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ASHBROOK-SIMON-HARTLEY

ASHBROOK-SIMON-HARTLEY

SUBMITTAL

FOR

MEAD PAPER

SIZE 3V WINKLEPRESS

PURCHASE ORDER #2074-149

SALES RELEASE #WP-1221

TYPE 78 3'V' WINKLEPRESS

INDEX

Section I

ASHBROOK-SIMON-HARTLEY

Ashbrook-Simon-Hartley
11600 East Hardy
Houston, Texas 77093
P. O. Box 16327
Houston, Texas 77022
Telex 79-1939
Telephone 713/449-0322

Your ref:

Our ref:

Date: July 21, 1980

(5) No. ASHBROOK WINKLEPRESSES SIZE 3V
FOR MEAD PAPER CORPORATION

Winklepress

mainly made of:

1 sludge distribution box

1 horizontal stage for predewatering by gravity, made of screen plate including fastener for reclaiming of returning upper sieve. Lateral limitation with adjustable seal, calibrating sheet

1 Vertical zone for predewatering of the sludge by increasing pressure, welded structure operation and driving-side-framework, as supports and cross-ties, are of steel structure welded.

Unit for adjustment of the inlet shaft of the vertical zone
Lateral sealing of the vertical dewaterating section

1 Patented special scoop roller (dandy roll) including bearing, support and lateral water discharge. Operating-and driving-side-framework and longitudinal girder for supporting the press-section, as supports and cross-ties, are of steel structure, welded

8 Sieve guide rolls including bearings and supports

7 Press rolls for the press section including bearings and supports

2 Belt tensions, hydraulically operated made of hydraulic ram, suspension, support and control

2 Automatic belt guides type BELLMER "Weasel" by means of which the positions of the sieve edges are automatically kept constant, after once being adjusted. Operation of sieve controllers is as follows: The sensing arm is transmitting all deviations to the alignment roller which causes the cylinder to move from its original position, producing a component perpendicular to the sieve direction which causes in turn the return of the sieve to the desired central position. This system guarantees low maintenance and a long life.

CONT'D ....

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Oil-hydraulically operated sieve alignment guide, with oneside sensing, hydraulic switch, pressure oil hoses and hydraulic lines to the unit.

1 Sludge control switch

2 Sieve guide transmitters

2 Final switches as safety against cracking of the sieves

1 Complete electrical wiring inside the Winklepress including all necessary connections electrical connection 230/460 V, 60 Hz

1 Set of collecting troughs for collecting the filtrate from the whole dewatering machine, including the necessary retainer

2 Sieve cleaning devices made of high pressure shower pipes with fan jet nozzles and incorporated cleaning system for cleaning the nozzles without dismantling or interruption of operation, required water pressure 6 bars

2 Closed splash water protection boxes with sealing lips and plastic tubes

2 Safety covers of GFK in the zone of the press rolls (glass-reinforced plastic)

2 Doctor blades with exchangeable rubber blade

1 Complete injection unit with 4-fold tangential injector and ball check valve

1 Bellmer-Mixing unit for mixing of sludge and organic flocculant

1 Hydraulic unit driving power 1.5 kW, 220/380 V 50 c/s, IP 55 including reservoir pumps and hydraulic valves for charging the hydraulic cylinders and controller with U.S. manufactured drive unit.

1 Set = 85 pcs. patented chicanes as assistance of the dewatering

1 Pressing section consisting of : one press roller with comp. bearings, two lever, link bearings, two hydraulic cylinders, hydraulic equipment and hydraulic hoses

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Winklesieves

1 Upper sieve No. 1077, 1079, 1081, 1083, 1085 approx. 2200 mm x approx. 20.100 mm

1 Lower sieve No. 1078, 1080, 1082, 1084, 1086 approx. 2200 mm x approx. 15.510 mm with clipper seam type of belt 5533, joint K3/300

2 Connection wires for each sieve Device to pull-in the sieves (for basic equipment only)

1 Extended predewatering stage with framework, screen plate, filtrate trough

Technical data of the Bellmer-Winklepress

Main dimensions of the Winklepress:

Length	approx. 5360 mm
Width with walkway	approx. 3290 mm
Height	approx. 3310 mm
Weight of the machine	approx. 10000 kg
Sludge feeding width	approx. 1700 mm
Operating width at discharge	max. 2100 mm
Operating speed	approx. 1-5 m/min

Materials and Protection against corrosion of Bellmer Winklepresses
Standard of PH between 6,5 and 8

Rollers	Steel, plastic coated (Rilsan=polyamid-type)
Driven rollers	Steel, rubber coated
Dandyroll	Aluminium
Troughs	Reinforced glass-fibre polyester
Lateral Covering	Reinforced glass-fibre polyester
Sieves	Polyester
Sieve Plates	Steel, plastic coated
Sludge Distribution headbox	Aluminium, Coated
Chicanes	Aluminium
All bright works screws and nuts	Non-corrosive material stainless steel
Piston Rods	Stainless Steel
Bearings	Ball-and roller bearings with labyrinth grease sealing

SIMON

CONT'D ....

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Frame Work	Steel, hot galvanized
Walkway	Steel, hot galvanized
Castings	Painted RAL 8104
Commercial Products i.e. Electro motors, drives etc.	Protected by usual paintings of supplier
Hydraulic system	Tubes: rubber fittings: galvanized steel
Color tone	RAL 8019

NUMBER ONE IN SLUDGE DEWATERING

WINKLEPRESS®

Continuous Filter Belt Press

The Winklepress has established itself in the United States as the Number 1 solution to sludge dewatering problems.

Employing the principles of gravity, pressure and shear force for water extraction, existing installations produce a final cake of 20% to 60% solids, dependent upon the type of sludge. This cake may be used for landfill or for direct discharge into an incinerator. Many of the sludge cakes are autothermic and require no additional fuel.

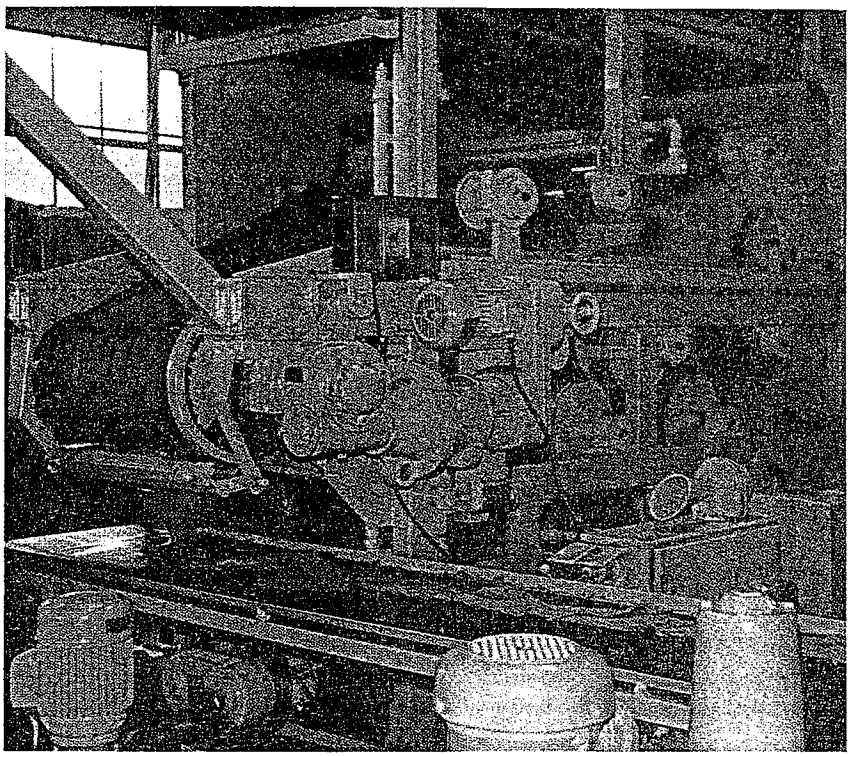
The entire dewatering operation is achieved by means of two endless polyester filter belts which perform the conveying, pressing and dewatering functions. After initial sludge conditioning in the unique Winklepress vortex sludge/polymer mixer, the conditioned sludge is fed gently onto the press and passes through two stages of gravity dewatering. On passing through the gravity stages, the sludge enters into the first press zone where the water drains outwards and inwards through a perforated internally scooped roller. The sludge then passes around a multiroller system where it is subjected to high pressures and shear forces before leaving the filter belt for disposal.

Note: On certain sludges, where very high cake solids are required, a fifth high pressure zone may be added within the multiroller system.

Due to the immense strength of the filter belts and the roller layout, it is possible to convert the belt tension into dewatering forces which expel the maximum amount of moisture from the sludge without resorting to outside pressure sources.

On their return route, the filter belts are washed clean by accurate high pressure wash water sprays, thus keeping the press operating at optimum solids recovery.

During the operation of the press, adjustments can be made to suit the nature of the sludge being treated, to alter its capacity, or to give higher or lower cake solids.



- High throughput
- Produces friable cake with high solids content
- Continuous 90% unattended operation
- Simple foundation structure. Only single story building required
- Delivered to site complete
- Moving parts rotate slowly
- Natural pressures created by belt tensioning only
- High quality engineered components
- Reduced Machine size — lower capital cost
- Easy low cost handling — energy saving
- Space and manpower costs reduced
- Low civil costs
- Simple and quick site construction
- Less wear — higher safety
- Product quality constant
- Low maintenance costs

ASHBROOK-SIMON-HARTLEY

INDEX

SLUDGE DEWATERING USING POLYMERS ON BAND PRESSES

1. INTRODUCTION

1.1 Historical Background

Simon-Hartley Ltd. is an engineering manufacturing company, a wholly owned subsidiary of Simon Engineering Ltd. Simon-Hartley specializes in the design and construction of complete plants, equipment and processes for water pollution control. The Hartley family founded the original portion of the firm near the turn of the century. In 1969, Simon Engineering purchased the Hartley Company and August, 1976, Simon-Hartley acquired the Ashbrook Corporation which now is a division of Simon-Hartley.

Simon-Hartley manufactures a full range of sewage treatment equipment which includes screens, grit and sand extraction, sedimentation tank equipment, biological filter distributors, surface aerators, sludge digestion and sludge dewatering equipment. As a service to industry, Simon-Hartley provides full assessment, laboratory facilities, engineering design, manufacture, installation and start-up of effluent treatment plants of all types.

1.2 International Collaboration

It has been Simon-Hartley's policy to spread its technology throughout the industrialized countries by licensing independent firms in each country. At present Simon-Hartley has licensees in Japan, U.S.A., Canada, Australia, Africa, W. Germany, France, Holland, Italy, Spain and Portugal. Agencies for direct exporting are present in many other countries.

It was due to this policy that Simon-Hartley collaborated with Gebr. Bellmer, a West German corporation, who developed the "Winklepress", a double belt press suitable for solids-liquids separation in wastewater applications as well as the chemical and food processing industries.

Bellmer has had extensive experience in the paper and board industry, and has established the technology for the construction of machines incorporating many innovations for belt presses. In particular they produced double wire presses for several products, for example — ground-wood (before and after bleaching), cellulose, leatherboard manufacture from latex and leather scrap.

This accumulated technology was to serve as an important feature in the rapid development program of the Winklepress. (US—Pat. 3951809)

2. SLUDGE DEWATERING

2.1 Types of Sludge

For the purpose of this paper sludges can be classified into three main groups. The origin of these is:

a. Biological and Organic; i.e. waste water treatment, animal wastes, vegetable and paper wastes.
b. Mineral: mainly from mining
c. Industrial: factory wastes, plating industry, etc.

2.2 Water Retention in Sludges

The water associated with sludges is retained in three ways:

Free Water
Inter - cellular
Intra - cellular

2.21 Free water is that water which is readily removable by sedimentation or normal drainage. In the case of sewage sludge the maximum concentration which can be achieved by such methods is about 5%.

2.22 Inter - cellular water is held around the sludge particles by chemical bonding. This can be released by polyelectrolytes which destroy the bonding and cause the water to become "free". With suitable dewatering machinery after such treatment the solids concentration can be increased up to about 35-40% by weight.

2.23 Intra - cellular water is that water which is contained inside the cells of biomass and which can only be removed by breaking the cell wall. This process can be very costly to carry out and is normally done by heat treatment, evaporation, etc.

3. CRITERIA FOR SUCCESSFUL BAND PRESSING

The development of high grade polyelectrolytes has been the main feature in the subsequent development of band presses and the extended application of other types of dewatering equipment such as centrifuges. Indeed the development of the equipment has had to wait until the conditioning agents were available.

A large proportion of the dewatering occurs at an early stage under the influence of unit gravitational force and prior to any pressure application. This requires that the sludge be conditioned with a floculating agent to aggregate the smaller particles and the water between the floc is clear.

This type of floc aggregation is commonly called "Super-flocculation". Not only is it important to obtain large self-dewatering flocs but it is essential that the flocs have a minimum strength. The strength of the floc can limit the extent of dewatering due to floc disintegration under the applied forces.

With band filters the forces which can cause floc breakdown are not applied until the conditioned mass has been partially dewatered by gravity and which, therefore, introduces stability of the flocs. Biological sludges are particularly susceptible to floc breakdown due to the fragility of the system and it is, therefore, considered that band filters are particularly suitable for these sludges.

4. DESIGN OF BAND PRESSES

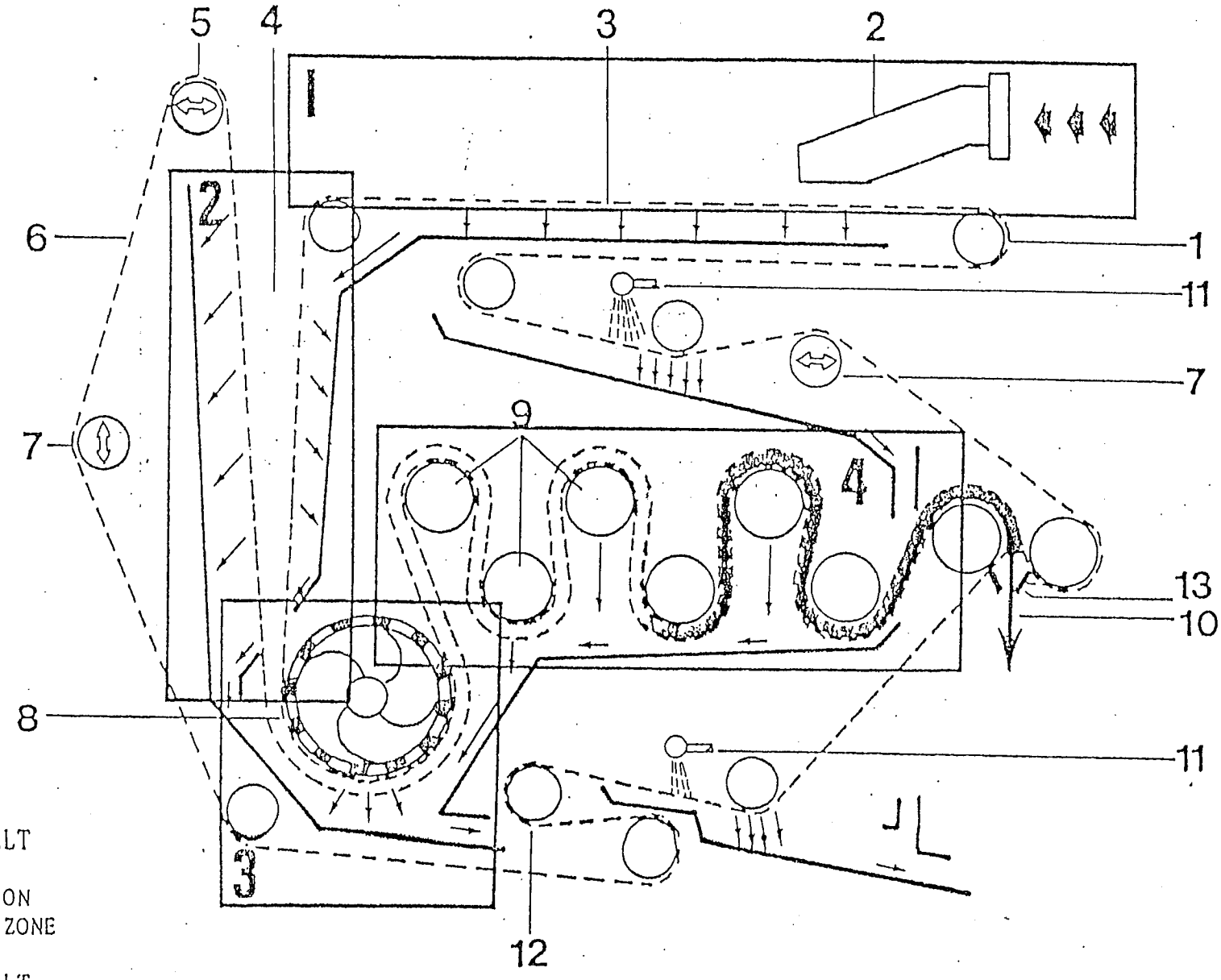
The nature of the floc system previously described really predetermines the parameters on which band presses are designed. The main parameters are:

a. that an adequate gravity drainage zone or zones are provided; and
b. that the pressing zone is designed to extract the maximum residual free water.

4.1 Early Presses

Historically, the first presses designed were of simple construction, having a horizontal perforated (mesh) band supported on a large number of small diameter rollers. A pressure belt was used at one end of the horizontal band to squeeze the cake. The feed on this type of press was introduced at one end of the band and gravity draining allowed to take place on the first part of the band. Pressure was subsequently applied before the cake discharge.

On sewage sludge for example, the solids concentration



1. CIRCULATING UPPER BELT
2. SLUDGE INLET
3. PRE-DEWATERING SECTION
4. VERTICAL "V" SHAPED ZONE
5. "V"-SLOT ADJUSTER
6. CIRCULATING LOWER BELT
7. BELT ALIGNMENT REGULATOR
8. PRESSING ZONE WITH PERFORATED ROLLER
9. "S" SHAPED TRACK
10. FILTER CAKE DISCHARGE
11. BELT CLEANING BY HIGH PRESSURE SPRAY
12. BELT TENSION ROLLER
13. BELT SCRAPER

DIAGRAMMATIC ILLUSTRATION OF THE WINKLEPRESS

FIG. 1

11. WINKLEPRESS SLUDGE — DEWATERING MACHINE

FEATURES	BENEFITS
High throughput and relatively low capital cost	Low running costs
Friable cake with high solids content	Easy low-cost handling of surplus sludge product
Increased throughput when high final cake solids not critical	Reduced running costs
Autothermic sludge-cake produced in most cases	Suitable for continuous discharge direct to incineration plant
Continuous operation	Space and manpower requirements reduced
Simple foundation structure	Low construction costs
Ground-floor mounting	Single story building can be used with consequent saving in building costs.
Delivered to site complete	Quick and easy to put into operation; only needs wiring and piping-up
Moving parts rotate slowly	Increased operator safety less water
Feed conditioning by polyelectrolytes	Small scale dosing equipment; large silos and chemical equipment not needed
The only pressure is that applied by natural tensioning of the bands	Product quality remains substantially constant irrespective of feed concentration

13. CAPACITY OF WINKLEPRESS

POPULATION FIGURES BASED ON:

kg/hd/d (3 meals/head/day) DRY SOLIDS *

m^3/h.p.e. (54 gpcd) FEED SLUDGE & MAX. EFFECTIVE BAND WIDTH *

3.0-6% SOLID CONCENTRATION

SIZE	EFFECTIVE BAND WIDTH IN M/M	INPUT CAPACITY APPROX. MAX CAKE M^3/H	GPM	MAX. CAPACITY AT ACCEPTABLE CAKE M^3/H	GPM	POPULATION HOU PER DAY OPERATE 8	16	
0-N	200 300	2-4	8.8-17.	6	26	11000	22000	33
0-V	200 300	4-7	17.-30.8	10	44			
1-N	800	8-12	35.-52.8	15	66	30000	60000	90
1-V	800	12-16	52.8-70.4	20	88			
2-N	1300	15-20	66.-88.	25	110	45000	98000	147
2-V	1300	20-25	88.-110.	30	132			
3-N	1800	22-28	96.8-123	35	154	68000	136000	20
3-V	1800	30-35	132.-154.	40	176			
4-N	2300	25-30	110.-132.	45	198	87000	174000	261

* SHOULD THESE FACTORS BE VARIED THEN THE POPULATION SERVED MAY BE INCREASED OR DECREASED IN POPULATION.

12. WINKLEPRESS DATA

MACHINE DETAILS											
SIZE	BAND WIDTH		MOTOR POWER (INSTALLED)			WATER PUMP @ 60M hd				SLUDGE PUMP	
	EFFECTIVE MM	TOTAL MM	MAIN DRIVE KW	Poly Pump kw	Hydraulic System kw	Flow m^3/h	gpm	Installed Power kw	Absorber Power kw	Flow m^3/h gpm	Installed Power kw
0-N 0-V	200-300	500	1.1 1.5	0.75	1.5	9.0	40.0	7.5 *	5.90 *	1-8 * 4.4-35	1.5*
1-N 1-V	800	1200	1.1 2.2	0.75	1.5	18.0	79.0	11.0	7.74	5.0-15.6 22-60	3.0
2-N 2-V	1300	1700	1.5 3.0	1.5	1.5	24.0	105.0	11.0	8.92	10.0-22.1 44-97	3.0
3-N 3-V	1800	2200	2.2 4.0	1.5	1.5	30.0	132.0	15.0	9.82	15-30 61-132	5.5
4	2300	2700	3.0	2.0	1.5	40.0	176.0	15.9	11.25	20-40 88-176	7.5

* BASED ON BELLMER SELECTION USING GERMAN EQUIPMENT

12.b. WINKLEPRESS DIMENSIONS

of the cost effectiveness of the various types of apparatus under consideration.

The following table has been prepared to show the level of costs for various dewatering equipment taking into account the items responsible for the costs. The table applies to a typical sewage sludge with primary and activated components at 5% feed concentration.

RELATIVE COST COMPARISONS FOR SLUDGE DEWATERING EQUIPMENT

RELATIVE COST PER TON OF DRY SOLIDS	FILTER PRESS	ROTARY VACUUM FILTER	CENTRIFUGE	BAND PRESSES		
				HORIZONTAL	VERTICAL	WINKLEPRESS
CAPITAL REPAY	11.0	3.0	3.8	3.6	9.0	4.0
POWER	0.4	0.6	0.7	0.2	0.5	0.3
LABOUR	1.3	1.0	0.7	0.9	2.0	0.9
MAINTENANCE	1.9	1.5	2.5	0.8	3.4	1.2
REAGENT	1.8	1.8	6.0	4.0	4.0	4.5
TOTAL	16.9	9.2	13.7	9.5	18.9	10.9
CAKE SOLIDS %	40	20	22	25	25	35
EFFLUENT SOLIDS mg/l	100	300	500	100	100	100
CYCLE TIME	BATCH 5 HRS.	CONTINUOUS 8 HOURS				

18. CONSIDERATION OF DIAGRAMS 1-4

The following conclusions can be drawn from the result tables and Diagrams 1-4.

1. Digested sludges can be dewatered in the case of inorganic contents over 50% to final dry solids values between 35 and 40%.
2. At higher speeds of the WINKLEPRESS, i.e. small dwell time of the sludge in the dewatering section, the capacity can be increased by about 70% at which the attainable final dry solids decrease, for example, from 39% to 31%.

   Through this the BELLMER WINKLEPRESS is also competitive for high quantities (in the case of maximum dry contents which are not definitely to be attained) as compared with dewatering machines obtainable on the market which give high capacities but remain limited as regards final dry contents.
3. The flocculant consumption is nearly constant with approx. 150 g of active substance per m³ of inlet sludge. (Applies to previous tests with Nalco 61-D25). We are convinced that in the case of continuous operation further savings are possible. Day-long duration tests have recently shown that the consumption of chemicals can be reduced from initially 148 g/m³ (.326 lbs/ton) to 116 g/m³ (.255 lbs/ton). We foresee a further reduction by the application of flocculants specially suitable for each sludge.
4. The higher the inlet concentration of the sludge, the higher the produced quantity of dry sludge (Diagram 3) and the lower the consumption of chemicals per kg (lbs) of dry solids (Diagram 4).
5. There is a certain dependency between ash content of the sludge and attainable final dry solids (Diagrams 1 and 2).
6. Sludges from primary settling attain final dry contents similar to digested sludges and require similar quantities of chemicals in kg/t (lbs/ton) of dry solids at comparable inlet concentrations.
7. Aerobically stabilized and related sludges can only be dewatered by an increased use of chemicals; the final dry solids values attained are about 26.5% according to previous investigations.

   We are especially convinced here that even better results can be attained by the use of specially suitable flocculants.
8. Sludges from the paper industry are easier to dewater than the above-mentioned sludges since the fiber residues contained form a network which supports dewatering. Higher final dry solids values are obtained at substantially lower consumption of chemicals.
9. The wide range of inlet concentration which the BELLMER WINKLEPRESS can handle without any problem can be clearly seen.

The following example is given to illustrate volume reduction: 0.6 m³ (158 gals.) of digested sludge with 4% inlet concentration gives 1 wheelbarrow of dewatered sludge.

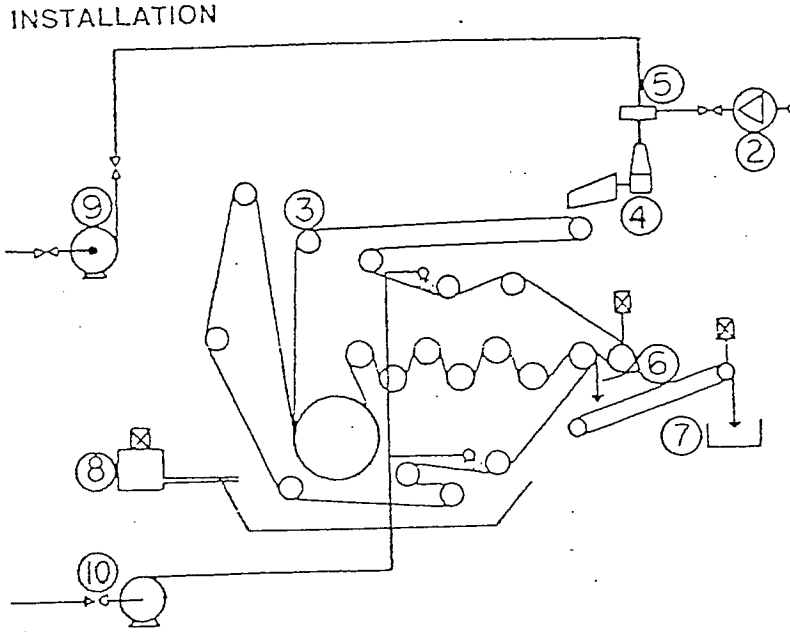
In other dewatering systems which condition sludge with lime and iron compounds up to 100% of sludge dry solids is partly added to these compounds, which first simulate a higher final dry solids value, and second bring about a larger volume of dewatered sludge plus increasing the absolute quantity of water in the dewatered sludge. In addition to this, sludges are less suitable for incineration and composting.

Further advantages of dewatering sludges with the BELLMER WINKLEPRESS:

1. Continuous mode of operation.
2. No loss of water on the roads during transportation of the dewatered sludge, thereby avoiding small annoyances.
3. The sludges do not release water in landfills: Avoidance of ground water pollution.
4. Great flexibility of the WINKLEPRESS with regard to inlet concentration range and quantity range handled, the latter with slight loss of final dry solids.
5. Careful dewatering of sludges through gradual pressure increase due to dividing the entire process into 4 stages.
6. Low personnel costs — the entire unit can be operated automatically and does not require continuous supervision. In the case of malfunctions the unit is programmed to shut down and sound an alarm.

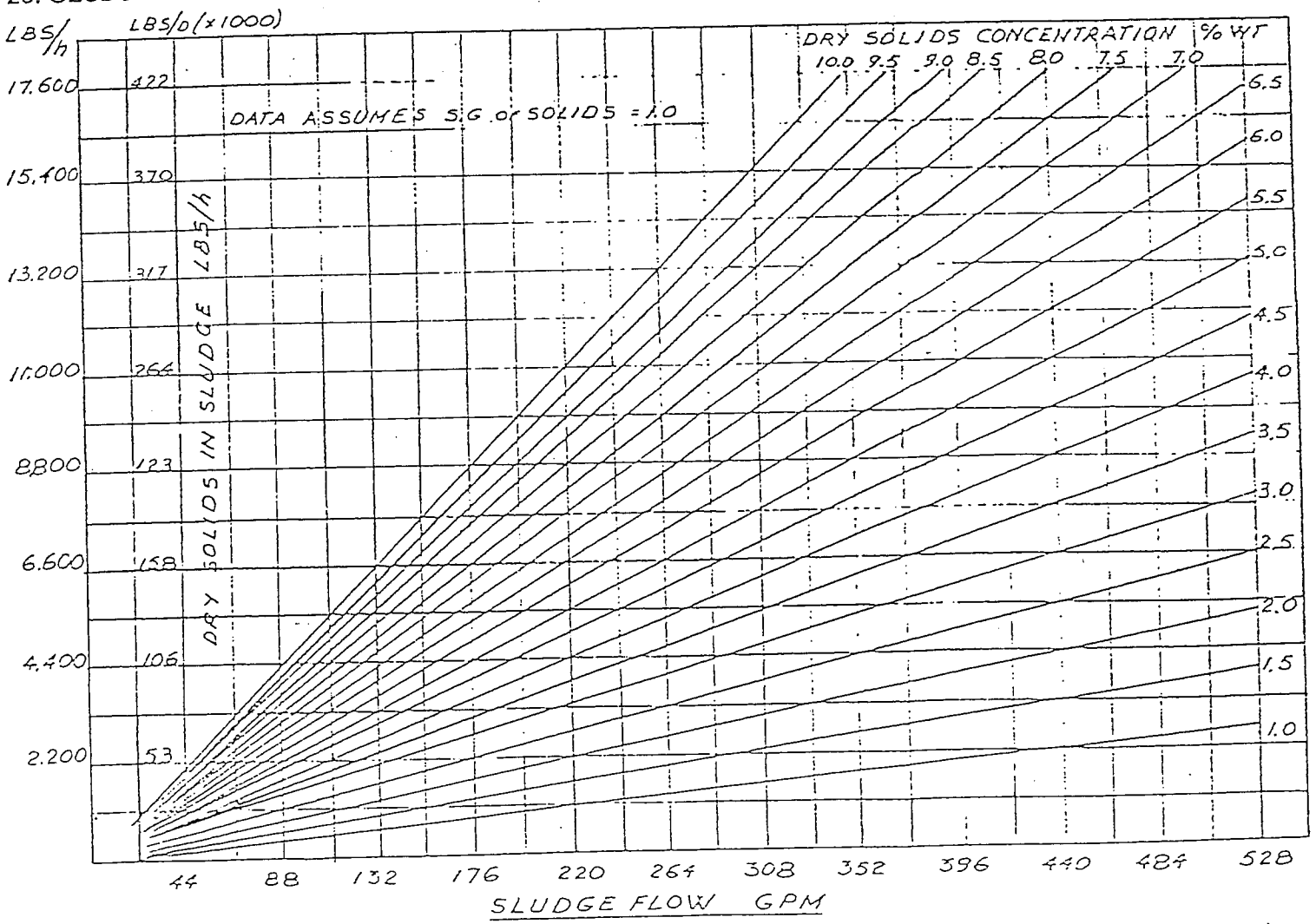
Worldwide experience has proven that the Bellmer Winklepress produces the highest attainable final dry content matter while presently the cheapest continuous process method.

19. SCHEMATIC FOR SLUDGE DEWATERING INSTALLATION



1. Polymer Preparation
2. Polymer Feed Pump
3. Bellmer Winklepress
4. Sludge Distribution Box and Polymer Mixing Unit
5. Polymer Dosing Unit
6. Cake Discharge
7. Conveyor
8. Hydraulic Control Panel & Reservoir
9. Sludge Pump
10. High Pressure Water Pump

20. SLUDGE FLOW DATA



COATING AND PAINTING SPECIFICATIONS

Materials and Protection Against Corrosion of Winklepresses

Dandy Roller	:	Aluminum
High Pressure Rollers	:	Steel, rubber covered or plastic (Rilsan) coated
Troughs	:	Glass-reinforced polyester
Belts	:	Polyester
Wire Frames	:	Non-corrosive material
Sludge Distribution Headbox	:	Aluminum, coated
Bright Work	:	Non-corrosive material
Screws & Nuts	:	Galvanized
Piston Rods	:	Stainless Steel
Bearings	:	Ball bearings and roller bearings with labyrinth-grease-sealing
Frame-work	:	Hot-galvanized
Walkways	:	Hot-galvanized
Commercial products i.e. electro motors, drives, etc.	:	Protected by usual paintings
Hydraulic system	:	Tubes: Rubber Fittings: Galvanized steel

Painting Specification:

1. All framework and other steel parts are galvanized 0.15 to 0.25 mm thick.

2. All cast iron parts as bearing house, bearing stands, belt alignment device (Wiesel), brackets for scarpers and hydraulic cylinders, main drive including support, etc.

   (a) One coat priming by "Friazinc R"

   (b) Two coats (Icosit K 24 Thick" epoxiresin (Two components)
   Color: RAL 8019 Grey-Brown

(c) One final paint "Icosit K 24", Color: RAL 8019 Grey-Brown

Total thickness of Item 2 is 0.2 mm
Manuafacturer of Paint:

Lechler Chemie
P.O. Box 1709
D-7012 Fellbach, West Germany

INSTALLATION - OPERATION AND MAINTENANCE MANUAL FOR BELLMER WINKLEPRESS

ASHBROOK-SIMON-HARTLEY

11600 East Hardy, Houston, Texas 77093

Mailing Address: P.O. Box 16327 Houston, Texas 77022

713/449-0322 TWX: 910-881-6346

OPERATING AND MAINTENANCE INSTRUCTIONS

1. DESCRIPTION OF OPERATION FOR THE WINKLEPRESS

The dewatering process is divided into four basic zones:

1.1 FIRST ZONE:

In operation the feed to be dewatered is pumped onto the belt of the horizontal dewatering section. Immediately prior to this a supply of polyelectrolyte conditioning reagent is pump metered into the main feed line. The reagent and feed are intimately mixed and the resultant conditioned sludge passes gently on to the horizontal (or slightly inclined) section of the upper band. The mixture is retained on this section by rubber edged guide plates, and the belt over this zone is being supported on a fixed plastic grid. Initial dewatering takes place by the water draining through the sludge mass and the perforated belt. This drainage is collected in a separate trough, located under the belt, for disposal or re-use as belt-wash water or as a pre-conditioning agent in a gravity thickener.

1.2 SECOND ZONE:

The remaining partially dewatered sludge is transported to the tapered V-shaped vertical chamber, which has a variable opening, and the sides are formed by the two downward moving belts. The end walls of this section are formed by two flexible seals, covered by low friction plastic strip, e.g. Teflon, and fixed to the frame of the press. In this vertical zone, each band is supported by rigid perforated plastic grids over which the belts slide and through which gravitational dewatering takes place.

The sludge feed quantity to the press is controlled such that the level of sludge in the vertical section remains substantially constant, insuring that the sludge at the bottom of this zone contains no free flowing water.

1.3 THIRD ZONE:

The two belts move from the vertical zone and pass around a large patented perforated drum fitted with internal scoops which carry the filtrate outwardly, passing from the inner surface of the belt/sludge sandwich, to discharge ports on one end of the drum.

At the entrance into the third stage (pressing zone) of the dewatering process, the sludge lies between the two belts and its dewatering has advanced to where it can no longer leave at the belt sides.

3. OPERATING INSTRUCTIONS

3.1 Installation

The start up of a Bellmer Winklepress will be carried out in every case by one of our engineers. As a rule the operating personnel is also trained at this time.

3.2 Operating and Setting of the Different Units of the Machine

3.2.1 Horizontal Predewatering Zone

A barrier at the sides prevents the sludge coming from the inlet unit from running off the belt. This barrier is set transverse to the direction of travel of the belt between minimum and maximum width during start up for the first and last time; the alteration of the in-feed width thus obtained permits optimum utilization of the machine capacity with all the occurring sludges.

In the area of the horizontal dewatering zone internals of various shapes, so-called baffle plates/"chicanes", are utilized. The number, shape and arrangement of these baffles depends in each case on the sludge to be dewatered and will be fixed during installation. The purpose of these baffles is to tear apart the filter cake which forms as the dewatering process continues and allow the released filtrate to drain off through the belt.

When fixing or adjusting the baffle plates it is essential to maintain a clearance of 1 mm between the belt and the bottom of the baffle plate. No adjustment must be made when the machine is running.

3.2.2 Setting the Vertical Dewatering Shaft

The vertical shaft can be adjusted both at the inlet and the outlet end. The ratio between the inlet and the outlet aperture should be approximately 2:1.

Adjusting the inlet aperture. This takes place with the handwheel (2) shown in Fig. 1. The adjustable minimum aperture between the belts is 20 mm (3/4 in.) at this point. With this handwheel the shaft can be opened at the inlet end to approximately 150 mm (6 in.) to improve accessibility for inserting the belts and for cleaning.

Adjusting the outlet aperture. This is carried out with the adjusting device (3) shown in Fig. 1, which is additionally designed as an overpressure safety device to ensure that in the

These strips are designed so that even with different thicknesses of the compressed material between the belts, it is ensured that the edge rests against the belt. The blades wear out in time, so that at lengthy intervals the swivelling movement towards the belt has to be restricted as follows:

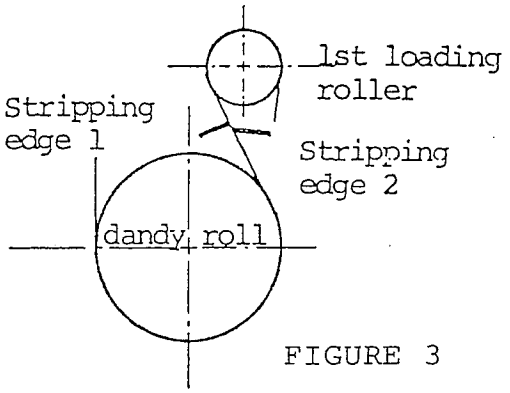


FIGURE 3

Adjust the stops so that when the belts are resting against each other (i.e. there must be no compressed material between the belts), the blades are in light contact with the belts.

When inserting a new belt, these stops should be set back wide enough to create a gap between the blades sufficient to draw the belt through.

3.2.4 Doctor Blades

For the arrangement on the Winklepress, see Fig. 1, No. (10).

These doctor blades remove the filter cake at the outlet from the Winklepress at the point where the two belts separate. Special plastic doctor blades ensure that the cake is removed without damage to the belt with an optimum service life of the blades.

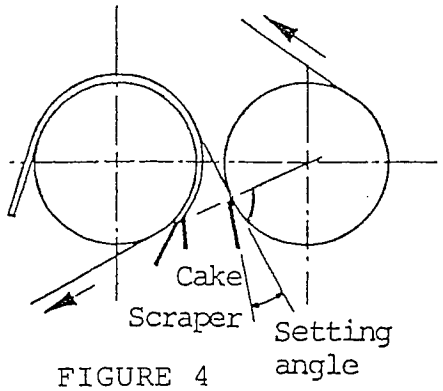


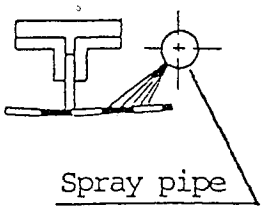
FIGURE 4

The blade angle should be the minimum for the composition of the sludge; this angle is fixed by moving the doctor blade in the direction of the center of the roller.

Change worn-out doctor blades as follows:

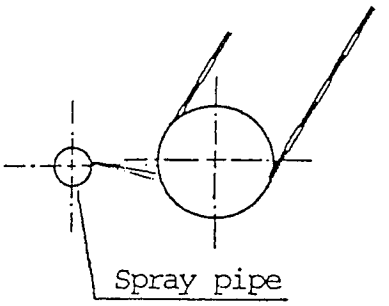
1. Remove the doctor blade with the square spanner supplied and secure it with the cotter pin.

2. Push the blade upwards by hand from the doctor blade (towards the roller) and withdraw it sideways from the Winklepress.



Top

FIGURE 6



Bottom

FIGURE 7

The belt cleaning unit is sealed at the belt inlet and outlet with rubber sealing strips. When replacing these parts proceed as follows:

Unscrew the side components from the cover and withdraw the strips from their mounting support transverse to the belt travel direction. (The strips are in two parts).

It is recommended to keep several spare strips in stock.

For the operation of the automatic spray cleaning unit, see subsection 3.2 (only supplied as special equipment).

3.2.6 Belt Tensioning Unit

For the arrangement on the Winklepress, see Fig. 1, No. (5).

The tensioning of the belts is accomplished by a hydraulic-mechanical tensioning unit.

The hydraulic tensioning unit enables the belt tension to be set infinitely variable separately for each belt when the Winklepress is running. This takes place by adjusting the oil pressure in the tension cylinders. The corresponding pressure control valves are mounted in the hydraulic unit. (For instructions for their operation, see subsection 3.2.9).

The tensions in the belts, depending on the oil pressure setting, are shown in Table 1.

TABLE 1

Size													Belt tension (kgf/cm)
0 - 4	1.1	1.6	2.2	2.7	3.3	3.8	4.3	4.9	5.4	6.0	6.5	7.0	
	10	15	20	25	30	35	40	45	50	55	60	65	

Oil Pressure (kgf/cm^2)

1.0 kgf/cm^2 = 14.22 psi

an adjustable guide roller is mounted in every belt guide (see Fig. 1, No. 12), with which a lengthwise compensation can be effected merely by moving it on its supports. It is essential to ensure that both roller bearings of each roller are tightened in the same position (follow the position indication).

3.2.7 Automatic Belt Travel Controller

The travel of the belt is constantly and automatically supervised, and where necessary automatically adjusted. This belt travel regulating unit is constructed as follows: - On a mechanical sensing instrument, when the travel of the belt edge deviates from the neutral position, the sensing plate is swung from its vertical position. This deviation effects by hydraulic control a unilateral shifting of the adjusting roller, and in consequence a gradual return of the belt opposite to the direction of deviation on the sensing plate.

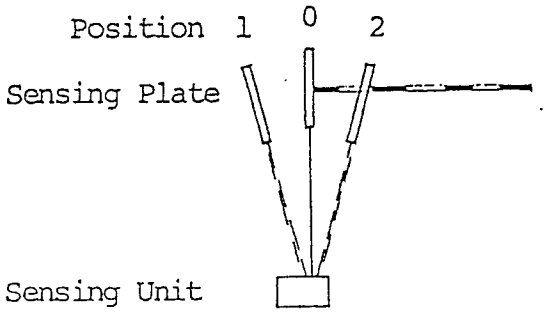


FIGURE 10

Because of its design, when the belt is missing the sensing plate, it takes up Position 2 in Fig. 10. To avoid damage to the sensing unit (Fig. 10) when installing a belt, the sensing plate should be locked in Position 1 by swinging up the lifting flap 180°C. After inserting the belt, do not forget to swing the lifting flap back.

3.2.8 Belt Drive Unit

The belt speed is infinitely variable according to the machine speed of approx. 1 - 5 m/min. Both with the mechanical setting mechanism by means of a handwheel on the gear unit and with remote adjustment, a change of speed is only permissible when the machine is running.

(For the maintenance of the belt drive unit, see Maintenance Schedule.)

3.2.9 Hydraulic Unit

The Winklepress and the hydraulic unit leave the factory completely hydraulically piped and operationally tested, however

Hydraulic Unit

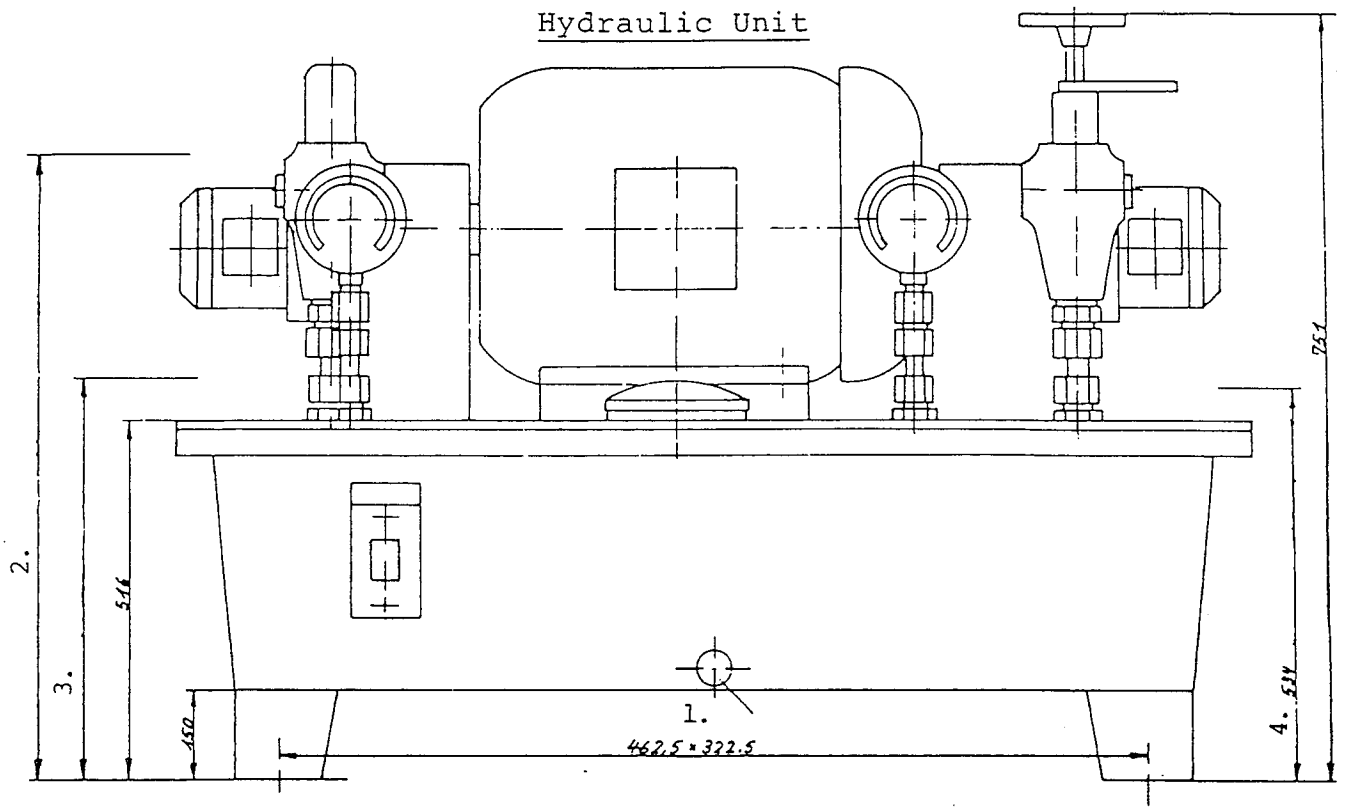


FIGURE 11

1. DRAIN
2. PRESSURE HOSE CONTROLLER
3. RETURN CONNECTION
4. PRESSURE CONTROLLER
   BELT TENSION

3.2.10 Contact Pressure on the Load Rollers

In special cases the Winklepress can be supplied with contact pressure locations.

Contact pressure of the load roller on the lower load roller is achieved by a mechanical/hydraulic swiveling device.

With the hydraulic swiveling device it is possible to set continuous pressure for each roller separately while the Winklepress is running. This is achieved by changing the oil pressure in the cocking cylinders. Corresponding pressure control valves are built into the hydraulic unit.

(See Section 3.2.9 for operation instructions)

5. Check seal of the vacuum line carefully. The seal of the vacuum line should also be checked periodically in the case of continuous operation (in case of unusual pump noises). A perfect seal is a basic condition for the life of the pump.

3.2.11 Rinsing the Vertical Dewatering Shaft

If when starting up or on installing the Winklepress, it happens that because of insufficient floccultion in the vertical dewatering shaft, sludge emerges at the side between the belt and the flexible packing, this leads to fouling of the lateral, transparent seal. To clean these parts of the dewatering shaft, spray nozzles are provided at both sides at the top of the intake end, with which such impurities can be rinsed off while the Winklepress is running. The quick-acting valve for opening the flushing line, which is easily accessible from the operating side, is located on the inner side of the top longitudinal beam.

3.2.12 RECOMMENDED OILS FOR THE HYDRAULIC UNIT

OIL FIRM	FOR LOW TEMP ∿ 20cST at 50°C	FOR NORMAL TEMP. ∿35cSt at 50°C
Chevron	EP Hydraulic Oil 32	Ephydraulic Oil 68
Exxon	Esstic 32	Esstic 68
Mobil	D.T.E. 24	D.T.E. 26
Shell	Tellus Oil 32	Tellus Oil 68
Sun Oil	Sunvis 816-WR	Sunvis 831-WR
Texaco	Regal Oil A R&O	Regal Oil PC R&O

Please consult us before using other oils.

4.2 Maintenance of Hydraulic Unit and Start-Up after Lengthy Downtime Maintenance

1. Only satisfactory hydraulic oils may be used. At a normal temperature of the hydraulic unit of 30 to 60°C (86 to 140°F), the hydraulic oil should have a viscosity of 33 cSt (4.5°E) at 50°C (122°F). At other temperatures correspondingly suitable hydraulic oils must be used. Too thick an oil increases the losses in capacity, while too thin an oil increases the losses through leakage. For recommended types of oil see page 14.

2. With newly installed plants the first oil change should take place after 20 operating hours, so that any impurities etc. can be removed. Care should be taken to see that the oil filling is sufficient at start-up. The charging quantity is about 70 to 80 litres. (18.5 to 21.0 gal. U.S.). The electric motor must never be switched on without an oil filling.

3. The penetration of foreign bodies into the oil circuit must be prevented. The regular oil change with, if possible, the same quality of oil must be carried out after a maximum of 1500 operating hours while the plant is in a warmed-up condition. Since the purity of the circuit is a prerequisite for its satisfactory working, careful filtering of the hydraulic oils is essential. Consequently the oil should always be poured in through the filling filter or return filter. The filters should be carefully cleaned at every oil change and replaced if necessary.

4. Before filling the oil tank it should be visually checked for cleanliness by shining a flashlight. It is not sufficient to drain off the old oil.

Starting

On starting after a lengthy shutdown (not shutting down over a weekend) and in start-up, proceed as follows:-

During start-up, when connecting the electric motor to the terminals the direction of rotation should be noted (there is an arrow showing the direction of rotation on the fan cover and on the pump casing). Do not undertake a check on the direction of rotation, even in inching operation, unless the oil tank has been filled.

4.3 Maintenance of Winklepress Main Drive

Gears, which are out of operation for longer periods, must be protected against corrosion.

Change of Grease or Oil

After about 10,000 hours of operation, latest after 5 years, the oil should be changed. Replacing of oil should be done immediately after stop, while the oil is still warm.

It is not allowed to mix the oils mentioned with oils on the basis of mineral oils. New oil should be of the same type as the replaced one.

4.3.4 Changing the Belt in the "Variable Speed Drive"

The broad V-belt is a special belt. It is absolutely essential that only the original broad V-belt of our own should be used.

Changing the Belt

To change the belt reduce the setting to the minimum speed.

Next, unscrew the half casing (in Fig. 17, half of Pos. 2 with Pos. 6 and 7 fitted). Then unscrew the motor flange, withdraw from centering and lower.

The belt can now be easily changed.

5. CONTROL AND ELECTRICAL INSTALLATION

5.1 Electrical Connection

The electrical control for a complete sludge dewatering plant with BELLMER Winklepresses is contained in a central control panel; this panel is supplied completely wired. Consequently, only the wiring between the control panel and the different components and the power supply to the control panel needs to be installed.

Type of current:	a.c. 440V, 60 Hz
Power consumption:	This is different from plant to plant according to construction and dewatering capacity. The performance data of the individual components are shown in the wiring diagrams.

The electrical installation is carried out according to the following drawings:-

Faults

A lighting of the lamp indicates that the pump motor has overheated. The pump is switched off; the motor cannot be switched on again until it has cooled down. Prior to this, locate the cause of the fault and correct the fault.

If in spite of pressing the starting button, the pump motor does not start, the water level on the suction side of the pump is too low. Remedy: make sure that there is enough water available.

If fault lamp lights up and the pump switches off automatically, this indicates an insufficient supply to the pump. The cause is a fault in the suction, for example, perhaps the suction line is leaking or blocked.

5.3.2 Hydraulic Unit

Switch on at pushbutton. The operating condition is shown by lamp. The motor cannot run until the high pressure pump is delivering.

Faults

A lighting of the lamp indicates an undue heating of the motor. In consequence the hydraulic unit and the high pressure pump are stopped; the motors cannot be switched on again until they have cooled down. Prior to this, locate the cause of the fault and repair the fault.

5.3.3 Winklepress Main Drive

Switch on at pushbutton. The operating condition is indicated by a lamp. The main motor cannot start until the high pressure pump and the hydraulic unit are properly working.

Faults

A lighting of the lamp indicates undue heating. Location and removal of fault as for hydraulic unit.

5.3.4 Metering Pump

Switch on at pushbutton. The operating condition is indicated by lamp lighting. The metering pump can only be switched on after the mixing unit drive has been switched on.

Faults

The switching off of the electric motor due to overload is indicated by lamp lighting up. At the same time the starting up of the sludge pump is blocked. Before the metering pump is

5.3.7 Supervising the Sludge Intake

A control device can be installed before the first loading roller, which operates in two ways:-

1. If on starting up the Winklepress, after a time which can be set on time relay (maximum 30 min.) the material to be pressed has not attained the anticipated minimum thickness at the point of the Winklepress described, the flocculant metering pump and the sludge pump switch off automatically. Lamp then lights up. Renewed switching on of these two pumps is only possible if lamp has gone out; this can be accomplished in two ways:-

   a) If material to be dewatered is in a condition such that on passing the measuring point the minimum pressed material thickness can be expected to be obtained, wait until lamp goes out; then switch on the metering and sludge pumps again.

   b) If the prerequisites described in subsection a) above are not present, switch off the main drive for a short time and then switch the individual units on again, in the sequence described in Section 5.3 beginning with the main drive.

   The time interval to be set on time relay is dependent on the machine speed and should be selected so that with the proper starting up of the Winklepress, the sludge cake will certainly have reached the anticipated thickness at the measuring point within this time.

   The setting of the thickness whose non-attainment induces a fault indication, should be undertaken according to Fig. 14 (only set when the Winklepress is not working). According to experience, dimension E should be approximately 2 mm.

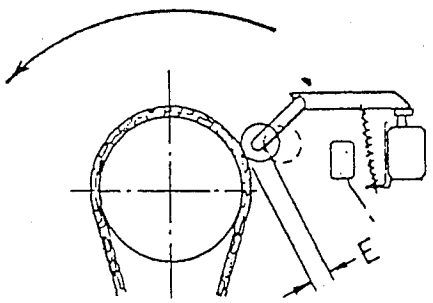


FIGURE 14

Fix the traverses on both sides by the adjustable stops so that dimension E is set between the belt and the sensing roller.

Setting dimension E = required pressed material thickness minus 1 mm

6.. CHANGING BELTS

The insertion of belts must always be carried out by two persons. Great care must be taken to ensure that the belt is not damaged, resulting in its running time being reduced.

6.1 Preparation of the Winklepress for Fitting Belts

1. Remove the side casing on both sides, top and bottom.

2. Remove the side guard gratings from the loading rollers.

3. Lift the guards from their mounting on both sides in the area of the drive roller.

4. Open the belt cleaning unit as follows: - Uncouple the water feed hose from the spray pipe; release the cover (top) by withdrawing the safety bolts, lift up the covers and secure in the raised position with the same bolt.

5. Run back the mechanically adjustable guide roller in the appropriate belt into position 0 and screw tight.

6. Swing back the hydraulic tension unit; i.e. run back in direction II in Fig. 8 or 9 to the end position.

7. Raise the scraper at the pressed material discharge point with the square spanner and secure in the raised position.

8. Slacken the star knobs on both sides on the measuring unit mounted before the first loading roller and push the whole unit back approximately to the center position between the two rollers.

9. The stripping edges mounted after the dandy roll should be moved so far apart that the belts can be drawn through the aperture between the blades. If only one scraper is mounted, this need not be raised (for instructions for separating the strips see subsection 3.2.3).

10. Release the overpressure protection on both sides at the discharge end of the vertical dewatering shaft and open the shaft. (For operating instructions see subsection 3.2.2).

11. Fully open the vertical dewatering shaft at the intake end. (For instructions see subsection 3.2.2).

12. Swing out the senser plates of the automatic belt travel controller from the belt level and secure. (For instructions see subsection 3.2.7).

3. A "belt insertion piece" has to be attached to the start of the belt. For the first fitting two such accessories are supplied with every Winklepress. These "belt insertion pieces" are particularly useful in preventing kinking of the belt seam.

6.3 Inserting the Belts in the Winklepress

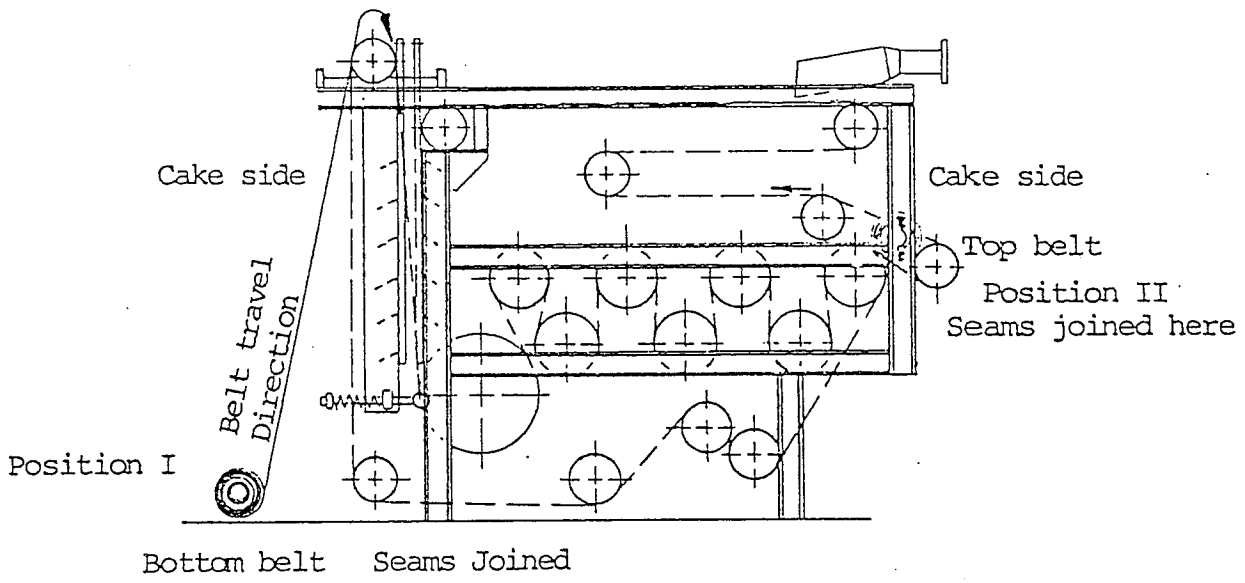


FIGURE 17

6.3.1 Both Belts Have to be Inserted

1. Place the belts at position 1 and 11 respectively in the Winklepress.

2. In the order top belt - bottom belt, draw both belts into the Winklepress up to Point 1 following the course shown in Fig. 17.

   For this, each belt should be fixed to the insertion piece with one person at each side and inserted into the Winklepress as parallel as possible to the rollers in the belt travel direction.

6.3.2 Replacing One Belt Only

If only one belt has to be replaced, proceed as described in subsection 6.3.1. When replacing a belt, from Size 3 onwards the new belt should be carefully stitched with joint wire to the seam of the good belt remaining in the machine and drawn in by means of this agency. The securing wire slings are fitted to the seam of the good belt, at an easily accessible Point 4 or 2 of Fig. 17 according to whether the top or the bottom belt has to be inserted.

The new belt is attached at the seam to these slings (spacing 60 - 80 mm) with inserted stitching wire at the top of the inlet to the vertical aperture and drawn through up to Point 2 of Fig. 17 by means of the drive. The stitching is then removed and the procedure followed described in 6.3.1. In this process, however, the side vertical sealing strips have to be removed from the aperture.

MOTOR DATA SHEET

DRIVE UNIT

Manufacturer	Baldor
HP	5
Input Voltage	30AMP/230VAC/10
Output Voltage	180VDC Armature 200VDC Field
Enclosure	TEFC

HYDRAULIC UNIT

Manufacturer	Baldor
HP	2
Input Voltage	3.05AMP/460V/3PH 6.1 AMP/230V/3PH
Enclosure	TEFC

RIGHT ANGLE — COMBINATION REDUCTION

SIZE 40 — C-FACE — CAST FOOT BASE

DESIGN FEATURES

- C-face motor shaft is coupled to splined input shaft, for ease of motor installation. Input flange compatible with NEMA 180TC, 210TC and 250TC face motors.
- Cast foot mounting is standard on combination Tigear units. Optional mounting bases and accessory kits are available for: Multimount, flange, and Dri-Seal flange. See pages ER-68 thru ER-71.

ORDER INFORMATION

LIST PRICE $3256.00	WEIGHT 680 LBS.

To Order — specify order number, from chart below, for selected ratio and motor frame. Then add mounting position designation.

Ratio	ORDER NUMBER (Add Mtg. Desig. to This No.) FRAME 180TC	FRAME 210TC	FRAME 250TC	Ratio	ORDER NUMBER (Add Mtg. Desig. to This No.) FRAME 180TC	FRAME 210TC	FRAME 250TC
25	M60329	M60345	M60361	101	M60337	M60353	M60369
30	M60330	M60346	M60362	121	M60338	M60354	M60370
36	M60331	M60347	M60363	144	M60339	M60355	M60371
40	M60332	M60348	M60364	162	M60340	M60356	M60372
50	M60333	M60349	M60365	192	M60341	M60357	M60373
60	M60334	M60350	M60366	240	M60342	M60358	M60374
70	M60335	M60351	M60367	288	M60343	M60359	M60375
86	M60336	M60352	M60368	336	M60344	M60360	M60376

RATING TABLE

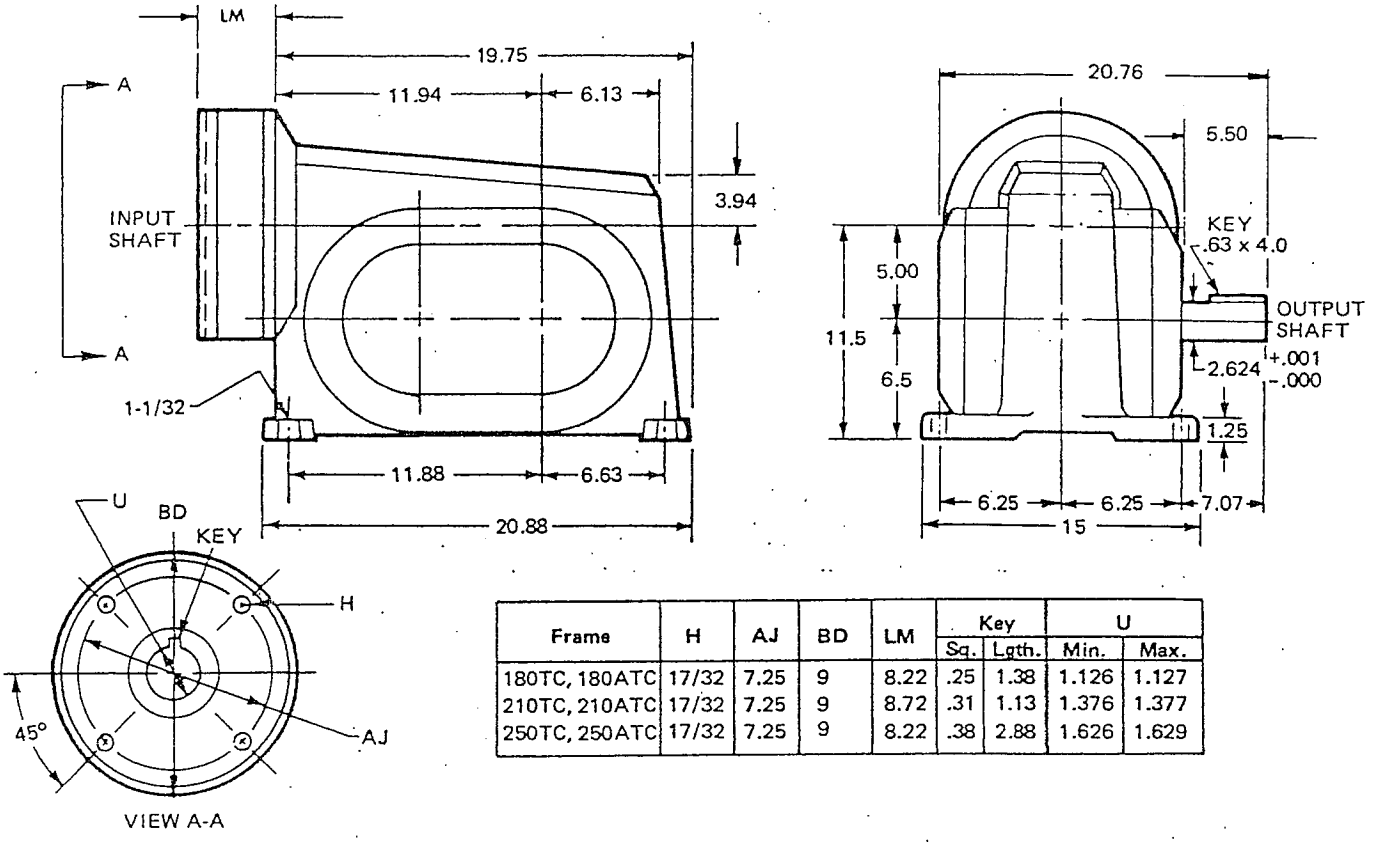
Ratio	Rating Data	RPM INPUT 2500	1750	1160	860
25	Output RPM	104	72.9	48.3	34.4
	Output Torque, in lb.	11150	13659	16963	18661
	Output HP	18.4	15.8	13.0	11.4
	Input HP	20.5	17.6	14.5	12.8
	OHL Output Shaft	57000	6300	7100	7800
30	Output RPM	83.3	58.3	38.7	28.7
	Output Torque, in lb.	12105	15458	18891	22400
	Output HP	16.0	14.3	11.60	10.2
	Input HP	18.0	16.1	13.20	11.7
	OHL Output Shaft	6200	6700	7700	8080
36	Output RPM	69.4	48.6	32.2	23.9
	Output Torque, in lb.	14530	18544	22704	26630
	Output HP	16.0	14.3	11.6	10.1
	Input HP	18.0	16.1	13.2	11.6
	OHL Output Shaft	6400	7030	7800	7580
40	Output RPM	62.5	43.8	29	21.5
	Output Torque in lb.	14016	16835	20428	23150
	Output HP	13.9	11.7	9.40	7.90
	Input HP	15.9	13.4	10.90	9.28
	OHL Output Shaft	6750	7300	8100	8000
50	Output RPM	49	34.3	22.7	17.2
	Output Torque, in lb.	13739	16746	20374	22720
	Output HP	10.9	9.30	7.50	6.20
	Input HP	12.8	10.90	8.95	7.44
	OHL Output Shaft	7100	7850	8130	8040
60	Output RPM	41.6	29.2	19.3	14.3
	Output Torque, in lb.	16513	20073	24491	27325
	Output HP	10.9	9.30	7.50	6.20
	Input HP	12.8	10.90	8.95	7.44
	OHL Output Shaft	7400	8150	7900	7440
70	Output RPM	34.7	24.3	16.1	12.3
	Output Torque, in lb.	17830	21428	24678	26860
	Output HP	10.1	8.5	6.50	5.20
	Input HP	12.0	10.1	7.90	6.44
	OHL Output Shaft	7800	8100	7880	7550
86	Output RPM	29.1	20.3	13.5	10.0
	Output Torque, in lb.	17326	21111	25676	27730
	Output HP	8.0	6.80	5.50	4.40
	Input HP	9.8	8.38	6.89	5.66
	OHL Output Shaft	8250	8100	7750	7400

Ratio	Rating Data	RPM INPUT 2500	1750	1160	860
101	Output RPM	24.8	17.3	11.5	8.5
	Output Torque, in lb.	16010	19308	21921	24440
	Output HP	6.3	5.30	4.00	3.30
	Input HP	8.0	6.80	5.20	4.45
	OHL Output Shaft	8300	8200	8100	7900
121	Output RPM	20.7	14.5	9.59	7.1
	Output Torque, in lb.	14005	16951	20373	24820
	Output HP	4.6	3.90	3.10	2.80
	Input HP	6.2	5.30	4.40	4.00
	OHL Output Shaft	8400	8280	8125	7850
144	Output RPM	17.4	12.2	8.06	5.97
	Output Torque, in lb.	16661	20147	24240	27450
	Output HP	4.6	3.90	3.10	2.60
	Input HP	6.2	5.30	4.40	3.75
	OHL Output Shaft	8300	8130	7915	7450
162	Output RPM	15.4	10.8	7.16	5.3
	Output Torque, in lb.	16370	19841	23766	24925
	Output HP	4.0	3.40	2.77	2.10
	Input HP	5.6	4.80	3.98	3.20
	OHL Output Shaft	8300	8160	7980	7850
192	Output RPM	13	9.11	6.04	4.48
	Output Torque, in lb.	17937	21446	26086	26730
	Output HP	3.7	3.10	2.50	1.90
	Input HP	5.2	4.50	3.70	3.00
	OHL Output Shaft	8215	8100	7700	7590
240	Output RPM	10.4	7.29	4.83	3.58
	Output Torque, in lb.	18180	21613	24792	28160
	Output HP	3.0	2.50	1.90	1.60
	Input HP	4.5	3.81	3.10	2.60
	OHL Output Shaft	8200	8100	7880	7300
288	Output RPM	8.68	6.08	4.03	2.99
	Output Torque, in lb.	16700	20731	25022	27400
	Output HP	2.3	2.00	1.60	1.30
	Input HP	3.7	3.22	2.68	2.32
	OHL Output Shaft	8290	8115	7820	7450
336	Output RPM	7.44	5.21	3.45	2.56
	Output Torque, in lb.	15247	18145	21921	27080
	Output HP	1.8	1.50	1.20	1.10
	Input HP	3.0	2.62	2.24	2.10
	OHL Output Shaft	8350	8215	8100	7500

RIGHT ANGLE — COMBINATION REDUCTION

SIZE 40 — C-FACE — CAST FOOT BASE

DIMENSIONS



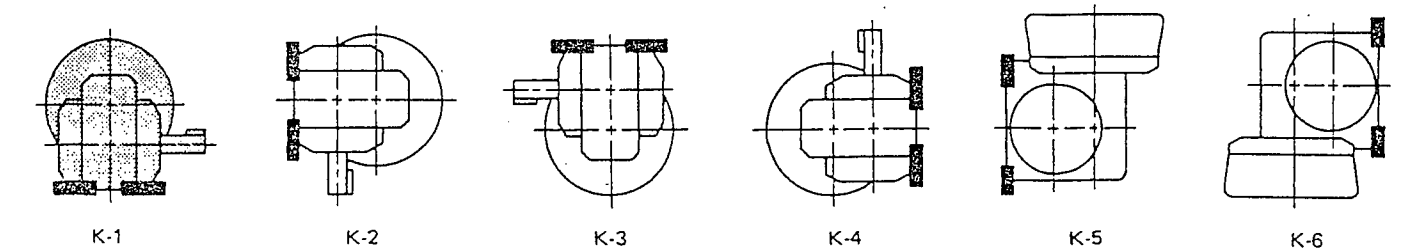
Frame	H	AJ	BD	LM	Key		U	
					Sq.	Lgth.	Min.	Max.
180TC, 180ATC	17/32	7.25	9	8.22	.25	1.38	1.126	1.127
210TC, 210ATC	17/32	7.25	9	8.72	.31	1.13	1.376	1.377
250TC, 250ATC	17/32	7.25	9	8.22	.38	2.88	1.626	1.629

MOUNTING POSITIONS

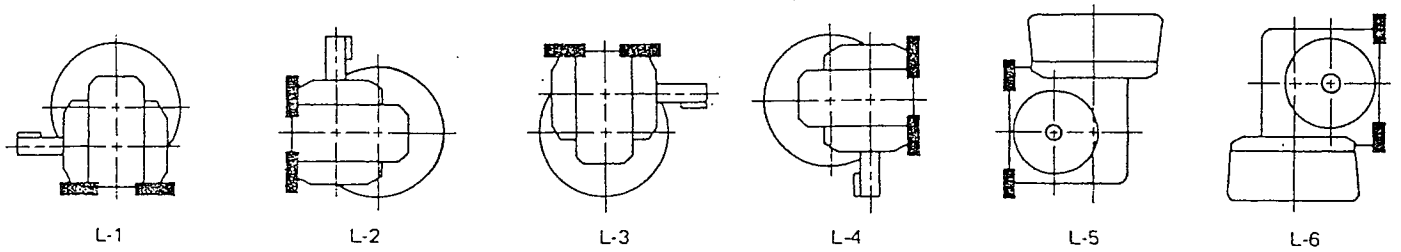
"K" mounting positions are standard. "L" mounts are available from factory.

☐ Standard

All standard mounting positions can be mounted up to ±5° from either vertical or horizontal axis without changing oil vent, level and drain plugs. If mounting angle exceeds ±5°, specify when ordering.



K-1 K-2 K-3 K-4 K-5 K-6



L-1 L-2 L-3 L-4 L-5 L-6

Section II

Section III

Section IV

STANDARD TERMS AND CONDITIONS

which shall apply and form part of the within quotation except as expressly otherwise agreed by an officer of Ashbrook-Simon-Hartley Inc.

ACCEPTANCE: Unless otherwise expressly stated herein, this quotation shall expire Thirty (30) days after its date.

DELIVERY: Except as otherwise specified in this quotation, delivery will be F.O.B. point of shipment. Time of delivery is an estimate only and is based upon the receipt of all information and necessary approvals. The company shall in no event be liable for delays caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond the company's control.

WARRANTIES: The equipment offered is warranted in accordance with the terms of Ashbrook-Simon-Hartley, Inc. standard warranty which is hereby made part of this proposal.

PRICES: All prices exclude sales, use, occupation, license, excise and other taxes in respect to manufacture, sale or delivery, all of which shall be paid by the buyer unless a proper exemption certificate is furnished. Prices are subject to adjustment to conform to the company's established prices in effect at time of shipment, or standard price adjustment clause.

TERMS: If not otherwise specified in the quotation, the terms of payment shall be balance net within Thirty (30) days after shipment. In all cases payment, other than initial payments, shall be made pro rata as principal items are shipped. If any proceeding be instituted by or against buyer under any bankruptcy or insolvency law, or if in the company's judgment buyer's financial situation justifies such action, the company may, at its election exerciseable at any time prior to delivery require payment in advance or cancel the order as to any unshipped items and require payment of its reasonable cancellation charges. In the event delay in making shipment is caused by buyer, payment for such shipment shall be due Thirty (30) days from date seller notifies buyer that seller is prepared to make such shipment. If buyer delays completion of manufacture, the company may elect to require payment according to percentage of completion. Machinery held for buyer shall be at buyer's risk and expense.

TITLE AND LIEN RIGHTS: The equipment shall remain personal property, regardless of how affixed to any realty or structure until the price (including any notes given therefor) of the equipment has been fully paid in cash, the company shall, in the event of customer's default, have the right to repossess such equipment.

THIS QUOTATION MAY BE CHANGED OR BE REVOKED AND WITHDRAWN BY THE COMPANY AT ANY TIME UPON WRITTEN NOTICE TO THE BUYER.

ASHBROOK-SIMON-HARTLEY

W A R R A N T Y

ASHBROOK-SIMON-HARTLEY, Corp. Warrants for a period of twelve (12) months from start up, not to exceed eighteen (18) months from date of shipment, the new equipment of its own manufacture to be free from defects in material and workmanship under normal use and service when used and maintained in accordance with instructions supplied by Ashbrook-Simon-Hartley. Ashbrook-Simon-Hartley's obligation under this warranty being limited to repairing or replacing at its option any part found to its satisfaction to be so defective, provided that such part is, upon request, returned to Ashbrook-Simon-Hartley's factory, freight prepaid. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, accident, neglect, or from improper operation, maintenance, installation, modification or adjustment. This warranty does not cover parts required outside Ashbrook-Simon-Hartley's factory without prior written approval. Ashbrook-Simon-Hartley makes no warranty as to starting equipment, electrical apparatus or other material not of its manufacture, since the same are covered by warranties of the respective manufacturer thereof.

Ashbrook-Simon-Hartley shall not be liable for consequential damages whether or not caused by sellers negligence. Consequential damages for the purpose of this agreement shall include, but not be limited to, loss or use, income or profit, or loss of or damage to property occasioned by or arising out of the operation, use, installation, repair or replacement of the equipment or otherwise.

LIMITED BELT WARRANTY

Ashbrook-Simon-Hartley warrants that the belts furnished with our sludge dewatering equipment are free of defects in material and workmanship. Should there be a defect in material or workmanship, Ashbrook-Simon-Hartley will replace such defective belts on a pro-rated basis based on a normal usage rate of 2,000 operating hours per belt. This warranty covers the belts only and does not include installation.

The life of a belt is primarily dependent upon the nature of the sludge and the experience and competency of the operator. Therefore, this warranty does not cover belts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from nuisance, accident, neglect, or from improper operation, maintenance, installation, modification, or adjustment.

SERVICE TERMS

ASHBROOK-SIMON-HARTLEY

1. RATES
Service rate is $300.00 net per 8 hour man day during normal working hours, Monday through Friday. Rate for Saturday is $450.00 net per 8 hour man day during normal working hours. Rate for Sunday and Holidays is $600.00 per 8 hour man day during normal working hours. Travel time is working time. Parts and expenses are additional. Terms - Net Cash.

2. MINIMUM BILLING
A minimum charge of 1/2 day's time will be made. Billing will be made in 1/2 day increments for time each day at job and/or traveling during normal working hours. Thus five hours spent on job and traveling is billed as one full day.

3. NORMAL WORKING HOURS AND DAYS
8 hours per day, with one hour for lunch, Monday through Friday, except observed holidays which include: Day before New Year's Day, New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving, Friday following Thanksgiving, Christmas Eve, Christmas Day.

4. OVERTIME
Overtime will be billed at 1-1/2 times the prevailing rate for hours in excess of 8 hours spent on a job.

5. EXPENSES
   A. Travel
      (1) Actual plane, train or rental automobile costs from Ashbrook-Simon-Hartley, Houston, Texas, to the customer's plant or construction site, and return.
      (2) Private automobile travel at the rate of $0.20 per mile.
      (3) Expenses also to include local travel required.
      (4) Where our service representative goes from job to job, rather that returning to his headquarters, and equitable distribution of travel charges will be made.
   B. Living
      (1) Actual expenses for lodging, meals and incidental costs.
   C. Telephone calls and wires as required in connection with the details of the job will be charged at cost.
   D. Administrative expenses and profit will be charged accordingly at the rate of 15%.

6. PARTS
All parts supplied will be billed at list prices. Service work performed by others under our authorization will be billed at our cost plus 20% overhead.

7. LIMITATION OF LIABILITY
As our representatives are authorized to work on Ashbrook-Simon-Hartley equipment and are not authorized to operate related equipment, all responsibility for operation rests with the customer. Ashbrook-Simon-Hartley shall not be liable for any claims, losses, labor, expenses or damages, direct or consequential, resulting directly or indirectly from the service performed hereunder or for other consequential loss or damage of any nature arising from any cause.

8. AUTHORIZATION
Ashbrook-Simon-Hartley cannot commence any service work until an official Purchase Order for the work has been received.

Section V