. It represents a departure from the machines previously discussed.

The throughput of this press is meats from 45 tons/day of cottonseed, but with an oil-in-cake figure of 20-25% one would think of this machine more as a fore-press; however, the figures may be different on other seeds.

The machine weighs ca. 4.25 tons and is driven by four geared electric motors of 7.5 or 10 HP each. Material is fed to the pressing chamber by an independently driven feed screw, and the pressing is carried out by a fluted roller, which is surrounded on approximately three-quarters of its circumference by press bars. The distance between the fluted roller and press bars can be adjusted to eight preset positions by eccentrically mounted bearing housings.

The cake is discharged as a continuous sheet. The oil drains to the bottom of the base plate and out.

The manufacturers of this press claim that it requires 50-60% less power than the conventional screw press, with less wear and therefore less downtime for maintenance and lower spare parts investment. Also claimed is better oil quality due to lower operating temperatures and less foots production giving easier filtration.

GENERAL OBSERVATIONS

It is the opinion of the authors that screw presses will be used for many years to come, especially in the extraction of oil from high oil-bearing materials which do not lend themselves to direct methods of extraction in solvent plants. Another point in favor of the screw press is that developing countries in general commence production of edible oils on a scale which, due to cost, would prohibit the use of solvent extraction methods.

At present the restrictions in the use of direct solvent methods are specifications on seed quality, economic plant capacity, cost of solvent, and, in developing countries, the availability of suitable manpower. These still make the screw press an attractive investment.

The ratios shown in Table I may be of interest. Where various motor sizes can be fitted to the machines, the highest HP has been used to obtain the figures tabulated. The capacities used for the basis of calculation are, in the case of dual purpose machines, the straight pressing figures and not pre-pressing.

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