PONDEROSA FIBRES OF PENNSYLVANIA

Northampton, Pennsylvania

Purchase Order No. 220224-060700
Specification No. 220221-607.00

CONSULTANT:

Parsons Main, Inc.
Prudential Center
Boston, MA 02199

Instruction Manual

for

1.0m SMX®-S8-LP Belt Filter Press

ANDRITZ-Ruthner, Inc.

Job No. : 612-690

FACTORY:

ANDRITZ-Ruthner, Inc.
1010 Commercial Blvd. So.
Arlington, Texas 76017

SPARE PARTS & SERVICE:

Fritz Rabler
Phone: (817) 465-5611
Fax: (817) 472-8589

IMPORTANT

This manual should be read in its entirety before attempting to install or operate the equipment supplied by *ANDRITZ*. Failure to follow the instructions contained herein could result in invalidation of warranties or injury to personnel.

SAFETY INSTRUCTIONS

It is the responsibility of the contractor, the installer, and the owner to maintain and operate the equipment supplied by ***ANDRITZ*** in such a manner as to comply with the laws concerning occupational safety and health, as well as with all national, state, and local laws and ordinances. Consult the local safety standard authorities or plant supervisors for a complete listing of these regulations.

Safety must be considered a primary factor in all aspects of equipment installation, operation, and maintenance, at all times. Safety training and equipment maintenance will be covered by authorized ***ANDRITZ*** personnel prior to start-up of the equipment. All operating personnel will be advised of the location and operation of all emergency control devices.

The following safety instructions are basic guidelines, and should be considered minimum provisions:

- Unobstructed access to controls and emergency stop devices should be maintained at all times. Sufficient lighting and good housekeeping practices should be maintained around the equipment at all times.
- All rotating equipment, such as drives, gears, fans, pumps, shafts, couplings, chains, belts, and ropes should be guarded, as required by the applicable laws and standards. The equipment should not be operated until all covers and guards are in place.
- If equipment is to be opened for inspection, maintenance, or servicing, the drive motor should be locked-out and secured against being switched-on again (lockable repair switch, shorting bar, etc.). Operation should not resume until all covers and safety guards are in place.
- High-voltage and rotating electrical machinery can cause serious or fatal injury. Installation, operation, and maintenance of rotating electrical machinery should only be performed by qualified personnel.
- Inlet and discharge openings should remain connected to other equipment to ensure that any dangerous parts of the machinery are not exposed.
- Warning signs should not be removed. If warning signs become dirty or damaged, they should be cleaned or replaced immediately.

Safety instructions for installation, operation, and maintenance of ***ANDRITZ*** equipment are found in Section 3.1, 4.1, and 5.1, respectively.

TABLE OF CONTENTS

7.0 Belt Cleaning System
- 7.1 Installation, Operation & Maintenance
- 7.2 Shower Pipe Drawing

8.0 Drive Information
- 8.1 Drive List
- 8.2 Instruction Manuals

9.0 Certified Mechanical Drawings
- 9.1 Side Elevation
- 9.2 Plan View
- 9.3 Plant Layout
- 9.4 Foundation Plan
- 9.5 4-inch Vertical Tank Mixer Assembly

10.0 Certified Electrical Drawings
- 10.1 LP Terminal Box Details
- 10.2 LP Control Panel Layout
- 10.3 LP Control Electrical Schematic
- 10.4 LP Control Electrical Schematic
- 10.5 LP Control Electrical Schematic
- 10.6 LP Pneumatic Schematic

Spare Parts - Last 2 pages

1.0 GENERAL INFORMATION

1.1 PERFORMANCE REQUIREMENTS

DESIGN CRITERIA

A. Effluent Treatment Sludge Presses

1. Type of Mill	Pulp & Paper Mill (M.O.W. Recycle Effluent)
2. Type of Sludge	Primary/Secondary (22%/78%)
3. Design Throughput	1.0 BDSTPD (Primary) 3.4 BDSTPD (Secondary) 4.4 BDSTPD (Total)
4. Inlet Consistency	3.2% SS (Primary) 4.0% SS (Secondary) 3.8% SS (Blend)
5. Hydraulic Loading	19 USGPM
6. Ash Content	15-20%
7. Fiber Content (% retained on 150 mesh screen)	0 - 5%

B. Equipment Recommendation and Anticipated Performance

1. Number. of Presses	Two (2) (one Stand-by Unit)
2. Type of Press	Belt Press
3. Model Number	1.0 meter SMX®-S8
4. Cake Consistency @ Design Criteria	20% BD ± 1%
5. Solids Capture Efficiency @ Design Critieria	95% SS
6. Polymer Consumption @ Design Criteria	7 - 9 kgs/ton estimated

ANDRITZ
CPF 1.0 METER SMX®-S8-LP
MACHINE SPECIFICATIONS

General Machine Technical Data

High Pressure Module	8 S-Rolls
Overall Length	250"
Overall Width	68"
Overall Height	88"
Overall Belt Width	46"
Actual Belt Working Width	40"
Dry Weight	16,800 lbs

Effective Filtration Areas

Gravity Zone	45.9 sq.ft.
Wedge Zone	55.8 sq.ft.
High Pressure Zone	60.7 sq.ft.

Utilities

Total Connected Load	3.0 HP
Washwater Requirements	45 gpm @ 120 psi
Air Requirements	4.0 cfm @ 90 psi

MAJOR COMPONENTS

Main Frame W6x20 wide flange beam of welded construction; 'hot-dip' galvanized coating with surface density of 2.0 ounces of zinc per square foot of metal surface (4-7 mils). Moment of inertia is 41.4 in^4 in the major load bearing axis.

Rolls A-106 B pipe or A-519 steel tubing with 1045 steel double end-plated journals; Buna-N or Rilsan covered.

Bearings Spherical roller type, L-10 rated for a minimum 5,700,000 operating hours.

Belt Tracking and Tensioning Pneumatically controlled for automatic operations.

Belts Seamed design; chosen for the application.

Belt Showers Pipe with recessed nozzles manually cleaned with handwheel operated wire brush.

Belt Doctor Blades UHMW polyethylene; rubber tensioned holding mechanism.

Motor/Drive Type AC Mechanical SEW Eurodrive Varimot type.

Control Panels NEMA 4X.

304 STAINLESS STEEL COMPONENTS

Headbox Assembly
Inline Mixer
Filtrate Pans
Thrust Rods, Pinion & Gear Assembly
Shower Housing, Pipe, Nozzle & Wire Brush
All Nuts, Bolts & Fasteners

1.4 ANDRITZ WARRANTY INFORMATION

MATERIAL AND WORKMANSHIP

The Seller warrants the material comprising the Product sold hereunder against defects in material and workmanship for a period of the earlier of one (1) year from date of acceptance or eighteen (18) months from delivery when given normal and proper usage while owned by the Purchaser, and in any case excluding normal wear items, provided the System has been operated in accordance with generally approved practice and accordance with the Seller's instructions, and further that no repairs, alterations or replacements have been made by others without the Seller's prior written approval. A part claimed defective must be returned by the Purchaser to the Seller for inspection by the Seller and, if found defective as claimed, will be replaced free of charge, including freight both ways. Parts claimed defective but not easily removable shall be inspected by the Seller at the location of the System and, if found defective will be repaired free of charge. The Seller shall in no event be held liable for damage or delay caused by the defective parts and will not accept any charges for work to the Product unless such work has been authorized in writing by the Seller. Any components of the Product not of the Seller's own manufacture is sold under such warranty only as the make thereof given the Seller and Seller is able to enforce but such items are not warranted by the Seller in any way. The Purchaser's sole and exclusive remedy against the Seller shall be for the repair or replacement of defective parts as provided herein.

In no event will the Seller be liable for any other remedy including, but not limited to, incidental or consequential damage, losses or expenses arising in connection with the use of or inability to use the product for any purpose whatsoever. The Limited Warranty, express or implied, including but not limited to, warranties of merchantability and fitness for a particular purpose.

1.5 SAFETY INSTRUCTIONS

It is the responsibility of the contractor, the installer, and the owner to maintain and operate the equipment supplied by ***ANDRITZ*** in such a manner as to comply with the laws concerning occupational safety and health, as well as with all national, state, and local laws and ordinances. Consult the local safety standard authorities or plant supervisors for a complete listing of these regulations.

Safety must be considered a primary factor in all aspects of equipment installation, operation, and maintenance, at all times. Safety training and equipment maintenance will be covered by authorized ***ANDRITZ*** personnel prior to start-up of the equipment. All operating personnel will be advised of the location and operation of all emergency control devices.

The following safety instructions are basic guidelines, and should be considered minimum provisions:

- Unobstructed access to controls and emergency stop devices should be maintained at all times. Sufficient lighting and good housekeeping practices should be maintained around the equipment at all times.
- All rotating equipment, such as drives, gears, fans, pumps, shafts, couplings, chains, belts, and ropes should be guarded, as required by the applicable laws and standards. The equipment should not be operated until all covers and guards are in place.
- If equipment is to be opened for inspection, maintenance, or servicing, the drive motor should be locked-out and secured against being switched-on again (lockable repair switch, shorting bar, etc.). Operation should not resume until all covers and safety guards are in place.
- High-voltage and rotating electrical machinery can cause serious or fatal injury. Installation, operation, and maintenance of rotating electrical machinery should only be performed by qualified personnel.
- Inlet and discharge openings should remain connected to other equipment to ensure that any dangerous parts of the machinery are not exposed.
- Warning signs should not be removed. If warning signs become dirty or damaged, they should be cleaned or replaced immediately.

Safety instructions for installation, operation, and maintenance of ***ANDRITZ*** equipment are found in Section 3.1, 4.1, and 5.1, respectively.

1.6 BELT SPECIFICATIONS

CPF 1.0m SMX®-S8-LP Belt Filter Press

Top Belt:	44" x 540" Clipper Seam
Bottom Belt:	44" x 907" Clipper Seam

1. Belt: IFC 6093

Material:	Polyester
Weave type:	Modified Satin
Weight:	35.4 oz/sq. yd:
Mesh Count:	64 x 24 per inch
Air Permeability:	360 cfm/sq. ft.

*Edges Chamfered
*Belt to have heat cut edges and sealed seams
*Belts to be provided with clipper seams

2. Seam: AX 1 + 1

*Seam width: 3/4", full penetration; applied from both sides.
*Hook and splice material: ASTM A316 stainless steel
*8 hooks per inch

1.7 STORAGE INSTRUCTIONS

When the Dewatering system is to be in storage for any length of time, ***ANDRITZ*** recommends the following consideration be taken:

1. The system should be kept inside, whenever possible.

2. The system should not be subjected to freezing temperatures or excessive direct sunlight.

3. The drive motor should be covered to protect them from moisture. Additionally, the fan should be removed and the motors rotated by turning the fan about once every six months, and the cover put back into place.

4. The roller bearings should be greased and turned about once a month to displace any moisture that might have accumulated.

5. The control panels should be left in their shipping crates and/or covered with plastic to kept them clean and dry. As an added measure, a desiccant bag will help maintain dryness.

6. The press should be covered with a tarp. This will help insure that any work in the area such as welding or painting will not hurt the roll or frame coatings. Any scratches or scrapes should be touched up immediately using the touch-up paint sent with the system.

7. Particular attention should be paid to miscellaneous tools and other small items. It is essential that the customer keep a good inventory record of all equipment in storage. This equipment has been accepted as complete during the signing of the shipping bill of lading. Therefore, any missing parts shown on the packing list will be the customer's responsibility.

IP-5
1989

ROLL COVERING HANDBOOK

Section III

Care & Maintenance

RMA®
RUBBER MANUFACTURERS ASSOCIATION
1400 K STREET, N.W., WASHINGTON, D.C. 20005

Care & Maintenance

3.1 Packing and Shipping

Boxes or cases are normally furnished with the core and are the responsibility of the user. Charges are made by the roll covering manufacturer for new boxes or the repair of old boxes.

At times special conditions dictate the use of skids, with the roll surface protected by wrapping material.

As the responsibility for the efficiency of the protection remains with the roll owner on both inbound and outbound shipments, he should ensure that the box or skid provided is adequate for shipment.

Upon receipt, rolls should be inspected for any obvious signs of damage to container and/or roll. If damage is found, a determination should be made as to the responsible party and appropriate notification should be made immediately.

3.1.1 Box Construction

The box should be so constructed as to provide sufficient strength for support and large enough to enclose the roll completely, providing protection to the roll and covering during shipment.

Boxes should provide a minimum clearance between the rubber surface of the roll(s) and the inside surface of the box as shown below.

Care should be taken to ensure that no movement of the roll takes place and that there are no nails, screws, or other internal projections which could damage the roll covering should the core or box flex during shipment or handling. Boxes should be marked to indicate the proper lifting points to prevent damage in handling.

3.1.2 Cold Weather Protection

Damage to roll coverings can occur from shock in handling while cold or from rapid temperature changes. Consequently, cold rolls should be lifted or handled with great care; temperatures below 5 °C (40 °F) are considered critical.

Under subfreezing temperature conditions, shipments of rolls with hard covers (e.g., 0–50 P & J) or any rolls with hard base construction, regardless of hardness, should be by heated transport in which the temperature is maintained at 5 °C (40 °F) or higher.

Heated transport is not required for rolls which are softer than 50 P & J or 75 durometer A and which do not have a hard base construction.

To minimize the effect of rapid temperature changes, the roll may be insulated. Roll coverings received at a mill during cold winter months in heated cars should be transferred to a heated location as quickly as possible.

In the event that covered rolls are received unheated at temperatures lower than 5 °C (40 °F), care must be taken that the covering and roll body increase in temperature at the same rate. Otherwise, they might be damaged by differential thermal expansion. The possibility of damage can be minimized by putting the roll in a warehouse where the temperature is around 5 °C (40 °F) for at least a 24-hour, gradual warm-up. Only after the 24-hour warm-up period should the cold rolls be moved into a mill where normal room temperature prevails.

3.2 Roll Covering Identification Records

It is recommended that a record of performance be maintained for each roll covering by the user. This record should include all pertinent information about the roll covering including such data as manufacturer, date of supply, type, measurements, identification numbers, plus a record of installation and removal.

Suitable roll covering record forms and materials are available on request from some roll covering manufacturers. When used regularly, records will enable the roll user to establish required roll covering service schedules and point up problems relating to roll performance.

Examples of typical roll covering service record forms are shown on adjoining pages.

Diameter of the Roll Including the Covering	Minimum Clearance All Around
under 750 mm (under 30") 750 mm and over (30" and over)	50 mm (2") 100 mm (4")

3.3 Care of Roll Covering

.1 Maintenance

Roll coverings should be used only for the service, environment and operating conditions for which they were intended. If any of these are to be changed, the roll manufacturer should be consulted as to the coverings' adaptability to the changes proposed, prior to placing the roll in operation.

Should a roll remain out of service for a long period of time, an oxidized roll surface may be refurbished by grinding off 1 mm (1/32") of rubber from the cover thickness, i.e., reducing the roll diameter by 2 mm (1/16").

Rolls should be removed from service as soon as damage or deterioration is observed. Continued use of the roll will accelerate loss of performance and lead to premature failure.

If the manufacturer's recommended care and maintenance procedures are followed, maximum service life and efficiency of operation will be achieved.

3.3.2 Surface Protection

Deterioration may result if oil, grease, kerosene, sol-'s, or other chemicals are allowed to come into contact ı and remain on the roll covering. Similarly, adhesion the rubber-metal interface may be reduced by contact with these materials.

In all cases when a roll covering is to be cleaned, the manufacturer should be consulted for a specifically recommended cleaning solution. Cleaning by hand with abrasive paper is not recommended because it usually results in uneven removal of rubber with resulting flat spots and operating difficulties.

When handling rolls, great care should be taken to avoid damage by bumping or knocking any part of the roll.

3.3.3 Storage

Rolls should be stored in a cool, dark area where they will not be exposed to direct sunlight or wide temperature or humidity variations from normal conditions. The storage area should be other than a work or high traffic area to avoid accidental damage. Where possible rolls should be stored in their shipping boxes. Additional protection may be afforded by keeping the roll covering in the wrapping supplied by the manufacturer. Areas of high ozone con-entration, such as areas with motor generators or other ctrical arc producing machinery, should not be used storage.

3.4 Chemical Attack on Roll Covering

The increased use of chemicals and of recycled process fluids, which frequently concentrate those chemicals, are a source of great concern to roll covering manufacturers. Chemical attack on roll covering is not likely to be sudden and catastrophic but is usually slow and frequently manifests itself in disguised form, such as in increased wear or loss of bond at roll covering edges or, in the case of suction rolls, over the entire face of the roll. Chemical attack may also result in a measurable softening of the covering. In fact, it is the only common cause of cover softening and swelling which can effectively destroy the surface contour of the roll. On the other hand, chemical attack may cause surface hardening or spalling or blistering of the surface of the roll covering.

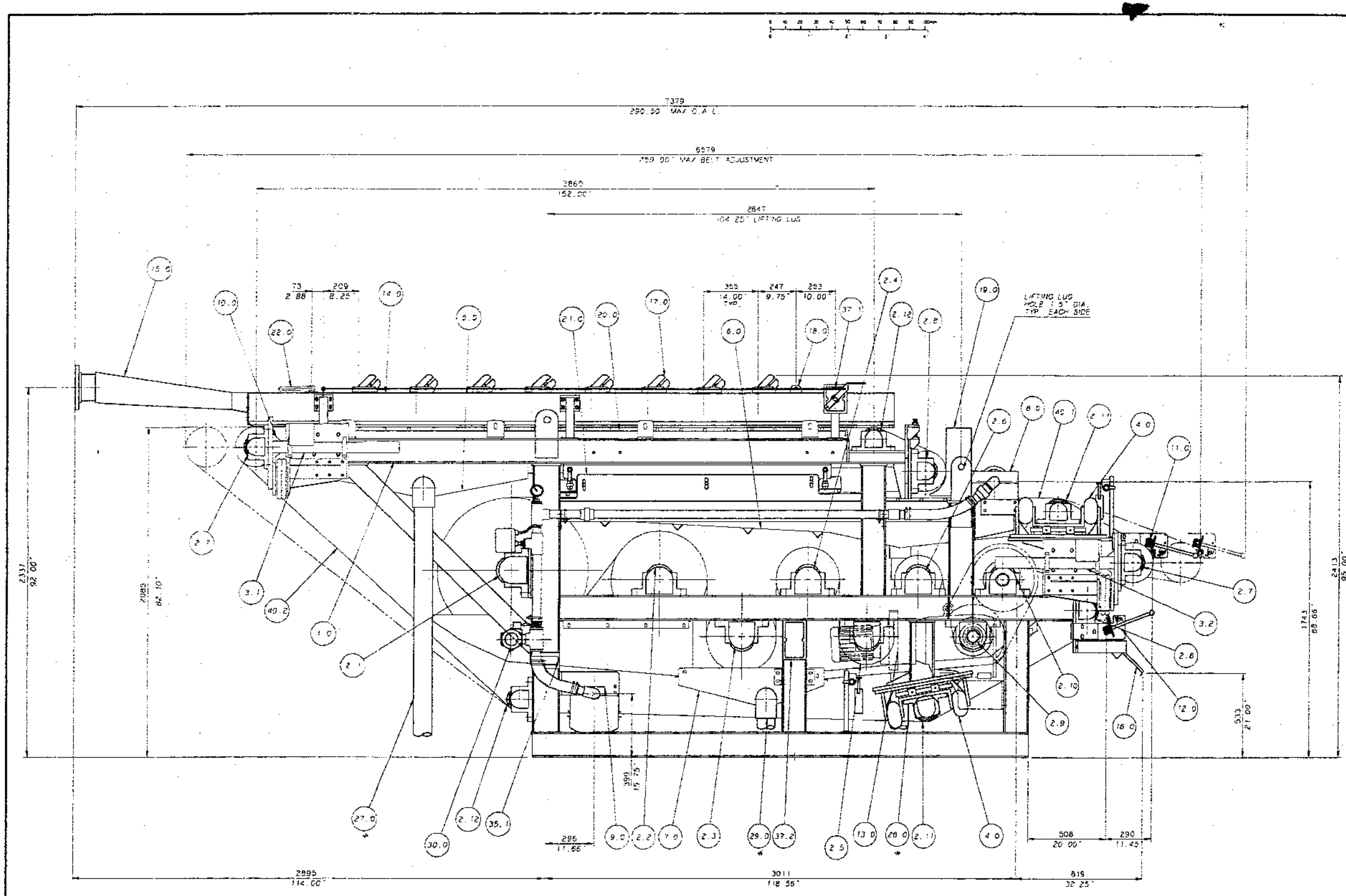
There is no way to predict, except in a general fashion, the action of a new chemical on existing coverings even if the exact chemical composition is known. It should be noted that most chemicals are proprietary products whose compositions are given only in a generalized form. In addition, combinations of chemicals may have a greater effect than the sum of the effects of each individually. This synergistic effect on the covering cannot always be predicted.

Obviously, under these conditions and with the proliferation of chemical additives, both the roll covering manufacturer and the roll covering user have a common interest. Processing chemicals, chemicals which become a part of the product, cleaning agents, defoamers, and inhibitors are increasingly important and are growing in variety and in quantity. It is essential that the roll user provide complete information to the roll covering manufacturer. The problem is to determine the offending chemical or combination of chemicals. Once this is done, those chemicals may be eliminated or, if this is impossible because of process restrictions, the covering manufacturer may be able to supply a covering which will be more resistant to those chemicals. To resist certain chemicals, a compromise of some other desirable quality of the covering may be necessary.

The inherent difficulties of performing and interpreting chemical attack tests are illustrated by the following excerpt from ASTM D 471–79:

"In view of the wide variations often present in service conditions, this accelerated test may not give any direct correlation with service performance. However, the method yields comparative data on which to base judgment as to expected service quality and is especially useful in research and development work."

Not only the chemical itself, but also the temperature at the interface of the covering and the chemical is important. Higher temperatures invariably accelerate attack.



1.0 FRAME ASSEMBLY
2.1 ø914 (36") "S"-ROLL ASSEMBLY
2.2 ø610 (24") "S"-ROLL ASSEMBLY
2.3 ø457 (18") "S"-ROLL ASSEMBLY
2.4 ø406 (16") "S"-ROLL ASSEMBLY
2.5 ø356 (14") "S"-ROLL ASSEMBLY
2.6 ø305 (12") "S"-ROLL ASSEMBLY
2.7 ø254 (10") TENSIONING ROLL ASSEMBLY (2)
2.9 ø254 (10") DEFLECTION ROLL ASSEMBLY (2)
2.9 ø241 (9 1/2") DRIVE ROLL ASSEMBLY (1)
2.10 ø241 (9 1/2") DRIVE ROLL ASSEMBLY (1)
2.11 ø165 (6 1/2") TRACKING ROLL ASSEMBLY (2)
2.12 ø152 (6") DEFLECTION ROLL ASSEMBLY (2)
3.1 GRAVITY ZONE BELT TENSIONING ASSEMBLY
3.2 LOWER FRAME BELT TENSIONING ASSEMBLY
4.0 BELT TRACKING DEVICE
5.0 GRAVITY ZONE FILTRATE PAN
6.0 WEDGE ZONE FILTRATE PAN
7.0 S-ZONE FILTRATE PAN
8.0 UPPER SHOWER ASSEMBLY
9.0 LOWER SHOWER ASSEMBLY
10.0 TENSION ROLL CHUTE ASSEMBLY
11.0 UPPER DOCTOR ASSEMBLY
12.0 LOWER DOCTOR ASSEMBLY
13.0 DRIVE ASSEMBLY
14.0 HEADBOX ASSEMBLY
15.0 DISTRIBUTION CHUTE
16.0 DISCHARGE CHUTE ASSEMBLY
17.0 PLOW CHICANE ASSEMBLY (8 ROWS)
18.0 SLUDGE LEVELER
19.0 SPLASH GUARD
20.0 GRAVITY ZONE GRID ASSEMBLY
21.0 WEDGE ZONE GRID ASSEMBLY
22.0 FLOATING WEDGE
27.0 GRAVITY ZONE FILTRATE DRAIN (ON BOTH SIDES)
28.0 WEDGE ZONE FILTRATE DRAIN (ON FAR SIDE)
29.0 S-ZONE FILTRATE DRAIN (ON NEAR SIDE)
30.0 SHOWER INLET PIPING
31.0 UPPER SHOWER DRAIN (NOT SHOWN)
32.0 LOWER SHOWER DRAIN (NOT SHOWN)
33.0 UPPER SHOWER BACKWASH PIPING (FAR SIDE)
34.0 LOWER SHOWER BACKWASH PIPING (FAR SIDE)
35.1 PNEUMATIC MANIFOLD
37.1 E-STOP SWITCH (BOTH SIDES)
37.2 ELECTRICAL TERMINAL BOX
40.1 TOP BELT
40.2 BOTTOM BELT

ANDRITZ
CERTIFIED CORRECT FOR INSTALLATION
DATE 6-30-95
PROJECT No. 612-690
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. SUBMITTALS

NOTE:
ONE MACHINE RIGHT HANDED.
ONE MACHINE LEFT HANDED.
RIGHT HAND MACHINE AS SHOWN.
LEFT HAND MACHINE OPPOSITE AS SHOWN.

* DRAIN PIPE LENGTHS TO BE DETERMINED AT JOBSITE. (SEE INSTRUCTIONS PROVIDED IN PVC SOLVENT AND PRIMER CONTAINER). SUPPORT BRACING TO BE PROVIDED BY OTHERS. 5 PLACES.

0607.00-A01-#11

NO	REVISION	BY	DATE
1	REVISED PER CUSTOMER REQUEST	GEH	06-09-95

Drawn by: G. HILL — Date: 5/16/95
THIRD ANGLE PROJECTION
ANDRITZ RUTHNER, INC. — 1010 COMMERCIAL BLVD. SOUTH, ARLINGTON, TEXAS 76017, Phone: (817)465-5611
CAD
Customer: PONDEROSA FIBRES
File Name: M690-4
Job No.: 612-690
Title: CPF 1.0m SMX-S8-LP SIDE ELEVATION
Drawing No.: M612690-4
Rev.: 1

10.0 CERTIFIED ELECTRICAL DRAWINGS

Job: E690-LP-PP Asm#: 0 Part: E690-LP-PP Rev: 0 Drawing: E612690-9
Desc: LP PNEU CONTROL PNL 690

---- Production Quantities ---- - Scheduled Dates -
For Stock: 1.00 For Order: 0.00 Total: 1.00 Start: Due: Req. By: 11/11/95

SUB-ASSEMBLY COMPONENTS:

Asm#	Part Number	Description	Required Qty	Qty from Stk	Whse
4	E690-PP-ENCL	PNEU PNL ENCLOSURE JOB 690	1.00EA	0.00	
5	E690-PP-SUB	PNEU PNL SUBPANEL 690	1.00EA	0.00	
6	E690-PP-ESCH	PNEU PNL ELEC SCH 690	1.00EA	0.00	
7	E690-PP-PSCH	PNEU PNL PNEU SCH 690	1.00EA	0.00	

Job: E690-LP-PP Asm#: 4 Part: E690-PP-ENCL Rev: 0 Drawing: E612690-9
Desc: PNEU PNL ENCLOSURE JOB 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 0	Part: E690-LP-PP	LP PNEU CONTROL PNL 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	BX-N4XS-363008-H01	HOFFMAN A-36H30SSLP ENCLOSURE	1.00EA	AA	0
20	PNEU-REG-M4-N01	NORGREN R07-200-RNKA REGULATOR	3.00EA	AA	0
30	PNEU-REG-ACC-N01	NORGREN 18-025-002 REG. NUT	3.00EA	AA	0
40	PNEU-VAL-M4-N01	NORGREN K41DA00-KCO-KKO 3/2	3.00EA	AA	0
50	PNH-F-BFV4-M01	McMASTER CARR 9833K22	1.00EA	AA	0
60	PNH-F-S6BU6-P01	PARKER 6-6WBZ-SS BULKHEAD UNIN	1.00EA	AA	0
70	PNH-F-S4BU4-S01	SWG SS-400-61 BULKEAD 1/4	3.00EA	AA	0
80	PNEU-GA-100P4-A01	ASH 35-1009-SWL-0-02B-XUC-0/10	3.00EA	AA	0
90	PNEU-FRL-M4-P01	PARKER 1411B13FOG	1.00EA	AA	0
100	PNEU-FRL-ACC-P01	PARKER PS417	1.00EA	AA	0
110	PNEU-GA-160P4-P01	PARKER P77413	1.00EA	AA	0
120	PNH-F-S6ME4-S01	SWAGELOK SS-600-2-4	2.00EA	AA	0
130	PNH-T-S6-P01	PARKER 3/8 O.D. 316SS TUBING	1.00FT	AA	0
140	PB-NXPB-2PMR2C-S01	SQD 9001 SK5RH13	1.00EA	AA	0
150	PB-NXPB-2P2C-S01	SQD 9001 SKR1UH13 UNIVERSAL	5.00EA	AA	0
160	PB-NXPB-2PIR1V2C-S01	SQD 9001 SK1L1RH13 ILL RED PB	1.00EA	AA	0

Job: E690-LP-PP Asm#: 5 Part: E690-PP-SUB Rev: 0 Drawing: E612690-9
Desc: PNEU PNL SUBPANEL 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 0	Part: E690-LP-PP	LP PNEU CONTROL PNL 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	BX-PNL-C3630-H01	HOFFMAN A-36P30 SUBPANEL	1.00EA	AA	0
20	SW-PRESS-N475P-S01	SQD 9012 GDW4 0-75 PSI SPDT	3.00EA	AA	0
30	TERM-EDPLT-W01	WEID AP4 1179.6	2.00EA	AA	0
40	TERM-ANCHR-W01	WEID EWK-1 2061.6	2.00EA	AA	0
50	TERM-6V30A10P-W01	WEID KB4/10 3226.6	4.00EA	AA	0
60	TERM-6V87A1PG-W01	WEID EK4 3546.6	1.00EA	AA	0
70	CND-CNIP-A.5ST-T01	T&B 842AL	3.00EA	AA	0
80	TERM-TRK-W01	WEID TS-32 1228.0	3.00FT	AA	0
90	HARD-DUCT-1C-P01	PANDUIT C1WH6	6.00FT	AA	0
100	HARD-DUCT-1X3-P01	PANDUIT F1X3WH6	6.00FT	AA	0
110	TERM-6V35A1P-W01	WEID SAK6N 1932.6	3.00EA	AA	0
120	TERM-6V87A1PG-W02	WEID EK-10 3546.6	1.00EA	AA	0

Job: E690-LP-PP Asm#: 6 Part: E690-PP-ESCH Rev: 0 Drawing: E612690-10
Desc: PNEU PNL ELEC SCH 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 0	Part: E690-LP-PP	LP PNEU CONTROL PNL 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	WIRE-14GA-RED-UL-X01	STRAND TFFN 14 GA RED (2500' R	50.00FT	AA	0
50	WIRE-14GA-WHT-UL-X01	STRAND TFFN 14 GA WHITE (2500'	50.00FT	AA	0
60	WIRE-16GA-RED-UL-X01	STRAND THWN 16 GA RED (2500' R	50.00FT	AA	0
70	WIRE-16GA-WHT-UL-X01	STRAND THWN 16 GA WHITE (2500'	50.00FT	AA	0
80	WIRE-14GA-GRN-UL-X01	STRAND TFFN 14 GA GREEN (2500'	10.00FT	AA	0
90	WIRE-16GA-GRN-UL-X01	STRAND THWN 16 GA GREEN	10.00FT	AA	0

Job: E690-LP-PP Asm#: 7 Part: E690-PP-PSCH Rev: 0 Drawing: P612690-5
Desc: PNEU PNL PNEU SCH 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 0	Part: E690-LP-PP	LP PNEU CONTROL PNL 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
	PNH-F-N4FE4-P01	PARKER N4FE4 ELBOW 1/4"	3.00EA	AA	0
	PNH-F-N4ME4-P01	PARKER N4ME4 1/4 MALE ELBOW	3.00EA	AA	0
30	PNH-F-N4MT4-P01	PARKER-N4MT4 MALE BRANCH TEE	6.00EA	AA	0
40	PNH-F-N4MC4-P01	PARKER N4MC4 1/4 MALE CONN.	3.00EA	AA	0
50	PNH-F-N6ME4-P01	PARKER N6ME4	1.00EA	AA	0

Job: E690-LP-PP Asm#: 7 Part: E690-PP-PSCH Rev: 0 Drawing: P612690-5
Desc: PNEU PNL PNEU SCH 690

MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
60	PNH-F-N6MT4-P01	PARKER N6MT4	2.00EA	AA	0
70	PNH-F-N6FC6-P01	PARKER N6FC6 FEMALE CONN 3/8"	1.00EA	AA	0
80	PNH-T-P4B-P01	PARKER EB-43 1/4" O.D. TUBING	25.00FT	AA	0
90	PNH-T-P6B-P01	PARKER EB64 3/8" O.D. TUBE	25.00FT	AA	0

Job: E690LPMW Asm#: 0 Part: E690LPMW Rev: 0 Drawing: MW612690-X
Desc: LP MACH. WIRING 690

---- Production Quantities ---- - Scheduled Dates -
For Stock: 1.00 For Order: 0.00 Total: 1.00 Start: Due: Req. By: 09/06/95

SUB-ASSEMBLY COMPONENTS:

Asm#	Part Number	Description	Required Qty	Qty from Stk	Whse
1	E690-LP-MW	LP MACHINE WIRING JOB 690	1.00EA	0.00	
3	E690-LP-PP	LP PNEU PAN JOB 690	1.00EA	0.00	

Job: E690LPMW Asm#: 1 Part: E690-LP-MW Rev: 0 Drawing: E690LPMW
Desc: LP MACHINE WIRING JOB 690

Prod. Qty Qty from Stk Over Run Qty --- Parent Assembly ---
1.00 0.00 0.00 Asm#: 0 Part: E690LPMW LP MACH. WIRING 690

TO MATCH LINE ITEMS TO BALLOONS DROP THE ZERO ON THE BOM

EXAMPLE: LINE ITEM 140 = BALLOON 14

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	000	THIS ITEM NOT REQUIRED	1.00EA	AA	0
20	000	THIS ITEM NOT REQUIRED	1.00EA	AA	0
30	000	THIS ITEM NOT REQUIRED	1.00EA	AA	0
40	000	THIS ITEM NOT REQUIRED	1.00EA	AA	0
50	SW-ES-CORD-C01	CCC RS-26 NYLON COATED CABLE	30.00FT	AA	0
60	SW-ES-ACC-M01	M-C 8913T13 U-BOLT CLIP S.S.	4.00EA	AA	0
70	CND-FLEX-P.5-KL01	KELLUMS G1050 1/2" NONMETALIC	10.00FT	AA	0
80	CND-FLEX-P.7-KL01	KELLUMS G1075	10.00FT	AA	0
90	CND-SR-P.5-T01	T&B 2673 1/2" STRAIN RELIEF	2.00EA	AA	0
100	000	THIS ITEM NOT REQUIRED	1.00EA	AA	0
110	933SXM10X100	HEX BOLT, M10 X 100, 316SS	2.00EA	AA	0
120	CND-FF-P.590-AR01	ARLINGTON NMT9050 NON-M 1/2"	2.00EA	AA	0
130	CND-FF-P.790-AR01	ARLINGTON IND. NMLT9075 90ø	3.00EA	AA	0
140	CND-FF-P.7ST-AR01	ARLINGTON IND. NMLT75 3/4" ST.	5.00EA	AA	0
150	CND-FF-P.5ST-AR01	ARLINGTON NMLT50 1/2 ST CONN	2.00EA	AA	0
160	CND-PIP-PC.7-R01	ROBROY CONDUIT 40 MIL COATED	40.00FT	AA	0
0	933SXM10X25	HEX BOLT, M10 X 25, 316SS	6.00EA	AA	0
)	CND-BDY-PC.7T-R01	ROBROY T28 CONDUIT BODY 3/4"	5.00EA	AA	0
)	CND-MNT-PC.7C-R01	ROBROY 22M ONE HOLE CLAMP	8.00EA	AA	0
0	CND-CPL-PC.7ST-R01	ROBROY COUPLING 3/4"	4.00EA	AA	0
210	CND-RB-A.7X.5-X01	3/4X1/2 REDUCING BUSHING	4.00EA	AA	0
220	SW-LIM-ARM-A01	AB 802T-WB3 SS LEVER	2.00EA	AA	0
230	SW-LIM-N4X-A01	AB 802MC-AY5 LIMIT SWITCH N4X	2.00EA	AA	0
240	SW-ES-N4PCDE-C01	CCC RS-2 TWO SPDT EPOXY COATED	2.00EA	AA	0
250	000	THIS ITEM NOT REQUIRED	1.00EA	AA	0
260	CND-MNT-PC.7CB-R01	ROBROY CLB-M75 CLAMP BACK	8.00EA	AA	0
270	SW-PRES-N4125P-S01	SQD 9012 GDW-5 PRESS SW.	1.00EA	AA	0
280	000	THIS ITEM NOT REQUIRED	2.00EA	AA	0
290	CND-HB-.7-R01	ROSTONE X1768-003 3/4" HUB	2.00EA	AA	0
300	933SXM06X30	HEX BOLT M6 X 30, 316SS	16.00EA	AA	0
310	125SXM06	FLATWASHER M6 316SS	16.00EA	AA	0
320	9021SXM06	FLAT WASHER, M6 25MM O.D.	8.00EA	AA	0
330	127SXM06	LOCKWASHER M06 316SS	16.00EA	AA	0
340	934SXM06	HEX NUT M6 316SS	16.00EA	AA	0
350	444SXM12X120	EYEBOLT 12 X 120	14.00EA	AA	0
360	934SXM12	HEX NUT M12 316SS	8.00EA	AA	0
370	125SXM10	FLATWASHER M10 316SS	7.00EA	AA	0
380	127SXM10	LOCKWASHER M10 316SS	7.00EA	AA	0
390	125SXM05	FLATWASHER M5 316SS	15.00EA	AA	0
400	127SXM05	LOCKWASHER M05 316SS	25.00EA	AA	0
410	934SXM05	HEX NUT M5 316SS	18.00EA	AA	0
420	84STM05X50	SCREW M5 X 50	16.00EA	AA	0
430	VAL-SBD-ESOL-A01	ASCO EF8210G100 N4" 2" N.C.	1.00EA	AA	0
440	934SXM10	HEX NUT M10 316SS	6.00EA	AA	0
450	9021SXM05	FLATWASHER M5 OVERSIZED 316SS	8.00EA	AA	0
460	84SXM05X30	SLOT CAM SCREW M5 X 30 316SS	16.00EA	AA	0

Job: E690LPMW Asm#: 3 Part: E690-LP-PP Rev: 0 Drawing: E612690-9
Desc: LP PNEU PAN JOB 690

Prod. Qty Qty from Stk Over Run Qty --- Parent Assembly ---
1.00 0.00 0.00 Asm#: 0 Part: E690LPMW LP MACH. WIRING 690

SUB-ASSEMBLY COMPONENTS:

Asm#	Part Number	Description	Required Qty	Qty from Stk	Whse
4	E690-PP-ENCL	PNEU PNL ENCLOSURE JOB 690	1.00EA	0.00	
5	E690-PP-SUB	PNEU PNL SUBPANEL 690	1.00EA	0.00	
6	E690-PP-ESCH	PNEU PNL ELEC SCH 690	1.00EA	0.00	
7	E690-PP-PSCH	PNEU PNL PNEU SCH 690	1.00EA	0.00	

E690LPMW Asm#: 4 Part: E690-PP-ENCL Rev: 0 Drawing: E612690-9
Desc: PNEU PNL ENCLOSURE JOB 690

Job: E690LPMW Asm#: 4 Part: E690-PP-ENCL Rev: 0 Drawing: E612690-9
Desc: PNEU PNL ENCLOSURE JOB 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 3	Part: E690-LP-PP	LP PNEU PAN JOB 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	BX-N4XS-363008-H01	HOFFMAN A-36H30SSLP ENCLOSURE	1.00EA	AA	0
20	PNEU-REG-M4-N01	NORGREN R07-200-RNKA REGULATOR	3.00EA	AA	0
30	PNEU-REG-ACC-N01	NORGREN 18-025-002 REG. NUT	3.00EA	AA	0
40	PNEU-VAL-M4-N01	NORGREN K41DA00-KCO-KKO 3/2	3.00EA	AA	0
50	PNH-F-BFV4-M01	McMASTER CARR 9833K22	1.00EA	AA	0
60	PNH-F-S6BU6-P01	PARKER 6-6WBZ-SS BULKHEAD UNIN	1.00EA	AA	0
70	PNH-F-S4BU4-S01	SWG SS-400-61 BULKEAD 1/4	3.00EA	AA	0
80	PNEU-GA-100P4-A01	ASH 35-1009-SWL-0-02B-XUC-0/10	3.00EA	AA	0
90	PNEU-FRL-M4-P01	PARKER 1411B13FOG	1.00EA	AA	0
100	PNEU-FRL-ACC-P01	PARKER PS417	1.00EA	AA	0
110	PNEU-GA-160P4-P01	PARKER P77413	1.00EA	AA	0
120	PNH-F-S6ME4-S01	SWAGELOK SS-600-2-4	2.00EA	AA	0
130	PNH-T-S6-P01	PARKER 3/8 O.D. 316SS TUBING	1.00FT	AA	0
140	PB-NXPB-2PMR2C-S01	SQD 9001 SK5RH13	1.00EA	AA	0
150	PB-NXPB-2P2C-S01	SQD 9001 SKR1UH13 UNIVERSAL	5.00EA	AA	0
160	PB-NXPB-2PIR1V2C-S01	SQD 9001 SK1L1RH13 ILL RED PB	1.00EA	AA	0

Job: E690LPMW Asm#: 5 Part: E690-PP-SUB Rev: 0 Drawing: E612690-9
Desc: PNEU PNL SUBPANEL 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 3	Part: E690-LP-PP	LP PNEU PAN JOB 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	BX-PNL-C3630-H01	HOFFMAN A-36P30 SUBPANEL	1.00EA	AA	0
20	SW-PRESS-N475P-S01	SQD 9012 GDW4 0-75 PSI SPDT	3.00EA	AA	0
30	TERM-EDPLT-W01	WEID AP4 1179.6	2.00EA	AA	0
40	TERM-ANCHR-W01	WEID EWK-1 2061.6	2.00EA	AA	0
50	TERM-6V30A10P-W01	WEID KB4/10 3226.6	4.00EA	AA	0
60	TERM-6V87A1PG-W01	WEID EK4 3546.6	1.00EA	AA	0
70	CND-CNIP-A.5ST-T01	T&B 842AL	3.00EA	AA	0
80	TERM-TRK-W01	WEID TS-32 1228.0	3.00FT	AA	0
90	HARD-DUCT-1C-P01	PANDUIT C1WH6	6.00FT	AA	0
95	HARD-DUCT-1X3-P01	PANDUIT F1X3WH6	6.00FT	AA	0
100	TERM-6V35A1P-W01	WEID SAK6N 1932.6	3.00EA	AA	0
110	TERM-6V87A1PG-W02	WEID EK-10 3546.6	1.00EA	AA	0

Job: E690LPMW Asm#: 6 Part: E690-PP-ESCH Rev: 0 Drawing: E612690-10
Desc: PNEU PNL ELEC SCH 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 3	Part: E690-LP-PP	LP PNEU PAN JOB 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	WIRE-14GA-RED-UL-X01	STRAND TFFN 14 GA RED (2500' R	50.00FT	AA	0
50	WIRE-14GA-WHT-UL-X01	STRAND TFFN 14 GA WHITE (2500'	50.00FT	AA	0
60	WIRE-16GA-RED-UL-X01	STRAND THWN 16 GA RED (2500' R	50.00FT	AA	0
70	WIRE-16GA-WHT-UL-X01	STRAND THWN 16 GA WHITE (2500'	50.00FT	AA	0
80	WIRE-14GA-GRN-UL-X01	STRAND TFFN 14 GA GREEN (2500'	10.00FT	AA	0
90	WIRE-16GA-GRN-UL-X01	STRAND THWN 16 GA GREEN	10.00FT	AA	0

Job: E690LPMW Asm#: 7 Part: E690-PP-PSCH Rev: 0 Drawing: P612690-5
Desc: PNEU PNL PNEU SCH 690

Prod. Qty	Qty from Stk	Over Run Qty	--- Parent Assembly ---		
1.00	0.00	0.00	Asm#: 3	Part: E690-LP-PP	LP PNEU PAN JOB 690

RAW MATERIAL COMPONENTS:

Seq#	Part Number	Description	Required Qty	Whse	RelOp
10	PNH-F-N4FE4-P01	PARKER N4FE4 ELBOW 1/4"	3.00EA	AA	0
20	PNH-F-N4ME4-P01	PARKER N4ME4 1/4 MALE ELBOW	3.00EA	AA	0
30	PNH-F-N4MT4-P01	PARKER-N4MT4 MALE BRANCH TEE	6.00EA	AA	0
40	PNH-F-N4MC4-P01	PARKER N4MC4 1/4 MALE CONN.	3.00EA	AA	0
50	PNH-F-N6ME4-P01	PARKER N6ME4	1.00EA	AA	0
60	PNH-F-N6MT4-P01	PARKER N6MT4	2.00EA	AA	0
70	PNH-F-N6FC6-P01	PARKER N6FC6 FEMALE CONN 3/8"	1.00EA	AA	0
80	PNH-T-P4B-P01	PARKER EB-43 1/4" O.D. TUBING	25.00FT	AA	0
90	PNH-T-P6B-P01	PARKER EB64 3/8" O.D. TUBE	25.00FT	AA	0

9E-8105
9E-8108

EFF. Sludge Press

PONDEROSA FIBERS
NORTH HAMPTON, PA.
ANDRITZ JOB# 612-690
RECOMMENDED SPARE PARTS
FOR
ANDRITZ CPF 1.0M SMX S8-LP
NOVEMBER, 1997

DESCRIPTION		PART NUMBER	RECOMMENDED QUANTITY	PRICE EACH
BELTS				
-Top		I44X5426093C	1	$ 1,078.00
-Bottom		I44X9136093C	1	1,655.00
SEALS				
-Shower Seals		DMM9968B	2	45.00
-Gravity Zone (sides)		DMM9264B	2	156.00
-Transversal Seal		DMM9783B	1	112.00
-Splash Guard (end)		DMM9990B	1	42.00
-Splash Guard (side)		DMM9629B	1	32.00
DOCTOR BLADES				
-Drive Roll		DMM9978C	1	55.00
-Breast Roll		DMM9978C	1	55.00
GRID ASSEMBLY				
-Flat Face Guide		GDGR1100-120X46.5	40	23.00
BEARING ASSEMBLIES				
-Drive Roll				
Complete Assemblies	(fixed)	BRLBBS226934(thru)	1	605.00
	(loose)	BRLBBS226935E(closed)	1	743.00
Components:				
-Brg. Housing (closed)		BRLBBY410619	1	357.00
-Brg. Housing (thru)		BRLBBY410620	1	452.00
-Spherical Roller Bearing		22218EASK.M.C3	2	245.00
-Tapered Adapter Assy.		SNW18X3-3/16"	2	78.00
-T-Lip Seal		BRLBLB6851-3T	2	98.00
-V-Ring Seal		V85A	2	9.00
-Fixing Rings		BRLBTD-LB6852-4	2	19.00
-V-Ring Holder		DMM9747B	1	35.00
-Lube Fitting		5000	2	3.00
-S-Rolls				
Complete Assemblies	(fixed)	BRLBBS226934	1	605.00
	(loose)	BRLBBS226934E	1	605.00
Components:				
-Brg. Housing		BRLBBY410619	1	357.00
-Spherical Roller Bearing		22218EASK.C.3	2	245.00
-Tapered Adapter Assy.		SNW18X3-3/16"	2	78.00
-T-Lip Seal		BRLBLB6851-3T	2	98.00
-V-Ring Seal		V85A	2	9.00
-Fixing Rings		BRLBTD-LB6852-4	2	19.00
-Lube Fitting		5000	2	3.00

K. VIERRA
11/10/97

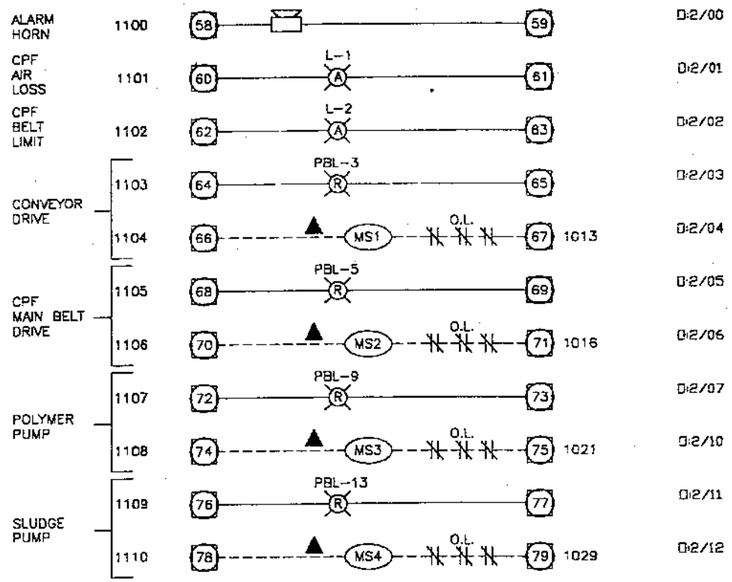
PONDEROSA FIBERS, NORTH HAMPTON, PA.
***ANDRITZ* JOB# 612-690**
RECOMMENDED SPARE PARTS
***ANDRITZ* CPF 1.0M SMX S8-LP**

Eff. Sludge Pump

DESCRIPTION		PART NUMBER	RECOMMENDED QUANTITY	PRICE EACH
-Tension, Tracking, & Deflection Rolls				
Complete Assemblies	(fixed)	BRLBBS226933	2	407.00
	(loose)	BRLBBS226933E	2	407.00
Components:				
-Brg Housing		BRLBBY410617	4	240.00
-Spherical Roller Bearing		22213EASK.C.3	4	117.00
-Tapered Adapter Assy.		SNW13X2-3/16"	4	35.00
-T-Lip Seal		BRLBLB6935-3T	4	80.00
-V-Ring Seal		V55A	4	7.00
-Fixing Rings		BRLBTD-LB6932-4	4	18.00
-Lube Fitting		5000	4	3.00
PLOW CHICANE ASSEMBLY				
-Plow Chicane		DMM3525D	10	37.50
BELT ALIGNMENT DEVICE				
-Control Valve		E260	1	1281.00
-Sensor Palm		DMM5557C-XL	1	104.00
-Sensor Palm Arm		DMM5558C-XL	1	154.00
AIR BELLOWS:				
-Belt Tension		AB-20-8910	2	306.00
-Belt Tracking		AY131	2	382.00

NOTE: (1) Parts listed are for this style of machine only.
(2) Quantities are shown for one (1) unit.
(3) Belt lead time is 4-6 weeks.
(4) All other parts are stocked.
(5) Prices are F.O.B. Arlington, Texas.

K. VIERRA
11/10/97



NO.	REVISION	BY	DATE

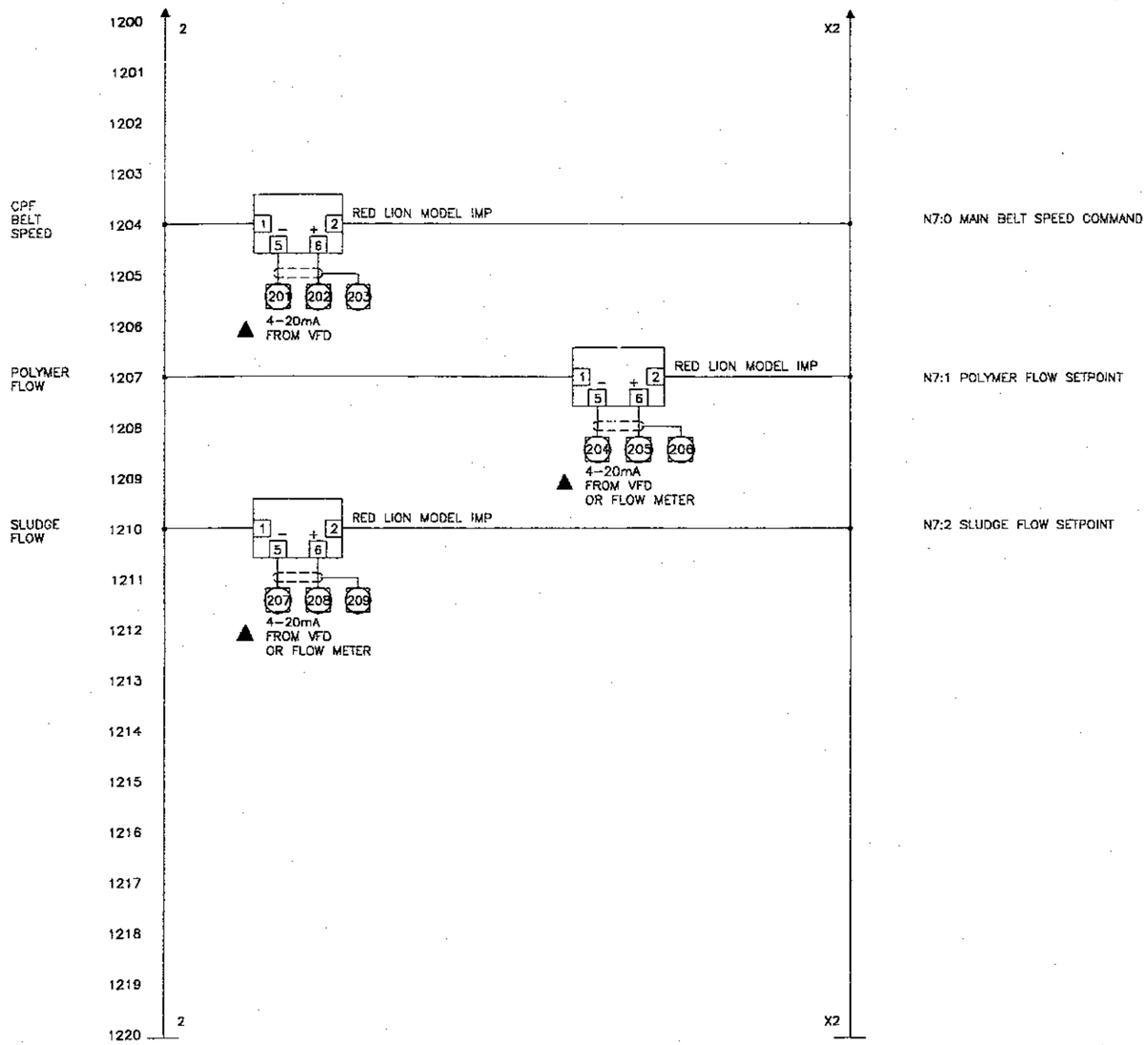
Drawn by: DT — Date: 5/5/95
Appr. by: KLK — Date: 5/5/95
THIRD ANGLE PROJECTION

ANDRITZ AUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611

Scale: NONE
Group:
Date:
Replaces Dwg. No.: F-553-4

Customer: PONDEROSA FIBRES
File name: E-690-11
P.O. No.: -
Job No.: 612-690

Acvr: CPF CONTROL ELECTRICAL SCHEMATIC
Drawing No.: E-612690-11
Rev.: 0



NO	REVISION	BY	DATE

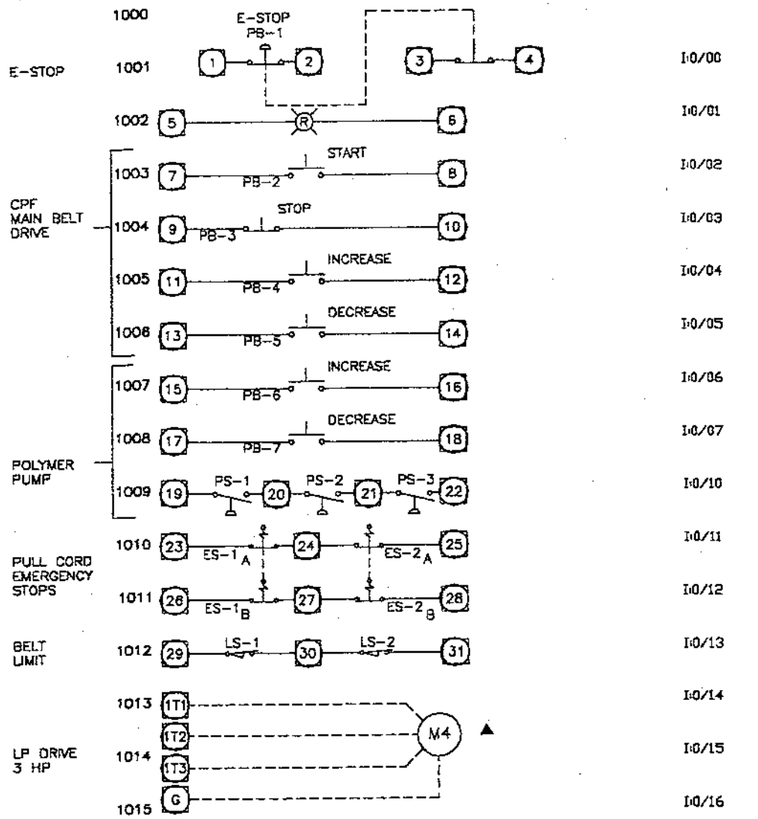
Drawn by: DT — Date: 5/5/95
Appr. by: KLK — Date: 5/5/95
THIRD ANGLE PROJECTION

ANDRITZ AUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611

Scale: NONE
Group:
Code:
Replaces Dwg. No.: E-553-5

Customer: PONDEROSA FIBRES
File name: E-690-12
P.O. No.: -
Job No.: 612-690

Name: CPF CONTROL ELECTRICAL SCHEMATIC
Drawing No.: E-612690-12
Rev.: 0



LEGEND:

MS1-MOTOR STARTER
CR1-CONTROL RELAY
AR1-ALARM RELAY
XFR-TRANSFORMER
PS1-PRESSURE SWITCH
LS1-LIMIT SWITCH
SOL-1-SOLENOID VALVE
TR1-TIMING RELAY

(1) -TERMINALS IN CPF PNEUMATIC PANEL
(3) -TERMINALS IN CPF CONTROL PANEL
(7) -TERMINALS IN CPF TERMINAL BOX
-WIRE NUMBERS
▲ -TO BE SUPPLIED BY OTHERS
---- -WIRING BY CONTRACTOR

0607.00-A01-42

NO	REVISION	BY	DATE
3	CHG'D PER ENGR.	DT	10/2/95
2	CERTIFIED & REVISED PER ENGR.	KW	9/6/95
1	REVISED AND ADDED NOTE PER ENGR.	KW	6/12/95

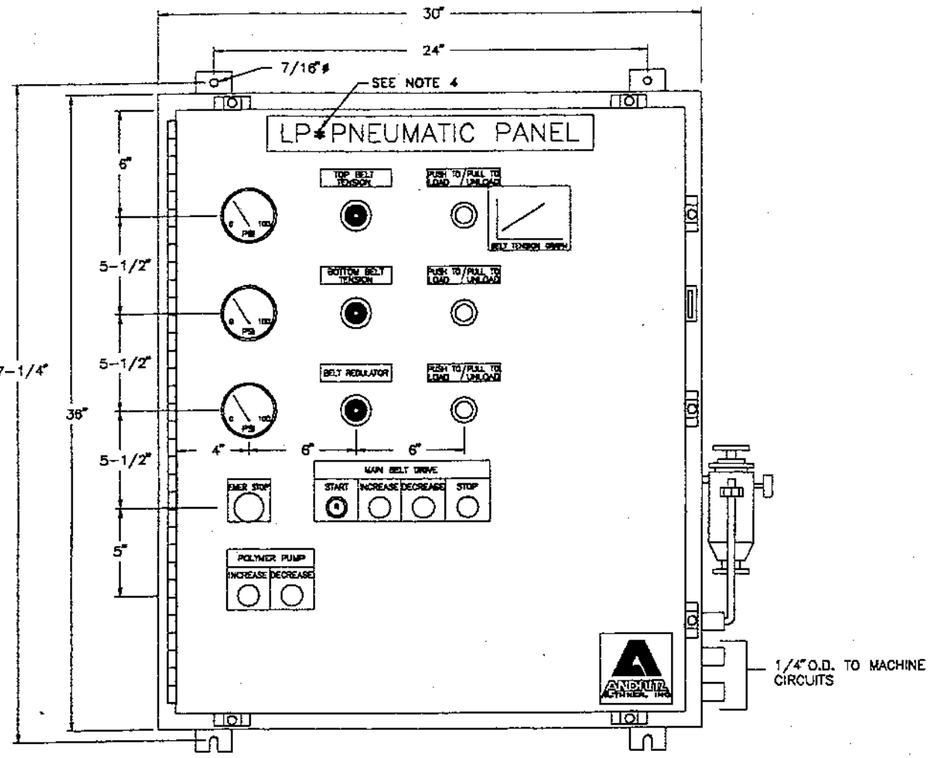
Drawn by: DT Date: 5/5/95
Appr. by: KLK Date: 5/5/95
THIRD ANGLE PROJECTION

ANDRITZ-AUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611
Telefax: (817)472-6588

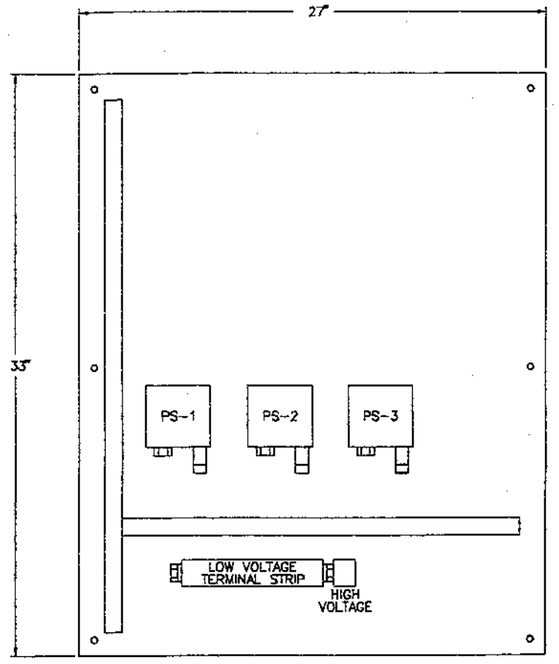
Scale: NONE
Group:
Code:
Reference Dwg. No.: E-553-2

CERTIFIED CORRECT FOR INSTALLATION
BY: SS DATE: 9/6/95
PROJECT No. 612-690
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

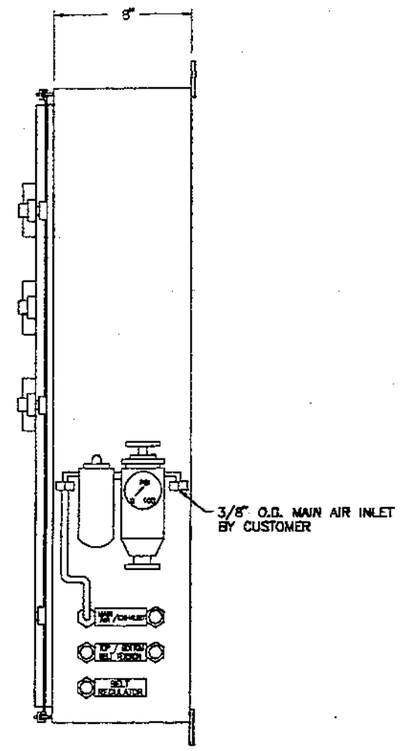
Customer: PONDEROSA FIBRES
File name: E-690-10
P.O. No.:
Job No.: 612-690
Name: LP CONTROL ELECTRICAL SCHEMATIC
Drawing No.: E-612690-10
Rev.: 3



FRONT VIEW



SUBPANEL LAYOUT



SIDE VIEW

0607.00-A01-41

NOTES:

1) ENCLOSURE IS NEMA 4X 304 STAINLESS STEEL SINGLE DOOR.
2) ALL PUSHBUTTON OPERATORS ARE SQD 9001 SK SERIES.
3) ALL WIRING TO CONFORM TO NATIONAL ELECTRIC CODE AND INCLUDES PERMANENT WIRE MARKERS.
* 4) 1 OF 2 IDENTICAL PANELS. 1st PANEL TO BE NUMBERED #1, 2nd PANEL TO BE NUMBERED #2.

NO.	REVISION	BY	DATE
4	CHG'D PER ENGR.	DT	10/2/95
3	CERTIFIED & REVISED PER ENGR.	DT	9/6/95
2	REVISED PER ENGR.	DT	6/28/95
1	REVISED AND ADDED NOTE PER ENGR.	KW	6/12/95

Drawn by: DT Date: 5/18/95
Appr. by: KLK Date: 5/18/95
THIRD ANGLE PROJECTION

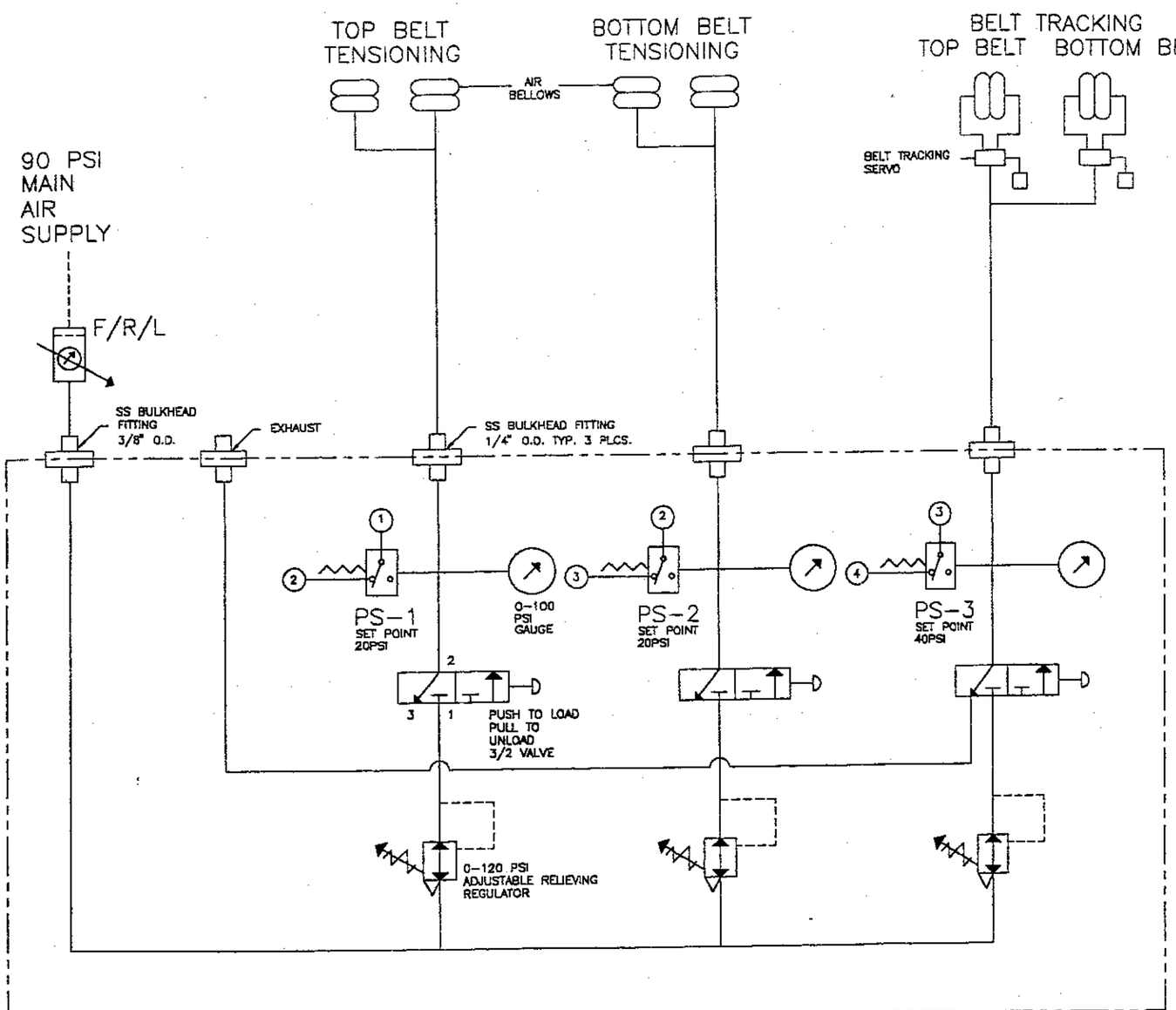
ANDRITZ SUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611
Telefax: (817)472-6508

CERTIFIED CORRECT FOR INSTALLATION
BY: SS DATE: 9/6/95
PROJECT No. 612-690
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

Scale: NONE
Groups:
Codes:
Replaces Dwg. No.: -

Customer: PONDEROSA FIBRES
File name: E-690-9
P.O. No.: -
Job No.: 612-690

Name: LP CONTROL PANEL LAYOUT
Drawing No.: E-612690-9
Rev.: 4



NOTES:

1) PANEL FITTINGS ARE NYLON 1/4" NPT BY 3/8" O.D. TUBE
2) ---- PNEUMATIC TUBING BY CUSTOMER

0607.00-A01-28

NO.	REVISION	BY	DATE
3	CERTIFIED & REVISED PER ENGR.	DT	9/6/95
2	REVISED PER ENGR.	DT	6/28/95
1	ADDED NOTE PER ENGR.	KW	6/12/95

Drawn by: DT Date: 5/5/95
Appr. by: KLK Date: 5/5/95
THIRD ANGLE PROJECTION

ANDRITZ-SUNDS
1010 COMMERCE BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611
Telefax: (817)472-8588

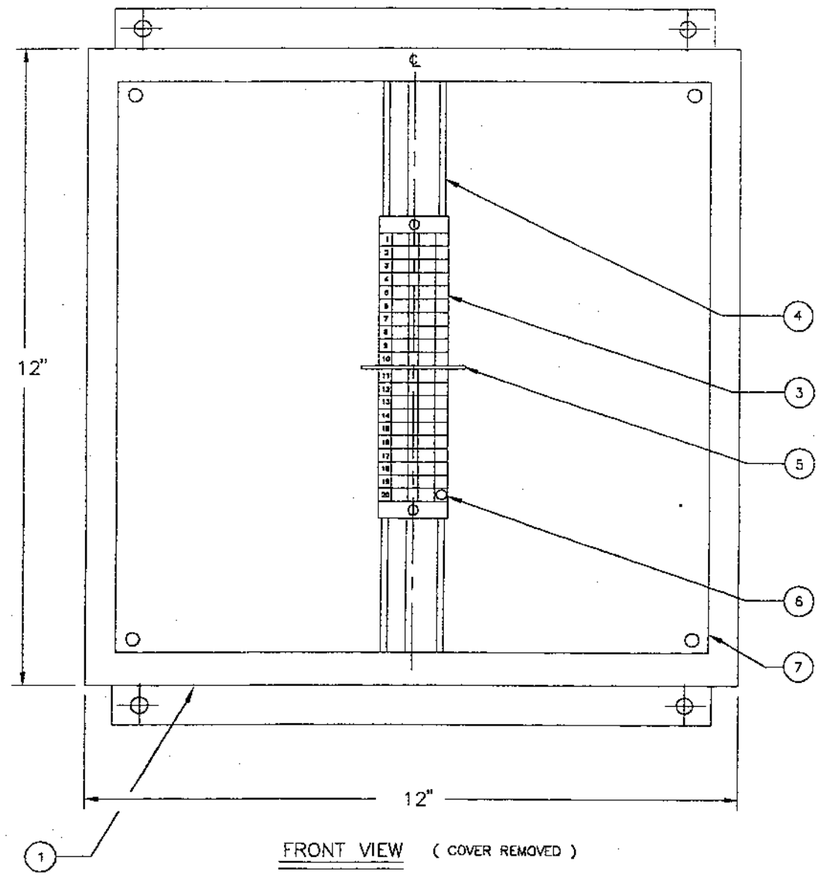
CERTIFIED CORRECT FOR INSTALLATION
BY: SS DATE: 9/6/95
PROJECT No. 612-690
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS

ANDRITZ-SUNDS
1010 COMMERCE BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611

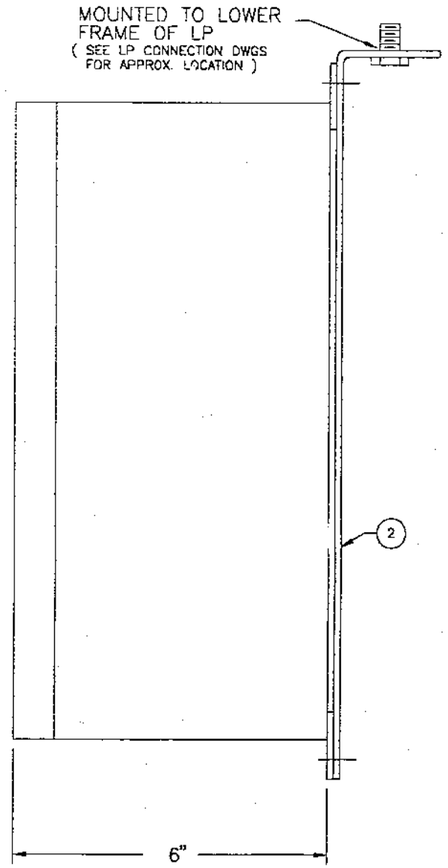
Scale: NONE
Group:
Order:
Reference Dwg. No.: SP01/77-2

Customer: PONDEROSA FIBRES
File name: P-690-5
P.O. No.:
Job No.: 612-690

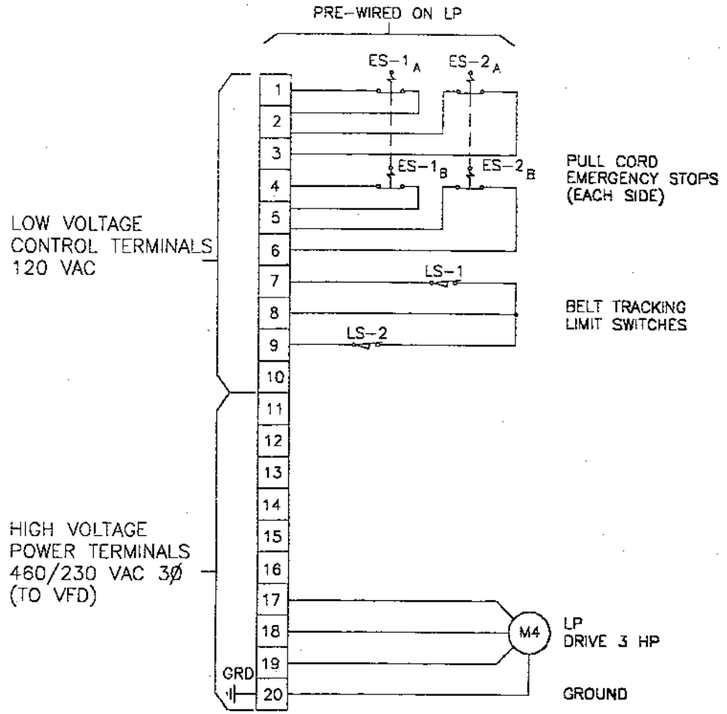
Name: LP PNEUMATIC SCHEMATIC
Drawing No.: P-612690-5
Rev.: 3



FRONT VIEW (COVER REMOVED)



SIDE VIEW



TERMINAL CONNECTION DETAIL

NOTES:

MACHINE WIRING WILL BE IN PVC COATED CONDUIT WITH NON METALIC LIQUID TIGHT FLEX CONDUIT AND CONNECTORS.

ITEM DESCRIPTION

1. -LP TERMINAL BOX-HOFFMAN #A-1212CHNFSS NEMA 4X 304 STAINLESS STEEL ENCLOSURE.
2. -STAINLESS STEEL MOUNTING PLATE 14x10x2-14GA.
3. -WIRING TERMINALS-WEIDMULLER TYPE SAK-6N, 47A @600 VAC-#8AWG. MAX.
4. -TERMINAL MOUNTING TRACK TS-32.
5. -HIGH VOLTAGE BARRIER STRIP AP.
6. -GROUND TERMINAL EK-10.
7. -TERMINAL BOX SUBPANEL A12P12.

ES-1-2-SINGLE END MAINTAINED NEMA 4 PULL CORD EMERGENCY STOPS.
LS-1-2-BELT TRACKING LIMIT SWITCHES, 15° TRIP, LOW OPERATING FORCE, STAINLESS STEEL ACTUATOR ROD NEMA 4X.

0607.00-A01-40

NO.	REVISION	BY	DATE
3	CERTIFIED & REVISED PER ENGR.	DT	9/6/95
2	REVISED PER ENGR.	DT	6/28/95
1	REVISED PER ENGR.	KW	6/12/95

Drawn by: DT Date: 5/5/95
Appr. by: KLK Date: 5/5/95
THIRD ANGLE PROJECTION

ANDRITZ AUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)485-5611
Telefax: (817)472-8589

CERTIFIED CORRECT FOR INSTALLATION
BY: SS DATE: 9/6/95
PROJECT No. 612-690
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PRINTS, REPRODUCIBLES, TRANSMITTALS

Scale: NONE
Group:
Code:
Replaces Dwg. No.: E-553-6

Customer: PONDEROSA FIBRES
File name: E-690-8
P.O. No.: -
Job No.: 612-690
Name: LP TERMINAL BOX DETAILS
Drawing No.: E-612690-8
Rev.: 3

2.0 DESCRIPTION OF THE SMX®-S8-LP

2.1 PROCESS OVERVIEW

The *ANDRITZ* SMX®-S8-LP Belt Filter Press is designed to remove water from a sludge or slurry by mechanical means. It uses the force due to gravity and the forces generated from filter fabrics, or belts, converging, and being wrapped around rollers to squeeze the water from the slurry. The suspended solids remain on the belt; the water is drained away.

The following components which make-up the SMX®-S8-LP are described in this section.

1. Sludge/Polymer Mixer
2. Gravity Zone
3. Wedge Zone
4. High Pressure Zone
5. Belt Tensioning System
6. Belt Cleaning Device
7. Belt Tracking System
8. Doctor Blade Assembly
9. Machine Drive
10. Machine Frame
11. Belt Limit Switches
12. Emergency Stops

The process normally begins with the injection of polymer into the slurry to cause "flocculation," that is the gathering of suspended solids particles into larger masses. These "clumps" remain on the surface of the belt, while the water drains through.

The flocculated slurry is introduced to the SMX®-S8-LP via a stainless steel distribution chute. This chute provides for an even spread of the slurry over the full working width of the belt, and provides for gentle handling of the slurry to minimize damage to the floc.

The first phase of dewatering is the Gravity Zone. In this phase, the slurry is carried along by the movement of the belt, being turned gently by the unique *ANDRITZ* "plow-shaped" chicanes. The chicanes rest lightly on the belt to wipe it clean, and actually roll the slurry over to expose the free water to clean belt, allowing it to drain through.

The thickened slurry then makes the gentle transition to the next phase of dewatering-the Wedge Zone. In the Wedge Zone, pressure is applied to both the top and the bottom of the slurry blanket by the gradual convergence of two belts. This phase of dewater is intended to stabilize the slurry in preparation for the application of higher pressing forces.

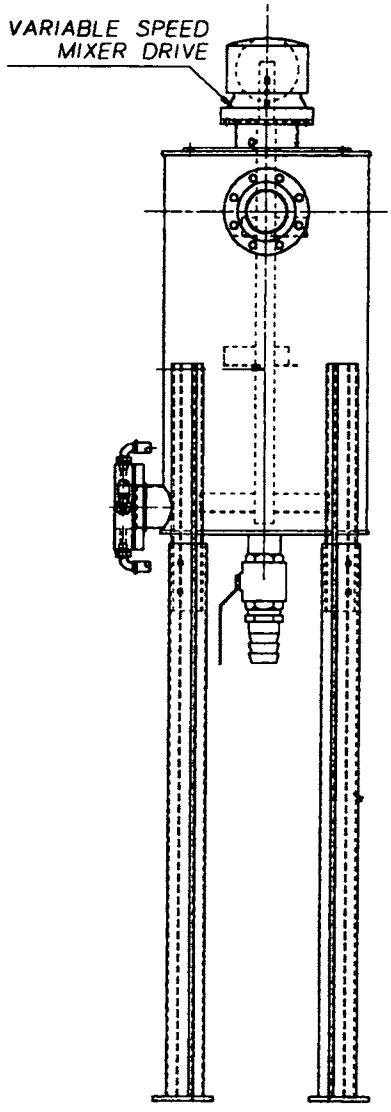
The final dewatering phase is the High Pressure Zone, where the highest allowable pressure for a given slurry is applied. Pressing forces in this phase are generated by wrapping the belts, with the slurry sandwiched between them, around a series of decreasing diameter rollers. Each subsequently smaller roller creates a larger pressing force, squeezing out more water.

With dewatering complete, the filter fabrics are made ready to accept a new charge of slurry. The cake is doctored away, and each belt is cleaned via a water spray shower. The process is continuous, slow-moving, and requires a minimal amount of maintenance.

2.2 SLUDGE/POLYMER MIXER

The Vertical Tank Mixer is a steel cylindrical vessel supported by four (4) adjustable height steel leg stands. It is used to thoroughly mix polymer with the sludge before it is applied to the press for dewatering.

The tank lid supports a mechanical variable speed drive that drives a series of mixing paddles. Sludge enters the tank from the side of the tank, near the bottom. Polymer enters the tank via two inlets located 90° relative to the sludge inlet. As the sludge and polymer enter the tank they are mixed together by the mixing paddles. The sludge rises through the mixer and then flows through the distribution chute onto the belt filter press.

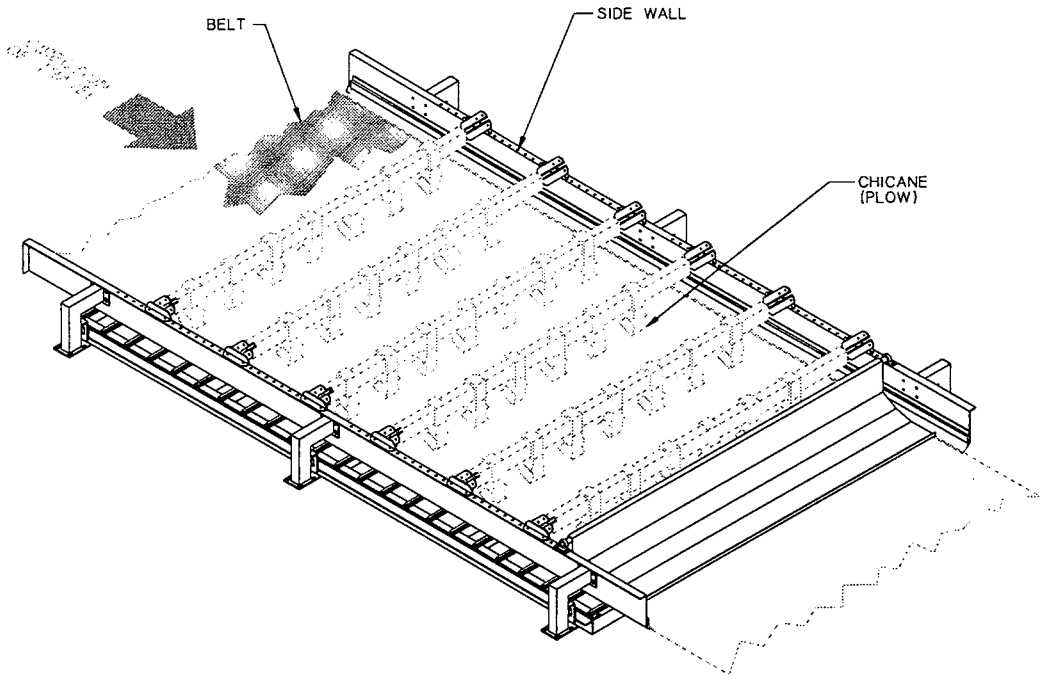


2.3 GRAVITY ZONE

The Gravity Zone on the SMX®-S8-LP is the area where the drainage of "free" water occurs. Its limits are defined by the tensioning roller at the inlet feed end, the fixed roller at the transition end, and the stainless steel containment walls on either side. Polyurethane seals are integrated into the side-walls to assist in confining the sludge to within the Gravity Zone.

Several rows of horizontal chicanes are used in the Gravity Zone to facilitate drainage. The plow-like shape of the ***ANDRITZ*** chicanes actually causes the sludge to roll over, and because the chicane actually rests on the belt surface, the sludge is continually exposed to clean belt. The chicane mounting hardware allows the chicanes to lift from the belt should an object in the sludge create an obstruction.

The Gravity Zone should remain viewable at all times during operation. This is where the operator can determine whether proper sludge conditioning and other press parameters are being maintained. Adjustments are made based on the appearance and feel of the sludge.

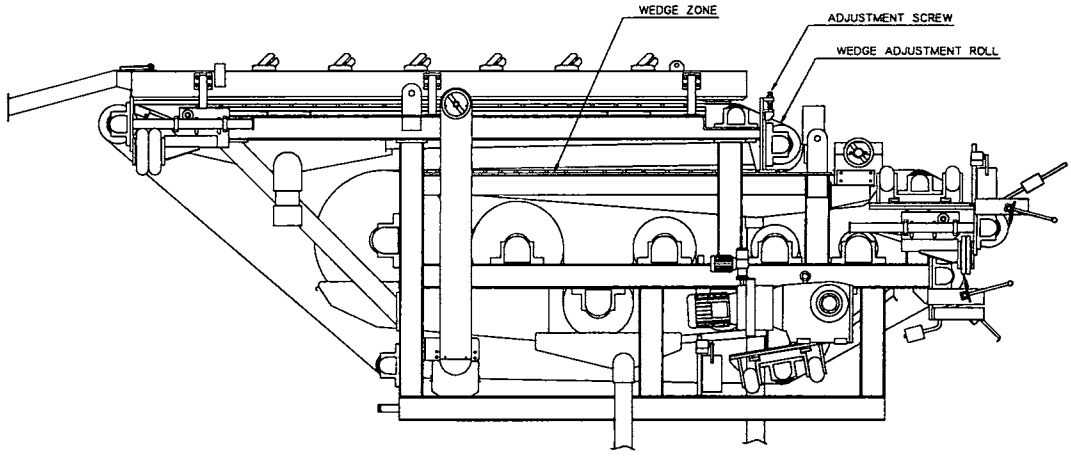


2.4 WEDGE ZONE

The Wedge Zone on the SMX®-S8-LP is the area on the press where the belts converge, gradually, to begin applying pressure to the sludge. Its limits are defined on one end, as the point where the top belt is backed by the fiberglass grid, and the bottom belt is accepting sludge, and on the other end, as the point where the belts are together and begin their wrap around the perforated drum.

The transition to the Wedge Zone is a gentle one; the sludge has a drop of less than six inches from the Gravity Zone. This is critical to maintaining the floc that has been achieved in the previous dewatering phases. A shield is provided in this area to prevent splashing or spilling during upset conditions.

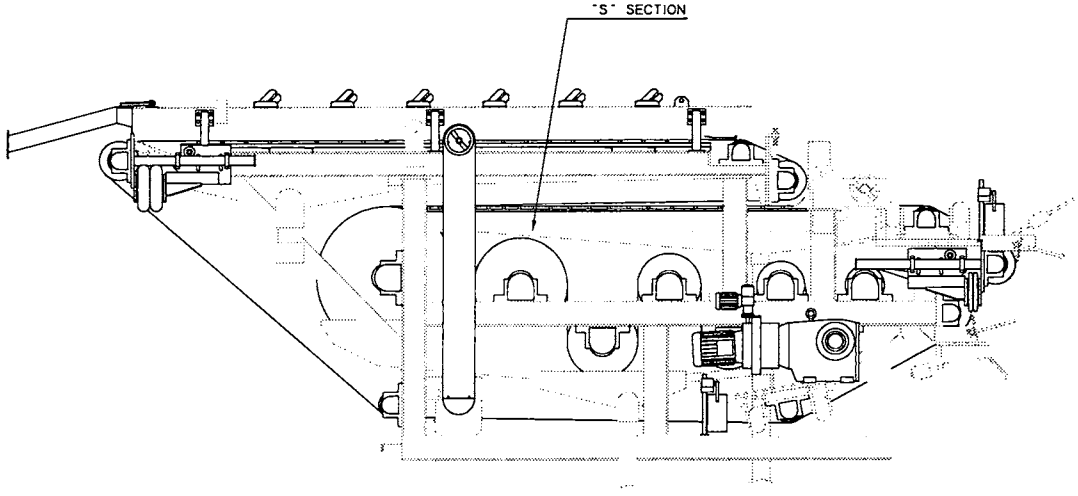
The supports for both belts in the Wedge Zone are UHMW polyethylene wear strips in slip-fit tracks, mounted on stainless steel fabricated plates.The top support plate is adjustable to allow for changes in the wedge angle. The angle in the wedge is set during start-up, but can be adjusted during operation, if necessary, by loosening the bolts on the top plate, and raising or lowering it to the desired position.



2.5 HIGH PRESSURE ZONE

The High-Pressure Zone on the SMX®-S8-LP is the area where the sludge is subjected to the maximum allowable pressure. Its limits are defined by the point where the belts are fully-converged and the point where they separate to discharge the cake. There are no deckle seals in the High-Pressure Zone, as the cake must be stable enough by this point to not extrude under pressure.

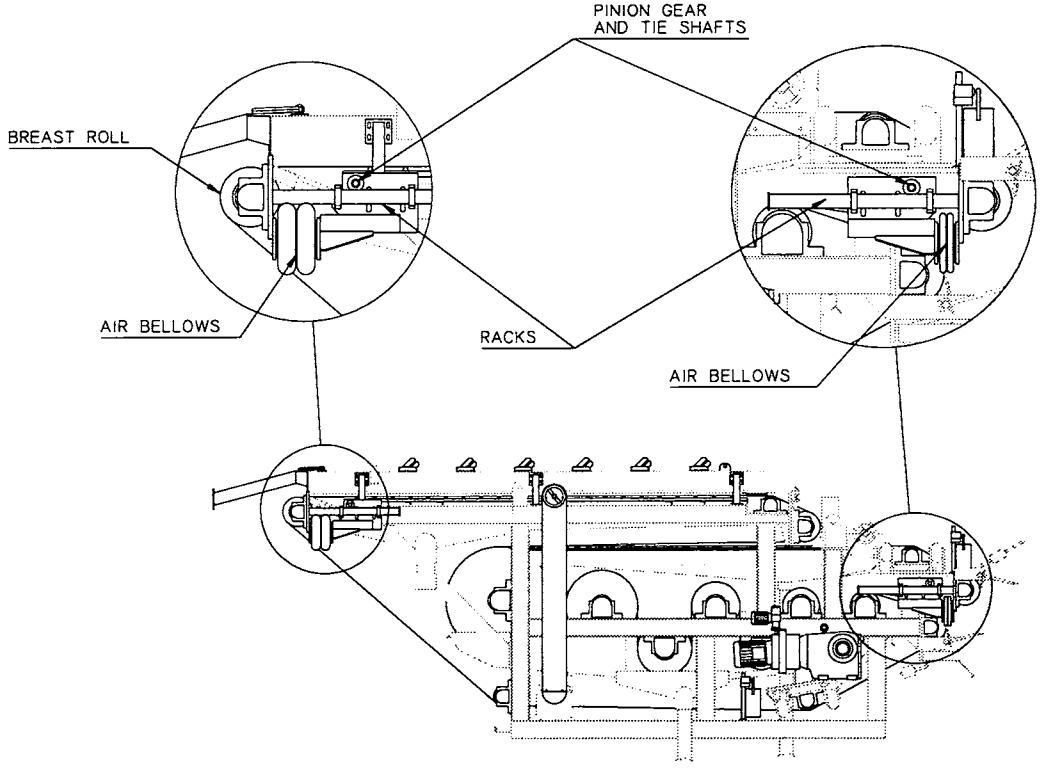
The pressure in this phase is generated by wrapping the belts in a serpentine fashion around a series of decreasing diameter rollers (i.e., each subsequent roller having a smaller diameter than the previous one). Adjustment to belt tension will determine the amount of pressing force generated on each roller.



2.6 BELT TENSIONING SYSTEM

Belt tensioning on the SMX®-S8-LP is achieved using pneumatics. Air bellows, located on both sides of the machine, control the movement of the tensioning roller via thrust rods. Compressed air is delivered to the bellows in such a way as to cause the tensioning roller to extend or retract, creating more or less tension in the belt. A chart located on the pneumatic panel correlates the air pressure gauge reading and the bellow measurement to a belt tension value (see procedure under section 4.3).

To insure that both ends of the tensioning roller extend the same distance (i.e. that the roller remains parallel with the rest of the machine) the SMX®-S8-LP utilizes a rack and pinion alignment system. The thrust rods on each side of the machine have teeth, or racks, in which a pinion gear rests. The pinion gears are connected by a rigid pipe which fixes the position of one roller end relative to its opposite end. This assembly can be adjusted by a hand-held wrench when the press is not in operation.

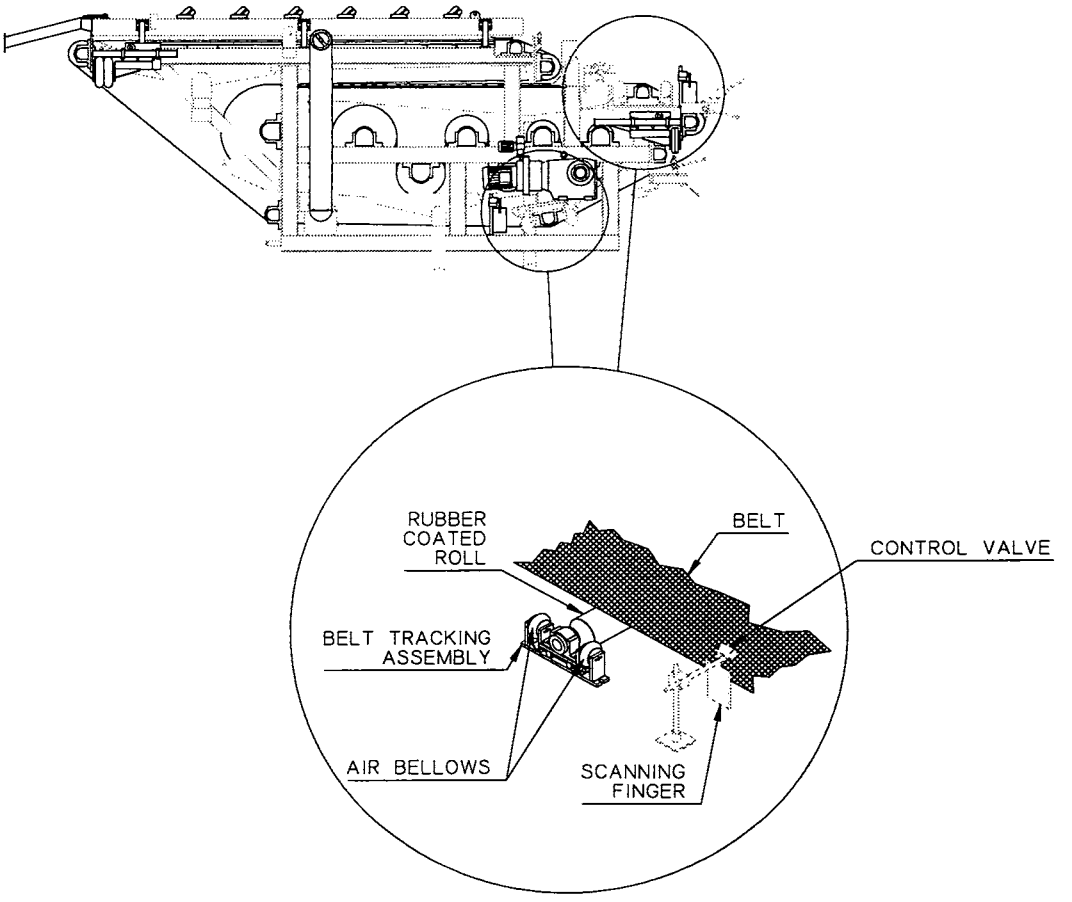


2.7 BELT TRACKING SYSTEM

Belt tracking on the SMX®-S8-LP is achieved using pneumatics. The system works on the concept that the belt will adjust to maintain a perpendicular relation to the tracking roller. A rubber coating on the tracking roller provides the traction necessary for this movement. The process is continuous and gradual, and under normal operating conditions, is hardly noticeable.

A sensing paddle monitors the position of the belt at all times. When the belt moves off-center in either direction, a pressure regulator is cued to make an adjustment to the moveable end of the tracking roller. This end of the roller has air bellows on both sides of a slide-mounted bearing housing to move the roller in either direction. The other end is capable of pivoting from a fixed point to accommodate this movement. The SMX®-S8-LP has a separate tracking system for each belt.

Complete instructions on the maintenance and operation of this system are included under Section 4.3 of this manual.



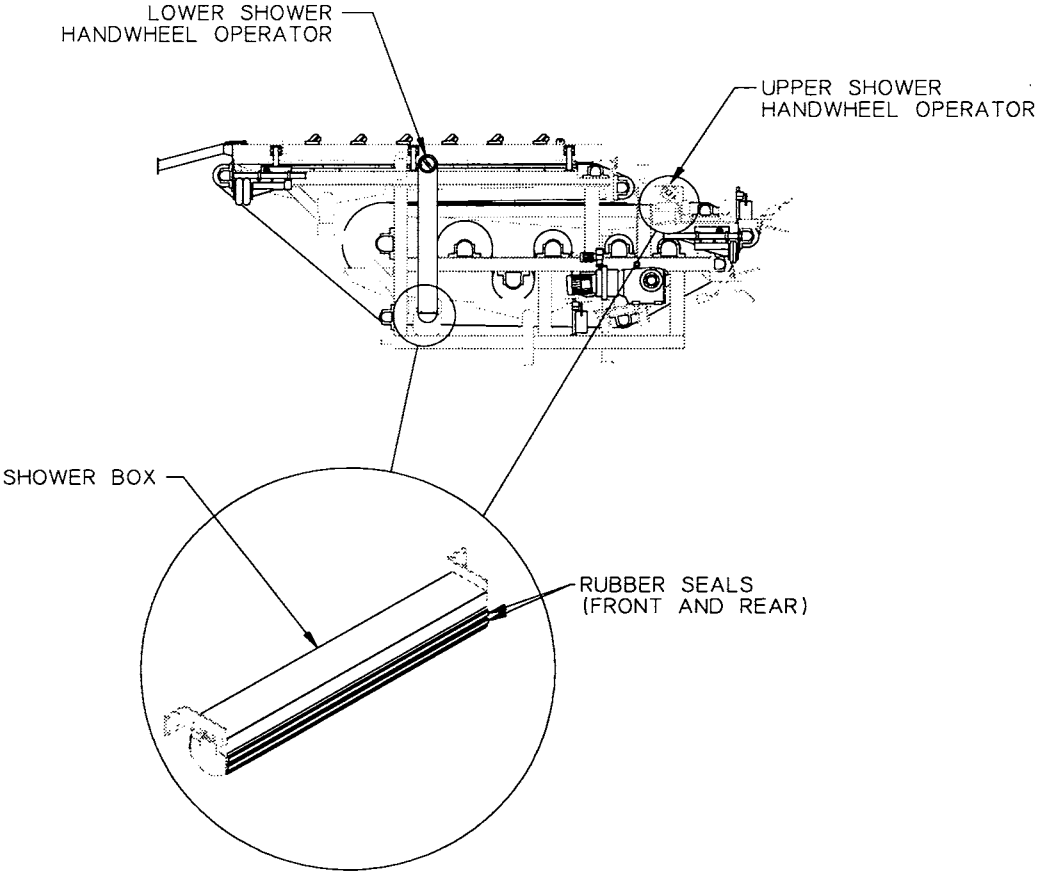
2.8 BELT CLEANING SYSTEM

The belts on the SMX®-S8-LP are cleaned via high pressure water showers, one per belt. The housings for the showers are located on the press such that the belts are washed just prior to accepting a new charge of sludge.

The high pressure spray is created by nozzles on the spray pipe. To dislodge any particles that may clog these nozzles or to periodically remove scale or build-up, the spray pipe is equipped with a stainless steel wire brush running the length of the pipe internally. By turning a hand-wheel located at the end of the spray pipe, the wire brush rotates and the washwater back-flushes the particulate and debris out of the pipe. The hand-wheel must be turned several full revolutions to achieve proper cleaning of the nozzles. Returning the hand-wheel to the closed position resumes normal belt cleaning.

The shower box is made of stainless steel for corrosion protection and durability. The split-case design allows easy placement of the belt between the upper and lower housing halves. A polyurethane seal keeps the washwater contained within the housing.

See Section 7.0 of this manual for more information on the Belt Cleaning System.

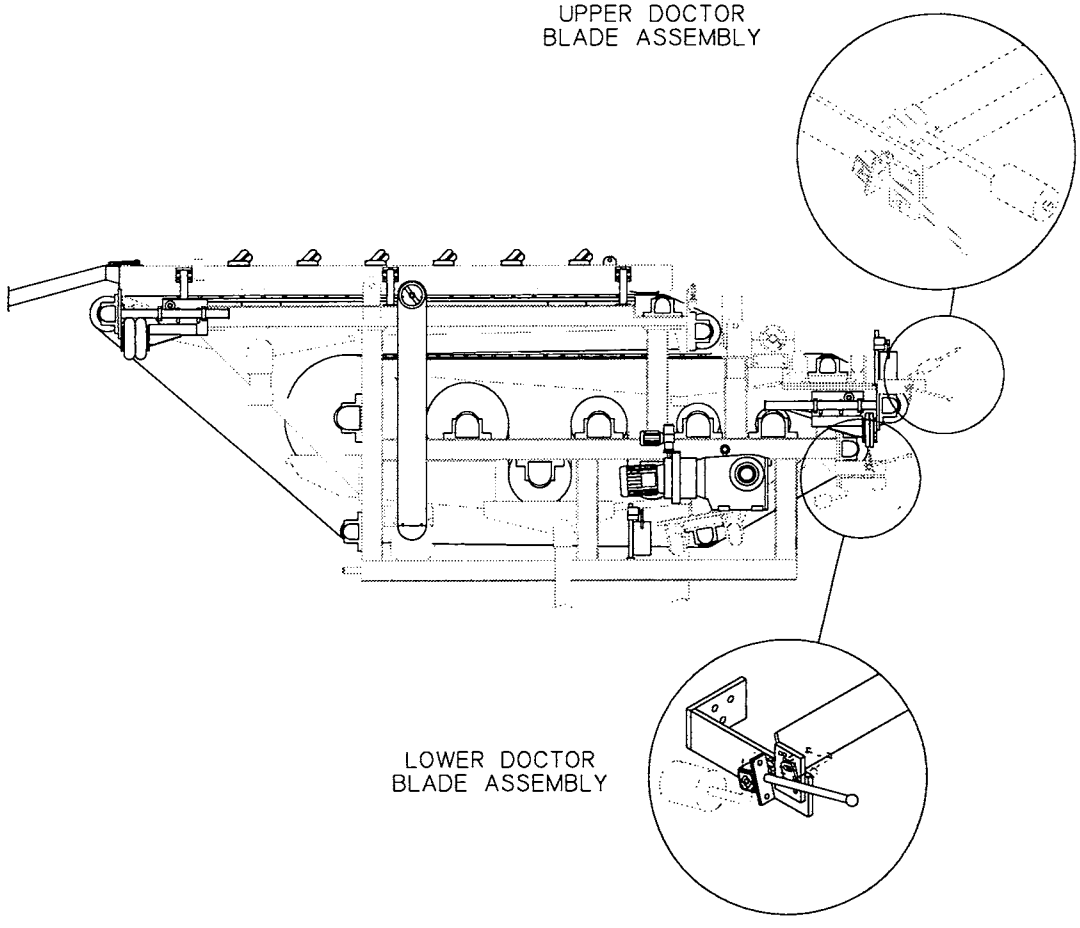


2.9 DOCTOR BLADE ASSEMBLIES

The Doctor Blade Assemblies on the SMX®-S8-LP are provided to separate, or doctor, the dewatered cake from each belt. They consist of flat pieces of UHMW polyurethane and mounting hardware. They are located at the discharge end of the press.

Proper adjustment of the Doctor Blade Assemblies will permit the blades to rest lightly on the belt, at obtuse angles to the rollers. The nature of the application will determine the pressures necessary to effectively remove the sludge from the belts. The assembly allows for adjustable pressure settings; the pressure settings on both ends of the Doctor Blade should be maintained the same.

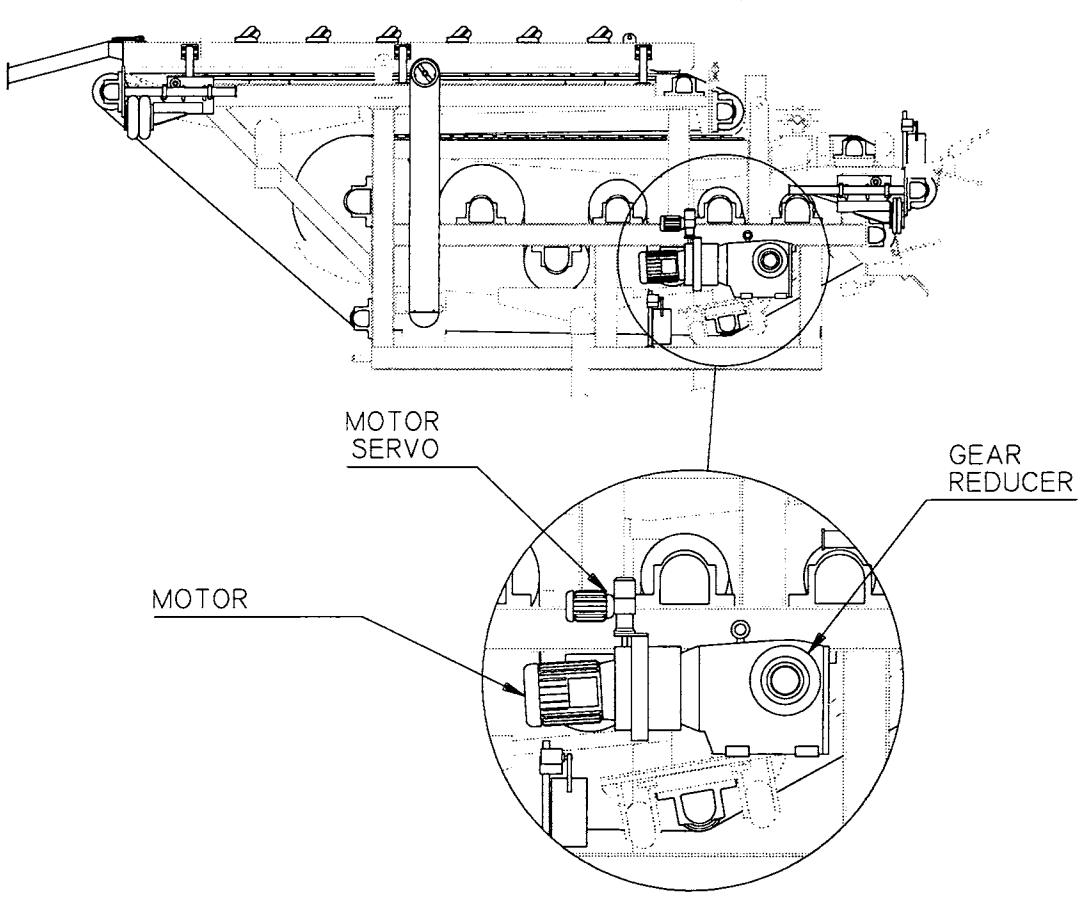
The Doctor Blade will wear and should be inspected periodically to insure good service. A worn or damaged doctor blade could result in shortened belt and roller covering life.



2.10 DRIVE ASSEMBLY

The Drive Assembly supplied with the SMX®-S8-LP is selected specific ally for each application. The drive motor utilizes a mechanical variable speed controller, and is directly shaft-mounted to one drive roller. A bull gear is used on the non-drive side to transmit the driving force to the other drive roller.

The drive specifications, as well as the operating and maintenance instructions for your particular drive system, are included in Section 8.0 of this manual. When electric motor & VFD controller are supplied by others, these products must be furnished according to the minimum requirements given in Section 8.1 of this manual.



2.11 MACHINE FRAME

The Machine Frame on the SMX®-S8-LP serves as the main carriage for the roller assemblies. It is designed for minimal deflection and maximum factor of safety.

All machined holes on the frame are precision-drilled, providing for the highest level of structural rigidity. Cross-frame members are of welded construction and are bolted in place. Bearing housings are of the split-case, pillow block design so they need not be removed from the frame when replacing the bearing cartridges.

The frame also accommodates the belt support structures and the stainless steel filtrate collection pans. Each belt support structure consists of a plane of wear strips which runs the full length and width of the belt contact area. The filtrate collection pans in each dewatering zone completely contain all of the water being drained away.

Materials of construction for the frame are given in Section 1.0 of this manual.

2.12 BELT LIMIT SWITCHES

Belt Limit Switches are provided on the SMX®-S8-LP as a safety device in the event that the belts should track drastically off-center. When the limit switch senses that the belt is in danger of running outside the roller surface, it signals the control panel to stop the press.

2.13 EMERGENCY STOPS

Emergency Stops are provided on both sides of the SMX®-S8-LP. Trip cords that run the full length of the press will shut-down the press when pulled in the event of a hazardous situation.

3.0 INSTALLATION OF THE SMX®-S8-LP

3.1 SAFETY INSTRUCTIONS FOR EQUIPMENT INSTALLATION

The installation of the ***ANDRITZ*** SMX®-S8-LP is an operation which must be given serious consideration. It is imperative that all safety measures be taken when moving and placing the machines, including, but not limited to, the following:

- All equipment should be checked for damage immediately upon arrival. A damaged component should not be put in operation.
- Use of electrical equipment in hazardous locations is controlled by national regulations and instructions. The manufacturer of original equipment and the owner must read, understand, and comply with these instructions for installation and operation of all equipment in such locations, as to ensure that these regulations are observed. Motors destined for use in specific locations will be designed, tested, and approved for use in such locations only.
- Only lifting gearing with sufficient load-bearing capacity should be used during handling of the machine. Lifting by hand is dangerous. Use only correctly attached cables, with sufficient load-bearing capacity on the lifting gear.
- **Do not walk or stand below the suspended load!!**

3.2 POSITIONING THE SMX®-S8-LP

The customer is responsible for providing a proper foundation for the SMX®-S8-LP. This includes, but is not limited to, insuring that the foundation is strong enough to support the floor loads, and that the concrete is resistant to any chemicals which may be present in the filtrate.

The primary concern is that the foundation is level. Exact leveling is critical in achieving optimum performance on the press. The foundations plates should be level to within a tolerance of ± 1/32 inch. Refer to the foundation plan drawing in Section 9.0 for details on foundation plate arrangement.

The SMX®-S8-LP may be placed into position either by moving it on a horizontal plane using jacks and transport rollers, or by lifting it with an overhead crane. The certified foundation drawing in Section 9.0 of this manual gives dimensions and weights of the SMX®-S8-LP, to properly size the equipment needed to move the unit. Use only the special lifting eyes as shown in Figure 3.1, when using an overhead device. In either case, do not apply pressures unevenly on the legs.

Make sure that the machine is perfectly level after setting it on the foundation pads. This may be done by placing steel shims between the leg of the machine and the foundation pad. Refer to Figure 3.1 for leveling check points on the machine. Exact leveling of the machine can only be ensured by checking each of these points.

3.3 PIPE CONNECTIONS DETAILS

Please refer to the figure below for an overview of required connections.

UNIT TYPE	SLUDGE CONNECTION	POLYMER CONNECTION	SHOWER INLET	PNEUMATIC CONNECTION
1.0 SMX-S8-LP	4" -150 LB ANSI	1" NPT	2" NPT	3/8" NPT

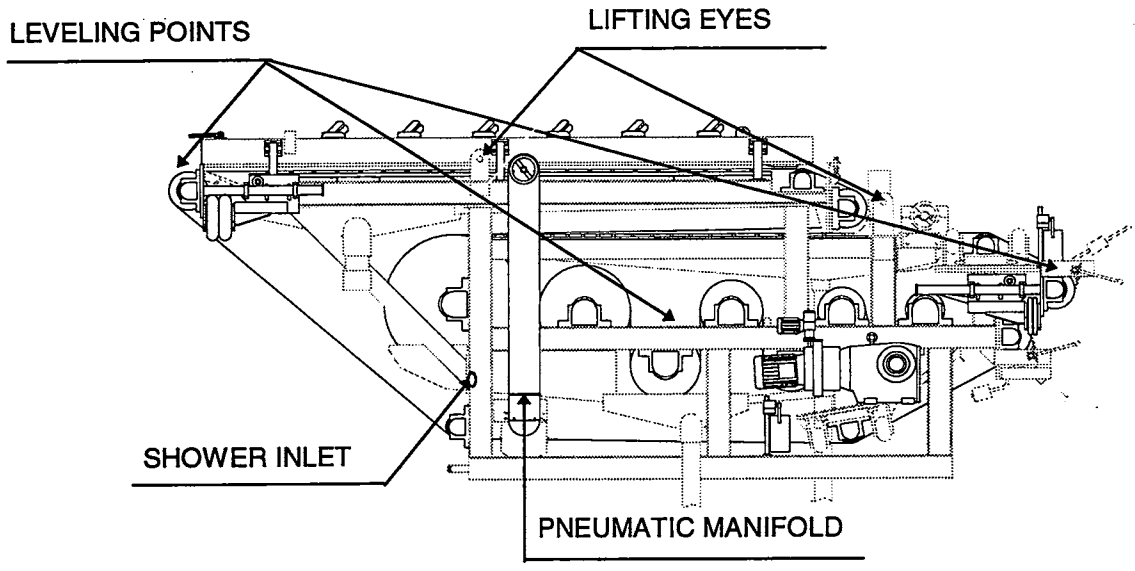


FIGURE 3.1

LEVELING REFERENCE = CENTER OF ROLL, 12 o'clock position

LEVELING TOLERANCE = ± 0.015 INCHES / METER of WORKING WIDTH,

i.e.: 0.030" for 2.0m SMX® Belt Filter Press

3.4 SLUDGE FEED CONNECTIONS

ANDRITZ recommends that all piping coming into the sludge feed system have a downward slope away from the machine of at least two (2) degrees, with a clean-out valve at the lowest point. This will allow the operator to thoroughly clean the sludge piping system after shut-down. If this is not done, sludge could remain in the lines and harden over time. A bypass line located at the machine is recommended in case the machine needs to be shut-down quickly.

ANDRITZ also recommends that the last two (2) feet of any connection between the sludge pipe and the machine be made of flexible rubber hosing or include a vibration dampening device to prevent damage that could result from movement at these points.

3.5 POLYMER FEED CONNECTIONS

Polymer is normally injected into the sludge flow just before the inlet flange of the mixer. However, there may be cases when other injection points may be necessary, as different sludges have different reaction times with polymers. There may also be occasions when more than one polymer is required to obtain a suitable floc.

Dual polymer injection may be handled in a number of ways. One way is to inject the polymers on opposite sides of the sludge feed line. This method makes best use of the full polymer charge. Another way is to inject the low consistency polymer (0.1% or less) about 25 to 35 feet upstream of the press, and the second polymer (the bulk of the injection) at the mixer itself. This method is particularly useful on high consistency sludges (greater than 4%).

There are other options available to assist in obtaining the proper flocculation. In-line kinetic mixers can be helpful, or the placement of spirals in the piping system. ***ANDRITZ*** can make suggestions or offer advice about alternative mixing schemes, at the owner's request. The choice of polymer dosing pumps is strictly per the preference of the owner.

3.6 BELT SHOWER CONNECTIONS

Two belt shower assemblies are located on the SMX®-S8-LP. ***ANDRITZ*** recommends that a manual or electric valve assembly be located near the shower assembly for quick shut-down of the water supply. Flexible hose or pipe is recommended for the last few inches of the connection between the shower pipe and water source to absorb vibrations.

The design operating pressure for the showers is 120 PSIG. Refer to the vendor data in Section 7.0 of this manual for the specific washwater consumption and system dimensions.

3.7 PNEUMATIC CONNECTIONS

Unless specifically ordered otherwise, all pneumatic connections on the SMX®-S8-LP are completed at the factory. The customer must make the following connections during installation:

1. The connection from the plant air or air compressor to the main air bulkhead fitting of the pneumatic control panel.

2. Connections from the machine-mounted pneumatic manifold block to the bulkhead fittings of the pneumatic panel, if pneumatic panel is not mounted on the machine.

The pneumatic control panel is supplied with a filter/regulator/oiler assembly. The assembly requires a light grade of oil such as "Parker F442P" or "Marvel Mystery Fluid." The filter should be checked regularly and purged should moisture appear. The operating pressure on the SMX®-S8-LP is approximately 90 PSI. Air consumption is 4 cfm at start-up and approximately 1 cfm during operation.

Refer to the certified project drawings in Section 10.0 of this manual for exact details of the pneumatic connections.

3.8 ELECTRICAL CONNECTIONS

All electrical functions on the ***ANDRITZ*** SMX®-S8-LP are prewired to two (2) enclosed terminal strips (Nema 4X construction) located on the machine. One terminal strip contains all high voltage lines for motors, the second carries all low voltage functions (belt limit switches, pressure limit switches, E-Stops, etc.).

The electrical connections from the machine mounted terminal strips to the ***ANDRITZ*** electrical control panel are the responsibility of the owner. Refer to the control panel layout drawing in Section 10.0 of this manual for the location of the terminal strips in the control panel.

4.0 OPERATION OF THE SMX®-S8-LP

4.1 SAFETY INSTRUCTIONS FOR EQUIPMENT OPERATION

Caution should be exercised in all aspects of machine operation. Safeguards against potentially hazardous situations have been provided by ***ANDRITZ***, but common sense is the operator's best protection.

The following is a list of the most noteworthy safety instructions regarding the operation of the SMX®-S8-LP; overall caution is advised:

- Confirm that guards, access doors and covers are securely fastened before operating the equipment. These items should not be stood upon or walked on.

- During operation of the equipment, manual intervention in the machine is strictly prohibited. Such interventions, such as lifting and adjusting the doctors, or cleaning the shower nozzles with the handwheel, can be carried out only by the approved operating personnel at the appropriate servicing points.

- Objects should not be poked into the machine while it is in operation.

- If it is necessary to clean the equipment during operation or no-load operation, this should only be done using a hose and water pressure at a safe distance from rotating and pull-in areas of the equipment.

- Hands and feet should be kept clear of the press or any openings of the equipment during operation. Loose-fitting clothing may present a safety hazard when worn around an operating machine.

- Power should be disconnected before touching any internal panel or drive part. High voltage may be present even when the machine is not running. If used with rectifier power supply, all AC line connections to power supply should be disconnected. With other power supplies, all DC lines and field connections should be disconnected, as well as power from auxiliary devices such as pumps, conveyors, fans, etc.

- The machine must be grounded properly to avoid serious injury to personnel. Grounding must be in accordance with the National Electrical Code and consistent with standard local practices.

4.2 BELT INSTALLATION

The dewatering fabrics, or belts, are chosen specifically for each application. ***ANDRITZ*** has a great deal of experience in the selection of the appropriate belt for a given situation. ***ANDRITZ's*** recommendation for a belt to suit your needs can be found in Section 1.0 of this manual.

The belts are provided with clipper seam closures. These clipper seams should be examined routinely for abnormal wear or damage. The life expectancies of the belts and the pin wires vary from application to application.

NOTE: ***ANDRITZ*** recommends that the owner keep a reserve stock of at least one (1) spare belt of each length and one (1) spare pin wire for each.

Accurate records should be kept on all belts. The following information should be kept on file:

1) The date the belt was installed.
2) The source of the belt.
3) Belt specification (if different from originally supplied belt).
4) Estimated hours of operation of the belt.
5) The reason or nature of the belt failure.

The following steps should be taken to install the belts on the SMX®-S8-LP Belt Filter Press:

1. Position both upper and lower drive roll doctor blades away from the rolls.

2. Remove the upper shower cover (upper half) and lower shower cover (lower half) to facilitate belt passage through the shower area.

3. Crank the upper and lower wire tension assemblies in towards the machine. The longer of the two belts will be the top belt of the SMX®-S8-LP machine.

NOTE! Determination of the sludge cake side vs. roller side of the belt must be made before installation begins. The belt is marked on the cake side.

Refer to Figure 4.1 for steps 4, A-G

4. Lower Belt (Short)

Place the rolled belt at the discharge end of the machine.

Pick-up the end of the clipper seam belt and slide it.

A. over the lower tensioning roll,
B. over the tracking roll,
C. through the upper shower box,
D. through the wedge section,
E. around the perforated drum,
F. through the "S" rolls, and
G. back to the lower tensioning roll where the belt clipper seam is joined.

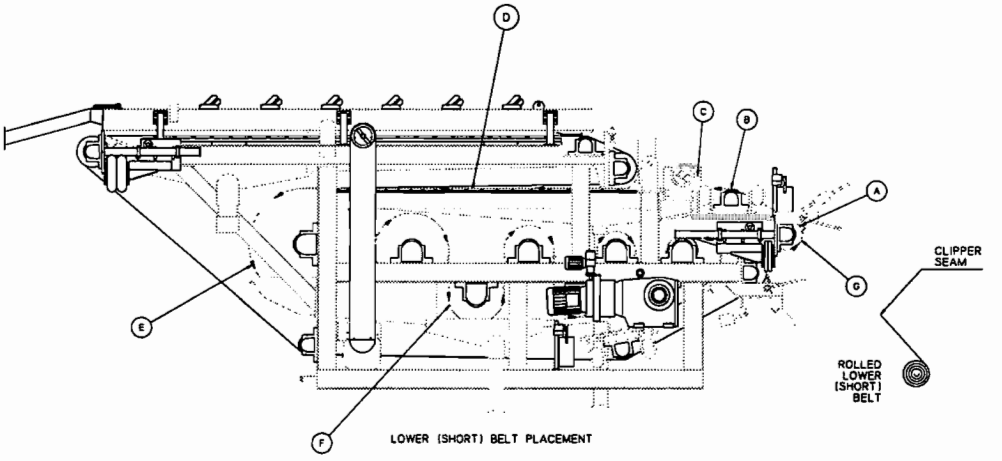


FIGURE 4.1

5. Place the seams together. Insure that the clippers are even on both sides before proceeding.

6. Insert the clipper seam wire through the seam.

7. Trim the seam wire to approximately 3/4" at each end and fold it under the belt.

8. Insure that the belt tracks properly before placing the upper belt on the machine.

Refer to Figure 4.2 for step 9, A-Q.

9. Upper Belt (Long)

Place the rolled belt at the headbox end of the machine.
Verify the cake side of the belt
Pick up the end of the belt and slide it

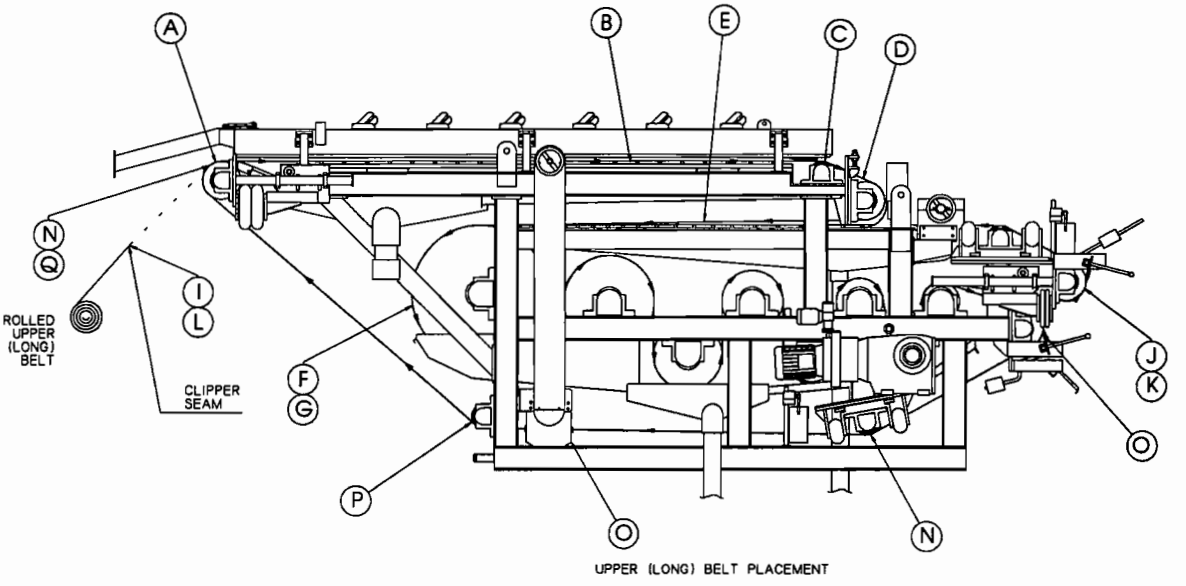
A. over the tensioning roll, (under the headbox seal),
B. across the gravity zone,
C. over the deflection roll,
D. around the wedge adjustment roll,
E. thru the wedge section, and
F. over the perforated drum,
G. Tape the seam of the upper belt to the lower belt. Be sure the belts are straight and even.
H. Turn on belt press main drive (slowest speed).
I. Guide the upper belt as the lower belt pulls it into the machine.
J. After upper belt seam passes thru the "S" section, stop the belt press main drive.
K. Remove the tape from the clipper seam, and slide the belt over the lower doctor roll.
L. Turn on belt press main drive (slowest speed), and continue to guide the upper belt into the machine.
M. As the trailing end of the upper belt reaches the upper tensioning roll, stop the main belt drive.
N. Guide the belt under the tracking roll
O. thru the lower shower box.
P. under the deflection roll, and
Q. up to the upper tensioning roll.

10. Place the seams together. Insure that the clippers are even on both sides before proceeding.

11. Insert the clipper seam wire through the seam.

12. Trim the seam wire approximately 3/4" at each end and fold under the belt.

13. Insure that the belt tracks properly before placing sludge on belt press.



UPPER (LONG) BELT PLACEMENT

4.3 START-UP PROCEDURES

The SMX®-S8-LP is now ready for operation. Section 4.3 of this manual should be read in its entirety and understood thoroughly before starting the equipment.

Before applying the sludge/polymer mix to the press, the following adjustments and checks should be performed during the "dry run" portion of the start-up.

- Electrical/Pneumatic System Checks
- Belt tension adjustments
- Belt tracking adjustments
- Doctor blade adjustments

IMPORTANT: Start-up of the SMX®-S8-LP should not be attempted without the supervision of an *ANDRITZ* Start-up Technician. Modifications made to the equipment without *ANDRITZ* authorization, or damage to the equipment resulting from unsupervised operation will void the mechanical warranty.

4.3.1 Electrical/Pneumatic System Checks

The following is the suggested order of start-up to insure proper function of the electrical system:

1) Turn main disconnect on - this provides 460 VAC 30 amp power to the variable frequency drive, motor starter, and control power transformer.

2) Turn system control power selector switch on - this provides control power to alarm circuits and meters (if alarm is energized at this time, it must be cleared and reset before proceeding).

3) Turn the air compressor on, or, if any air is supplied, verify that it is available at a quantity of 4 cfm and a pressure of 90 psi.

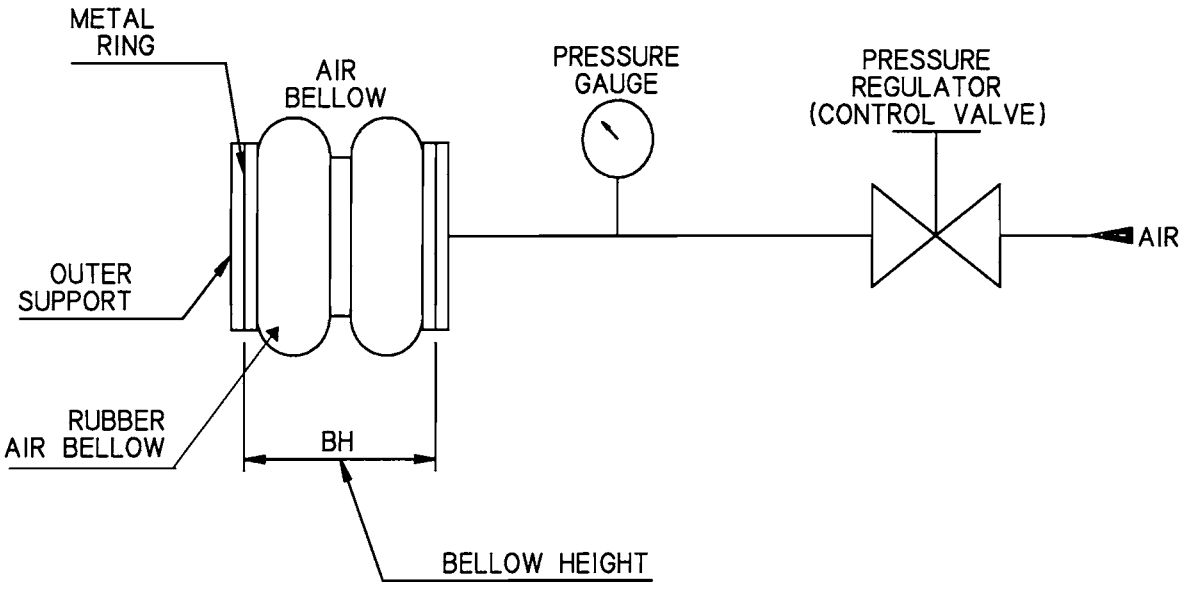
4) Energize system control power start push-button - this permits starting of the other system components; i.e., washwater booster pumps, main belt drive, etc.

Interlocks are recommended, and may be provided by ***ANDRITZ*** such that the preceeding drive must be running before the next one can be energized. When turning the system off, the reverse order of start-up should be followed.

4.3.2 Belt Tension Adjustment

The tension in each belt is adjustable to accommodate variations in sludge drainage characteristics. Optimum operating tension will be determined at start-up, but can be changed during opeation to improve performance.

As the bellows inflate, the air pressure is working on a larger surface area. For this reason, the gauge pressure reading is not a direct reading of the pressure being applied to the belt. It is necessary to take a measurement of the "bellow height" (see diagram below), along with the reading from the pressure gauge, to determine the tension in the belt. A chart like the one shown in the example on the next page is mounted on the control panel of the press.



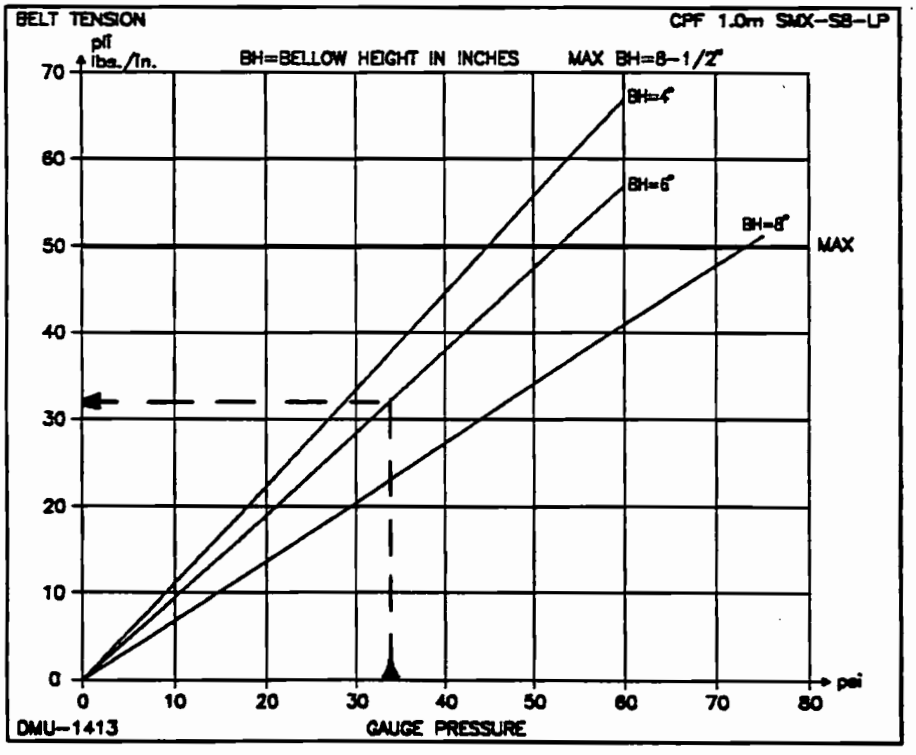
To read the Belt Tension graph:

1) Record gauge pressure (psi) at control panel.
2) Measure bellow height (inches).
3) Find gauge pressure value on the horizontal axis and draw a vertical line.
4) Determine the point where the vertical line intersects the line that corresponds to the measured bellow height.
5) Draw a horizontal line to the left from the point of intersection determined in step 4.
6) Record the belt tension for this belt.

EXAMPLE

A. TOP BELT

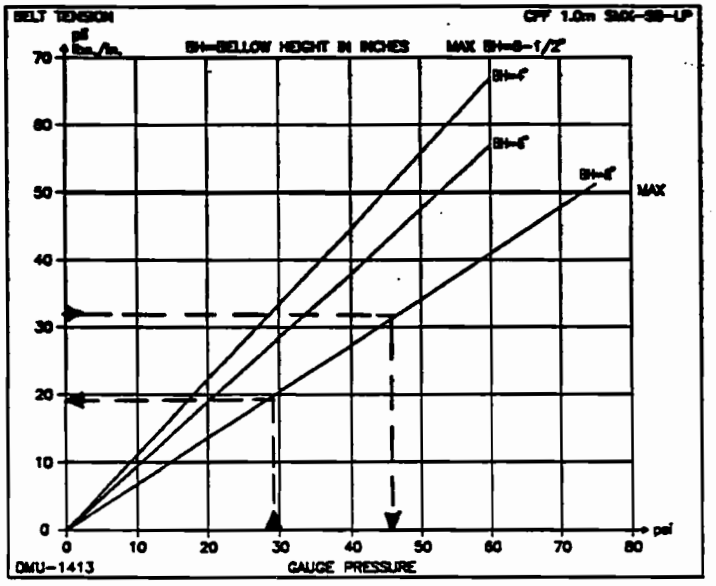
-Gauge Pressure: 33 psig
-Bellow Height 6 inches



The top belt tension is 32 pli.

B. BOTTOM BELT

Gauge Pressure: 29 psig
Bellow Height: 8 inches



The bottom belt tension is 19 pli.

NOTE: Typically the top and bottom belt **tensions** should be about the same.

The proper procedure in the example would be to either reduce the top belt tension or increase the bottom belt tension.

For example, to increase the bottom belt tension to a value similar to the top belt tension the operator should determine the gauge pressure needed to achieve a tension of 32 pli on the bottom belt.

1) Find 32 pli on the Y-axis, draw a horizontal line and determine the point of intersection with 8 inch bellow height curve. Draw a vertical line down to the X-axis and read the gauge pressure.

2) The required gauge pressure for the bottom belt is approximately 47 psig.

3) Increase the gauge pressure on the bottom belt to 47 psig.

4) Cross-check after the machine has reached equilibrium (after approximately 10 minutes) and repeat the procedure if necessary.

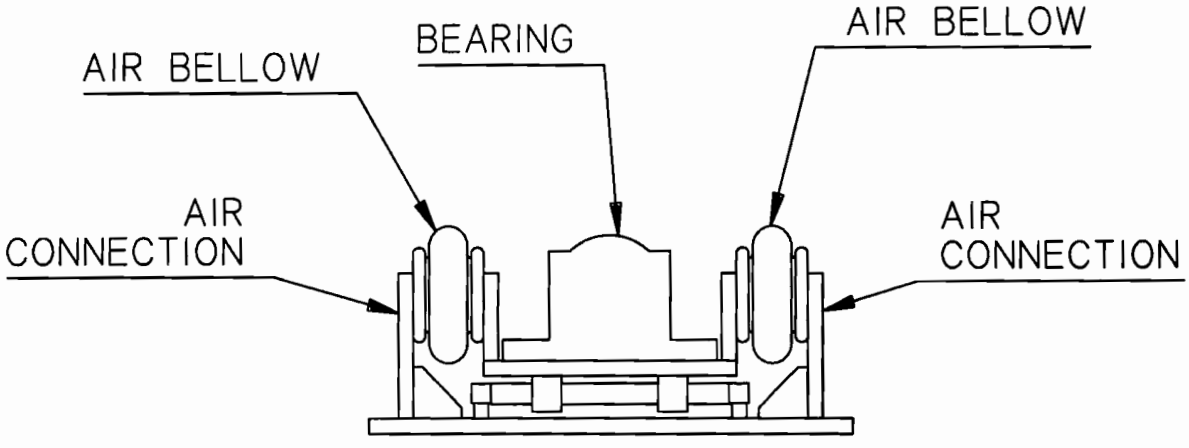
4.3.3 Belt Tracking Adjustment

It is essential that each dewatering belt's position be maintained in the center of the machine. To achieve this centering automatically and continuously, the *ANDRITZ* SMX®-S8-LP utilizes pneumatically controlled and actuated tracking devices, one for each belt. Each device consists of a sensing paddle which rides the side of the belt during operation, a regulator to maintain a constant supply of air to the system, and an automatic control valve to move one end of the roller.

The bearing on the moveable end of the roller is mounted on a slide mechanism; the other end is fixed, with a slight built-in tolerance to accommodate the pivoting motion. As the sensing paddle moves when the belt tracks off center, the air holes in the side of the control valve align to send air to one bellow or the other, to make a correction. In this way, the moveable end of the roller is adjusted to make the belt move back into the proper position.

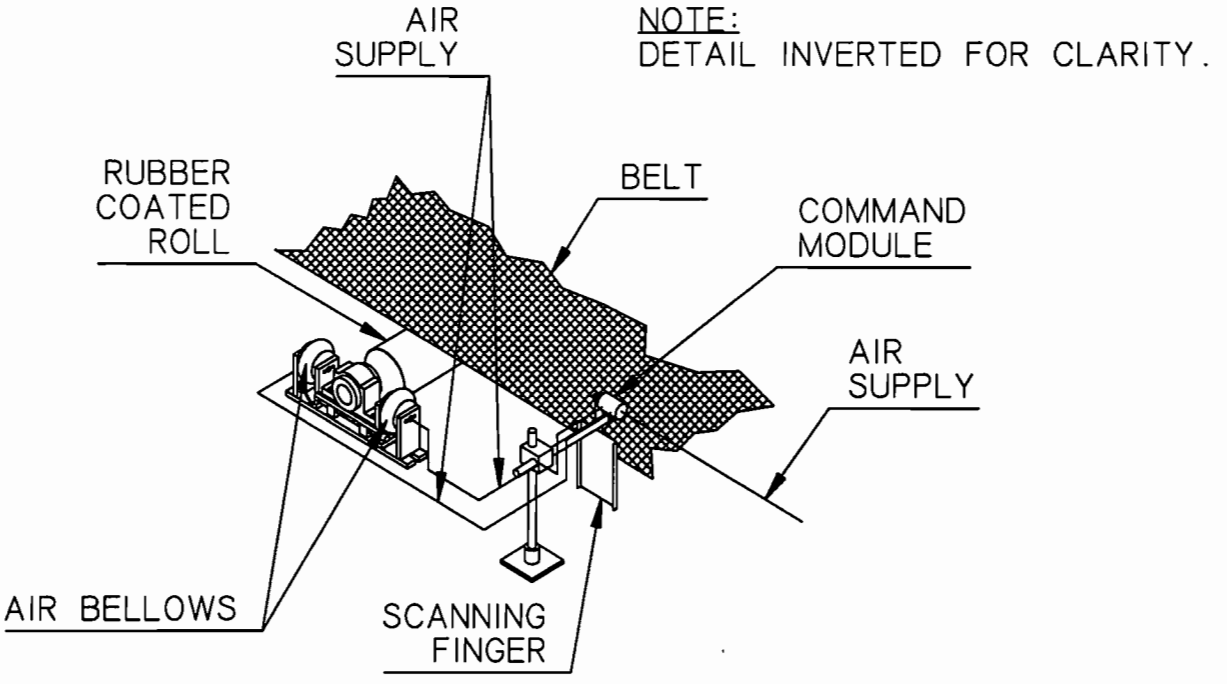
The belt tracking system also includes a limit switch on each side of the machine to ensure that the belt does not "walk" completely off the roller. This malfunction could occur if the air supply is not sufficient to the belt tensioning or tracking system, or if the sensing paddle has become obstructed. This limit switch will shut the press operation down and sound an alarm. The problem should then be rectified, and the machine started again, as per start-up operating procedures.

The belt tracking device should only need to be set-up during the initial start-up of the press, but it is advisable to check it regularly to ensure proper operation. When new belts are installed on the machine, it is also advisable to double-check the position of the sensing paddle.



The neutral positions of the components of the tracking system are as follows:

- The belt is in the center of the roller.
- The sensing paddle is making full-width contact with the belt, and is touching the belt in the upper half of the paddle (see diagram on the next page). The reaction time of the tracking device is faster as belt contact is brought closer to the top of the paddle.
- The sensing paddle arm should be at a 16° angle to vertical when the paddle is resting on the edge of the belt. A calibration pin is provided to assist in achieve this position. Red marks on the control shaft and the control valve housing are provided for visual inspection during operation.
- The slide-mounted bearing is centered between the inflated bellows. The control valve assembly can be moved to compensate for unequal inflation when all other adjustments are in the neutral position. This can be achieved by loosening the set screw on the control valve mounting hardware and sliding the assembly towards or away from the belt.

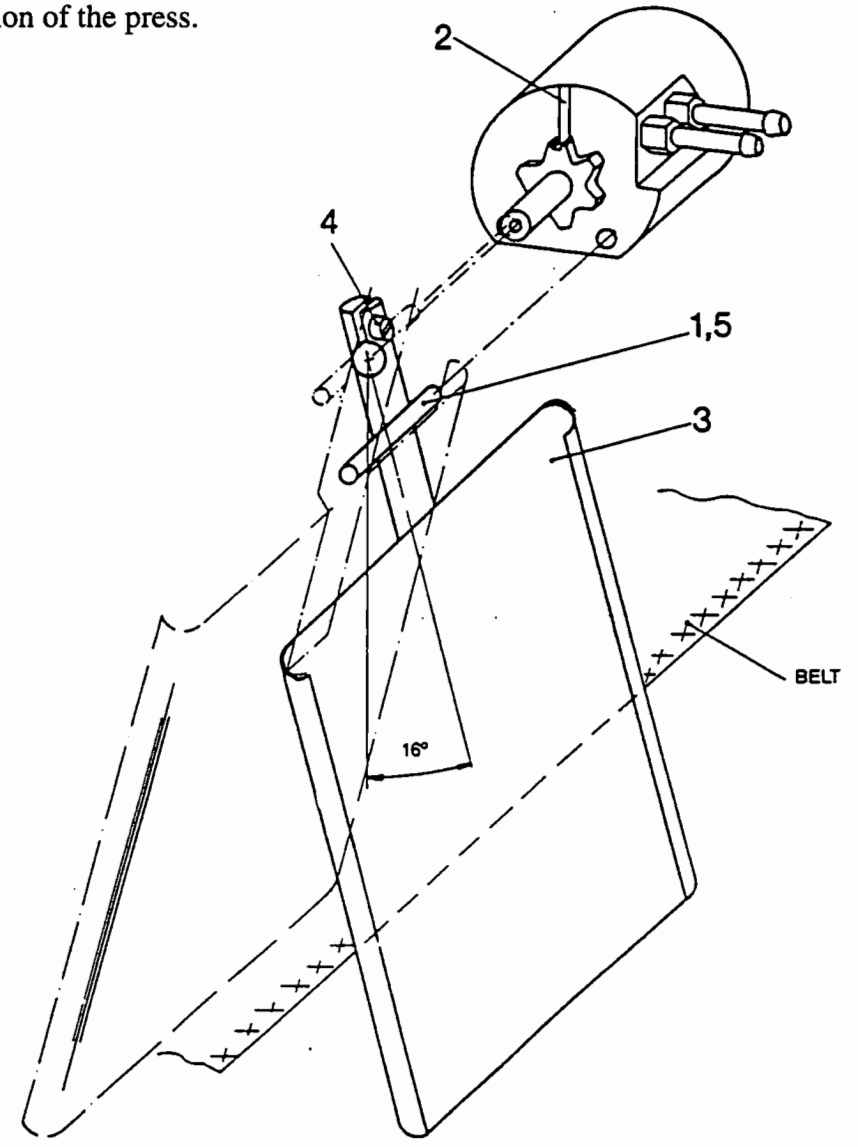


Installation Instructions

1 Insert the adjustment pin
2 Set the alignment disc on the red mark
3 Move the control valve until the sensing paddle touches the adjustment pin (16°)
4 Fix the sensing paddle in this position
5 Remove the pin

NOTE: Do not forget to remove the calibration pin from the control valve housing before placing the unit in operation.

It is imperative that the control valve remain clean and lubricated. The filter/regulator/lubricator assembly employed on the ***ANDRITZ*** SMX®-S8-LP is described on the next page. Regular maintenance of this system is critical to proper operation of the press.



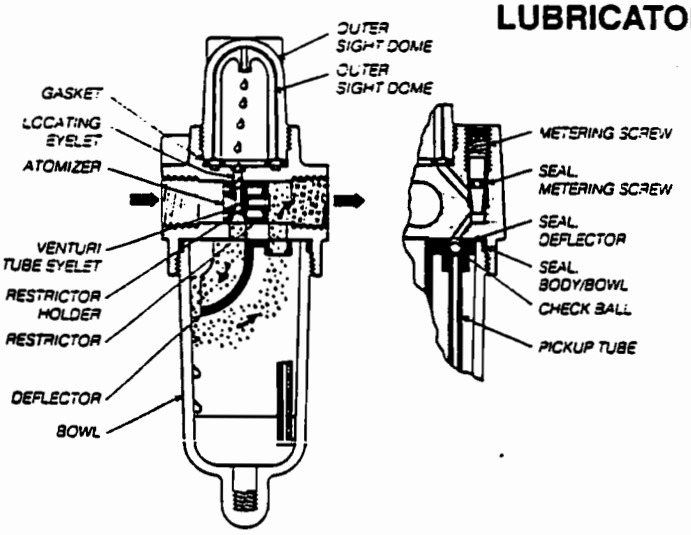
Parker Motion & Control
Pneumatic Division
Richland, Michigan 49083

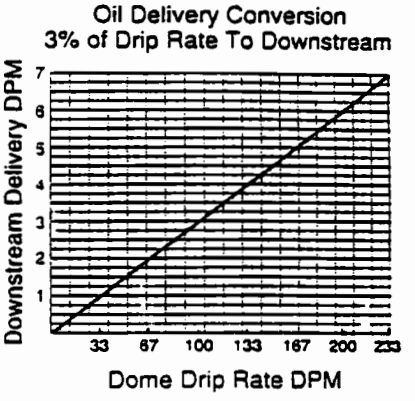
ISSUED: FEBRUARY, 1994
Supersedes: March, 1993

1M103 DP

MINIATURE SERIES MICRO-MIST LUBRICATOR 14L FILTER 14F

LUBRICATOR





INSTALLATION

1. Install LUBRICATOR so Air Flow is in direction of arrow cast in body.
2. Installation should be upstream from the device it is to lubricate (valve, cylinders, tool, etc.).

OPERATION AND SERVICE

1. FILLING—Inlet pressure must be eliminated before fill plug or bowl is removed. Fill to fill line on the bowl (DO NOT OVER FILL) with oil of 100 to 200 SSU viscosity at 100°F and an aniline point greater than 200°F—same as SAE No. 10 (petroleum base hydraulic oils or spindle oils are good examples). DO NOT USE OILS WITH ADHESIVES OR TACKY ADDITIVES COMPOUNDED OILS CONTAINING SOLVENTS, GRAPHITE, SOAPS OR DETERGENTS (automotive oils generally contain detergents) ARE NOT RECOMMENDED.
2. Replace the fill plug and/or bowl assembly firmly—excessive torque is not necessary. The lubricator is now ready for setting. Repressurize the lubricator.
3. OIL DELIVERY ADJUSTMENT—To adjust oil delivery, use a small blade slotted screwdriver to turn the adjusting screw in the top of the lubricator.

   Leaner—Clockwise
   Richer—Counterclockwise

   By counting the number of drops per minute in the sight dome, you can adjust to your requirements. Approximately 3% of the drops seen in sight dome go downstream. Adjust drip rate accordingly. Consult oil delivery conversion chart above.

   25 drops per minute equal is one ounce per hour —volume of oil passing through sight dome.

NOTE: This is a constant density type lubricator which delivers a constant ratio of oil to air flow. Therefore, if air flow increases or decreases, oil delivery will be adjusted proportionately. ONLY IF A DIFFERENT RATIO IS DESIRED SHOULD YOUR NEEDLE VALVE SETTING BE CHANGED AFTER YOUR INITIAL SETTING.

SAFETY: TRANSPARENT BOWLS

CAUTION:

Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to direct sunlight, an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydro carbons, ketones, esters and certain alcohols. They should not be used in air systems where compressors are lubricated with fire-resistant fluids such as phosphate ester and di-ester types.

Metal bowls are recommended where ambient and/or media conditions are not compatible with polycarbonate bowls. Metal bowls resist the action of most such solvents, but should not be used when strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! DO NOT use cleaning agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

Bowl guards are recommended for added protection of polycarbonate bowls where chemical attack may occasionally occur.

14L REPLACEMENT BOWL

KIT NO.	DESCRIPTION
PS420P	Poly Bowl With Drain
PS421P	Poly Bowl Without Drain
PS447BP	Metal Bowl With Drain

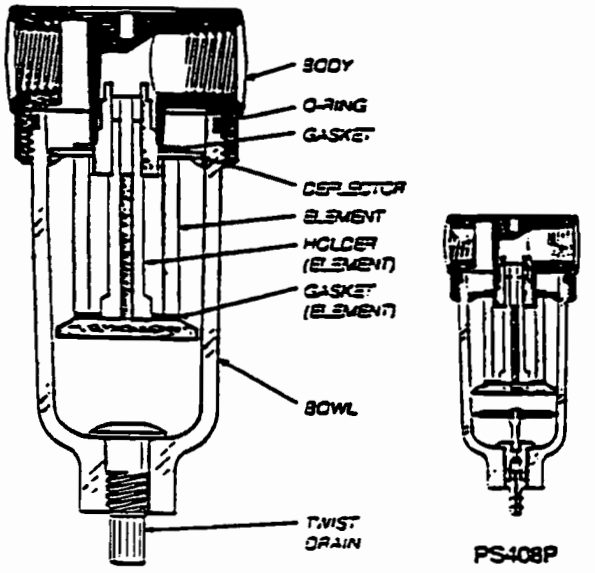
NOTE: All bowl kits consist of (1) bowl assembly and (1) body to bowl seal (o-ring).

MAXIMUM PRESSURE AND TEMPERATURE

150 PSIG @ 125°F (10 bar @ 52°C) with Polycarbonate Bowl
250 PSIG @ 175°F (17 bar @ 80°C) with Metal Bowl

Conversion: 1 bar = 14.5 PSI; °C =5/9 (°F - 32)

FILTER



PS408P

MAINTENANCE SERVICE KITS	14F
5 MICROMETER ELEMENT KIT	PS403P
(2) Gasket (1) Bowl Seal (1) Filter Element	
40 MICROMETER ELEMENT	PS401P
(2) Gasket (1) Bowl Seal (1) Filter Element	
POLYCARBONATE BOWL MANUAL DRAIN	PS404P
POLYCARBONATE BOWL AUTOMATIC DRAIN	PS408P
METAL BOWL MANUAL DRAIN	PS447BP
METAL BOWL WITH AUTOMATIC DRAIN	PS451P
5 MICROMETER ELEMENT CARTRIDGE KIT	PS407P

MAXIMUM PRESSURE AND TEMPERATURE

150 PSIG @ 125°F (10 bar @ 52°C) with Polycarbonate Bowl
250 PSIG @ 175°F (17 bar @ 80°C) with Metal Bowl

Conversion: 1 bar = 14.5 PSI; °C = 5/9 (°F - 32)

INSTALLATION

1. The equipment to which the filter is attached should be internally cleaned to remove all traces of accumulated oil and dirt. Also, new pipe or hose should be installed between the filter and equipment being protected.
2. Blow all upstream pipe work clear of accumulated dirt and liquids.
3. Select a filter location as close as possible to the equipment being protected and upstream of any pressure regulator.
4. Install filter so that air flows in the direction of arrow on body.
5. Install filter vertically with bowl drain mechanism at the bottom. Free moisture will thus drain into the sump ("quiet-zone") at the bottom of the bowl (automatic drain models are recommended as standard equipment).

OPERATION & SERVICE

1. Both free moisture and solids are removed automatically by the filter. There are no moving parts.
2. Manual drain filters must be drained regularly before the separated moisture and oil reaches the bottom of the lower baffle. Automatic drain models will collect and dump liquids automatically.
3. The filter element should be removed and replaced when the pressure differential across the filter is ten (10) PSIG.
4. To service the filter element: SHUT OFF AIR SUPPLY and de-pressurize the unit.
   a. Unscrew threaded bowl.
   b. Unscrew element holder and remove filter element & gaskets.
   c. Clean bowl and internal parts before reassembling. See polycarbonate bowl cleaning section.
   d. Replace element and gaskets (2)
   e. Attach element post assembly and tighten firmly.
   f. Replace bowl seal; lubricate seal to assist in retaining it in position. Use only mineral base oils or grease. DO NOT use synthetic oils such as esters, and DO NOT use silicones.
   g. Screw bowl into body.

SAFETY: TRANSPARENT BOWLS CAUTION

Polycarbonate bowls, being transparent and tough, are ideal for use with Filters and Lubricators. They are suitable for use in normal industrial environments, but should not be located in areas where they could be subjected to an impact blow, nor temperatures outside of the rated range. As with most plastics, some chemicals can cause damage. Polycarbonate bowls should not be exposed to chlorinated hydro-carbons, ketones, esters, and certain alcohols. They should not be used in air systems where compressors are lubricated with fire resistant fluids such as phosphate esters and di-esters types. In areas where polycarbonate bowls are exposed to high temperatures or atmospheres containing vapors or fluids, which are damaging to plastic, use metal bowls.

Metal bowls resist the action of most such solvents but should not be used where strong acids or bases are present or in salt laden atmospheres. Consult the factory for specific recommendations where these conditions exist.

TO CLEAN POLYCARBONATE BOWLS USE MILD SOAP AND WATER ONLY! DO NOT use cleaning agents such as acetone, benzene, carbon tetrachloride, gasoline, toluene, etc., which are damaging to this plastic.

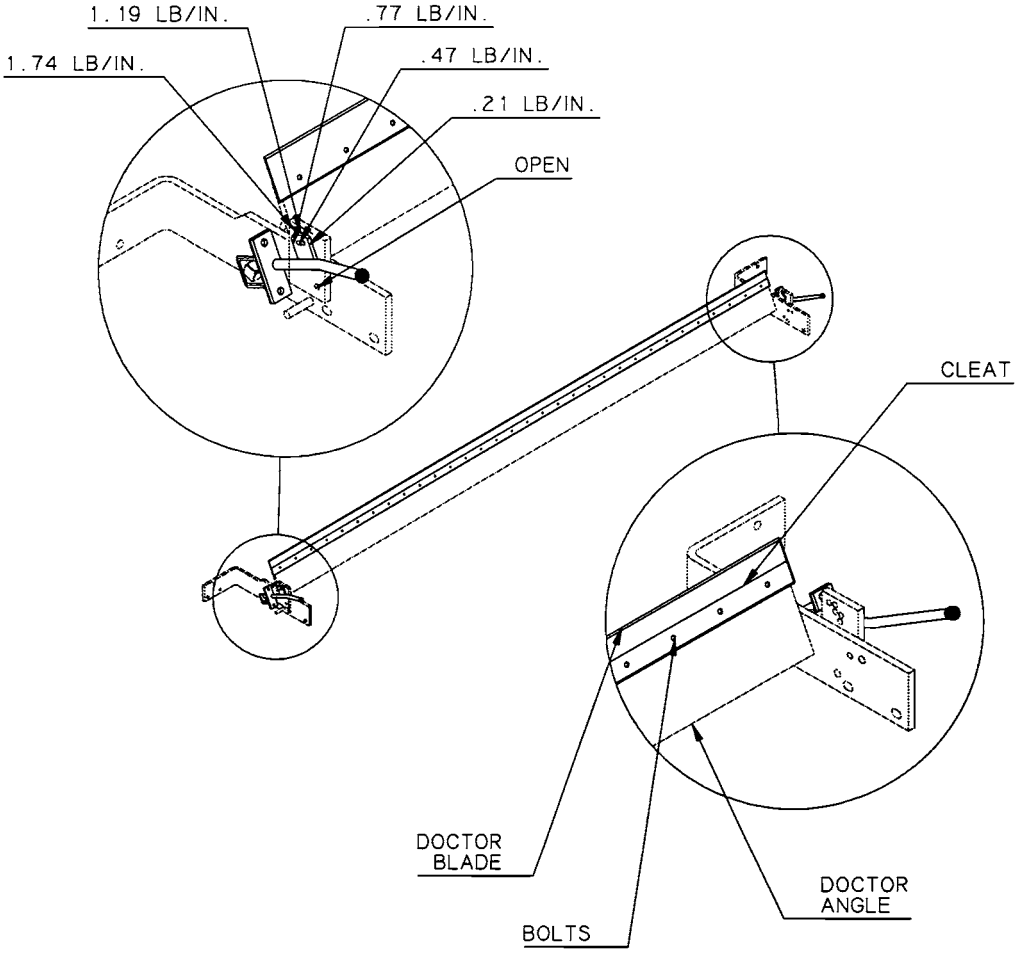
4.3.4 Doctor Blade Adjustment

The doctor blades should be checked before starting the machine to make sure they are in the appropriate positions. Damage to the belts and/or the rollers could occur if the doctor blades are improperly set.

NOTE: When running without sludge, it is recommended that the doctor blades be moved away from the rollers.

The important item to consider in aligning the doctor blades is that they be square against the belt. If there are gaps at any points along the roller, the small fastening bolts should be loosened, and the blade should be raised or lowered to make a flush fit.

The pressure that the doctor blade exerts on the belt can be adjusted to any of five settings. The setting on both ends of the doctor blade should be maintained the same.



4.5 OPTIMIZATION PROCEDURES

* This section contains exerpts from Operation and Maintenance of Sludge Dewatering Systems, Manual of Practice No. OM-8, Water Pollution Control Federation, 1987.

After the SMX®-S8-LP is on-line, operators can adjust the followings items to optimize the performance:

- Sludge Feed Rate
- Polymer Feed Rate
- Belt Speed
- Sludge/Polymer Mixer
- Plow Position

Adjustments are made to achieve satisfactory discharge consistency at the targeted sludge feed rate while using the minimum amount of flocculant. The above parameters should be adjusted to the point where the system can operate with minimum supervision. Operators will have more time for system maintenance tasks, preparing flocculant solutions, data collection, and other work items required to run a dewatering system.

For systems that are not operated continuously, allowances must be made in the available shift hours for preparation of flocculant solutions, start-up, shut-down, and clean-up. Even at multi-unit installations designed for continuous operation, provisions should be made for downtime to allow required inspection, maintenance, and/or repair of each unit and the auxiliary equipment systems (such as the sludge feed pumps).

4.5.1 Sludge Feed Rate Adjustment

The appropriate sludge feed rate depends on three criteria:

- Minimum daily sludge volumes to balance wastewater treatment process (V_{min}) measured in gal (L).
- Maximum sludge solids feed rate to produce acceptable final dryness (Q_{max}) based on past performance measured in gpm (L/s).
- Number of shift hours per day during which manpower will be available (T) measured in hours.

A simple calculation provides the appropriate feed rate; Q, in gpm:

$$V_{min}/(T \times 60) = 60$$

For installation with more than one press, the feed rate per press is found by: Q/no. of presses, or Q per press.

The SMX®-S8-LP will produce a dewatered sludge with desired solids contents as long as the sludge feed rate per press is less than or equal to Q max. The sludge feed pump's calibration curve can be used to set the pump speed.

4.5.2 Polymer Feed Rate Adjustment

Initially, the flocculant feed pumps should be set to provide a 20% overdose to the sludge. This will help eliminate spills of unflocculated sludge during start-up. After the system has reached a steady state condition (a few minutes), the polymer pump speed should be reduced to just above the point of desired performance.

When testing a new polymer product for the first time, the polymer feed pump should be set at the flow rate suggested by jar test results. After flocculated sludge appears on the belt, operators should carefully observe the sludge drainage rates, filtrate clarity, and belt cleaning. Problems with belt cleaning and/or gravity drainage indicate that the initial flocculant pump setting must be adjusted. If both problems occur at the same time, this usually indicates that the sludge is being overdosed with flocculant. In this case, the sludge feed should be stopped until the filter belt has been adequately cleaned. After restarting the sludge and flocculant feed pumps, the flocculant feed pump should be adjusted to half of the original flow rate.

By continuing to cut the flocculant feed rate by half, a rough search can be conducted for the minimum required feed rate. At least 5 minutes should be allowed after each flocculant feed rate adjustment to observe sludge floc consistency and drainage characteristics. Eventually after cutting the flocculant feed rate 2 or 3 times, flocculation will be lost, as evidenced by poor gravity drainage. At this point, the current flocculant feed pump setting should be doubled. The minimum required flocculant feed rate falls in between these two pump speeds; that is, between the speed at which flocculation failed and twice that speed. In a similar manner, a fine adjustment search for the minimum required feed rate can be conducted by successively cutting the flocculant pump discharge rate by increments of 10%.

The initial flocculant pump setting may result in poor gravity drainage and loose floc structure without belt blinding. This usually indicates that the flocculant feed rate is too low. The feed rate should be successively doubled until a freely draining sludge floc is obtained.

Adequate dilution water must be supplied at any flocculant feed rate to help disperse the flocculate solution throughout the feed sludge solids. A normal operating procedure would be to set dilution water flow (typically indicated by a rotameter) at 3 to 5 times the flocculant feed rate.

4.5.3 Belt Speed Adjustment

At start-up, the belt speed should be set at 75% of maximum to prevent sludge ponding and spillage. The operator should then reduce belt speed after observing that the sludge is properly conditioned. Belt speed should be decreased to the minimum rate at which sludge flocs can drain without causing filtrate to pond in the gravity drain section. The belt speed may be slowed in incremental steps and 5 minutes allowed between changes to observe gravity drainage. After finding the minimum belt speed, it is a good idea to slightly raise the speed (5%) to provide some leeway for absorbing process upsets.

4.5.4 Sludge/Polymer Mixer Adjustment

Unless the feed sludge has changed drastically between shifts of operation, the venturi mixer should not require adjustment each time the unit is started, provided that it was set properly during the previous operation. The amount of mixing energy applied to the sludge will be directly related to how narrow the mixer gap setting is. In other words, the tighter the gap, the higher the mixer energy. To improve press performance as well as to reduce polymer cost, the mixer position should be evaluated at least for its visual effects, especially when sludge characteristics change.

4.5.5 Plow Position Adjustment

Plow position is normally a minor variable for obtaining optimum press performance. The requirement for plow positioning should not be significant as the plows are properly oriented (staggered) at the factory. The contact between the belt and plows should provide the desired raking/turning action. In general, the plow bars should freely float within range of the slide brackets, allowing the plows to ride evenly on the belt and be able to rise up upon passing of belt clipper seam or obstacles in the sludge.

4.6 ROUTINE MACHINE CHECKS

To keep the SMX®-S8-LP in the best operating condition and to reduce wear on critical parts, ***ANDRITZ*** recommends the following maintenance checks be performed regularly.

a) Check each belt before each start-up for holes and tears. If the holes and tears are detected early, they may be patched.

b) Check the doctor blades for unusual wear.

c) Check all pneumatic equipment. (including lubricator oil level).

d) Check all rollers - especially the roller coatings

e) Check all rubber seals in the gravity dewatering zone and the shower boxes. Look for wear on rubber and/or leaks during operation.

f) Check each belt after it passes through the shower box. Dirty stripes on the belt, usually indicates that a shower nozzle is blocked. To clean nozzles, turn shower cleaning hand wheel to fully open. Close the valve and check the belt. If the stripe is still present, repeat the operation.

Maintenance procedures are described in detail in Section 5.5 and Maintenance Summary Forms are provided in Section 5.6 for the SMX®-S8-LP.

4.7 PROBLEM SOLVING TIPS

* This section contains exerpts from Operation and Maintenance of Sludge Dewatering Systems, Manual of Practice No. OM-8, Water Pollution Control Federation, 1987

It is quite easy to see when a dewatering system is not working properly. The discharge will look and feel wetter or will have become runny or semi-liquid. Puddling or ponding may occur. The filtrate and/or washwater return flow may look cloudy or turbid. These symptoms of performance troubles are easily noticed by the trained operator. Performance problems will contribute to an increase in operating costs.

Wetter cakes cost more to dispose of either through incineration or land application. A wetter cake has a low net heat value, costs more to incinerate, and reduces furnace capacity. Wetter cakes contain fewer solids per unit of cake volume. Therefore, given the same mass of solids, a wetter cake will occupy more volume and require more truckloads to be hauled. Poor solids recovery, as indicated by high solids levels in the filtrate and/or belt wash return stream, adds to the mass of solids that must be treated again as corrective action. Recycling solids around the plant only adds to the normal volume of solids to be settled, pumped, and then fed to the press for dewatering. Thus, dewatering system operators constantly should watch for what may appear to be substandard performance, particularly in the area of solids recovery. Common causes for press performance problems are discussed below.

SLUDGE CONDITIONING

Because successful operation of the dewatering system depends on proper sludge conditioning, selection of the correct flocculant is perhaps most critical to press operation. Choosing the best flocculant for a particular sludge and installation is unfortunately an imprecise, trial-and-error procedure. Jar and free drainage tests for flocculated sludge samples provide a somewhat standardized basis for initially screening and determining rough dosage requirements of different chemical preparations. Chemical manufacturers usually provide this service free of charge. The only way to genuinely establish the required dose of a particular flocculant to make cost effectiveness comparisons between competing products, however, is through full scale performance testing with a sample batch of the proposed flocculant. When comparing different flocculant brands, the price per ton of treated sludge, not the polymer price establishes which product is better.

During press operation, one quick check for proper conditioning is through the free drainage test. If the solids on the belt sample do not look well flocculated or the collected filtrate seems cloudier than normal, then one of the reasons listed below may be a source of the problem.

MIXING

Over or under agitation of the sludge/diluted polymer mix will make it difficult to flocculate the sludge. Over mixing will brake up floc clumps, whereas a mixing energy that is too low prevents adequate sludge particle/polymer molecule contact and inhibits floc formation. This is especially true for sludges that form weak flocs, such as waste activated sludge or alum sludge (those sludges containing little fiber or inert solids.).

With any change in press operation (sludge flow, sludge characteristics, etc.) the mixer setting should be evaluated and adjusted, if necessary.

POLYMER DILUTION

Optimum dilution of the polymer solution enhances sludge floc formation by dispersing the polymer molecules throughout the suspended sludge solids. Sludge conditioning can be improved by ensuring that the dilution water flow provides between a 3:1 and a 5:1 dilution of the polymer solution. Dilution flows beyond this level provide negligible improvements in sludge conditioning and only increase the volume of water to be removed by the press.

POLYMER SOLUTION

It is important to use polymer products as efficiently as possible to help minimize chemical conditioning costs. The polymer manufacturer's directions for solution preparation should be strictly followed, particularly regarding solution aging, make-up strength, and solution batch life. Polymer solutions, particularly those prepared from dry powders, require a certain aging period before maximum activity is achieved and a have a specific batch life during which maximum activity is maintained. Batch life primarily depends on the specific product being prepared, solution strength, and solution temperature. Warmer solution temperatures quicken the rate at which charge sites on the polymer molecule become neutralized, thus shortening batch life. These temperature effects can be particularly pronounced during summer months when polymer solution make-up volumes may need to be reduced.

Operators should be certain that solution make-up procedures allow sufficient aging time before the solution is used. In addition, only that volume of solution that can be consumed within the polymer manufacturers specified batch life should be prepared.

Oxidizing chemicals in the polymer preparation water, especially hypochlorite and reacted chlorine residual compounds, will react with polymer molecules to neutralize charge sites, break molecular bonds, and diminish polymer activity and effectiveness. Compounds containing chlorine can be a problem when plant effluent is used to prepare polymer solutions. Potable water, if available, carries a lower chlorine residual and should be used to avoid oxidizing the polymer.

FEED SLUDGE CHARACTERISTICS

Feed sludge characteristics may change slowly over several weeks, between shifts of system operation, or even during a single shift. Performance problems (wetter discharge, loss of performance, ponding, and spillage) can then result. Some of these symptoms can occur even if the system had been optimally adjusted for sludge conditioning, belt speed, and belt tension at the start of a shift.

It is imperative that system operators fully understand these principles of sludge dewatering and routinely measure and log sludge furnish and performance properties. This gives operators the ability to trend data and utilize this information to establish a cause and effect understanding of the sludge variations and resulting performance.

CONCENTRATION CHANGES

Variations in feed sludge concentration principally affect sludge conditioning. For example, overdosing will result if the sludge reduces in concentration by half (say from 2 to 1% for an aerobically digested sludge) although all other conditions remain constant. Depending on the sludge being dewatered, overdosing may be severe enough to lose flocculation.

To provide long-term relief from process upset caused by frequent changes in feed sludge concentration, operators must examine where the sludge is stored and the volume of sludge maintained at the storage location. Greater retention time minimizes variations in sludge concentrations.

BLEND VARIATIONS

The systems that dewater a sludge mixture, for example aerobically digested WAS and anaerobically digested primary, can suffer process upsets if the mixture proportions change. The faster the change occurs, the greater the chance of upset. Sludge handling operations that precede dewatering should be adjusted to keep the blend constituents notified whenever changes are imminent. Operators should ensure that the blend is well mixed in a holding tank before dewatering. Thorough mixing will protect the dewatering system from changes in mixture constituents. In preparing the mixture, operators should try to feed the holding tank with the same volume of blend constituents. In addition, respective feed and withdrawal rates should be adjusted to and from the blend tank to keep tank residence time below 24 hours. This will require coordinating the schedules for press run time and holding tank feed operations.

Variations in the sludge mix can be accommodated by adjusting sludge and polymer feed rates and belt speed. This variation is generally a trial-and-error process. Discharge consistency and throughput capacity will vary do to the mixture constituents. For example, a greater percentage of hard-to-dewater sludge in a mix (aerobically digested and extended aeration sludge) will cause discharge solids to fall. To maintain a constant discharge consistency, the feed rate should be reduced, which will in turn decrease throughput capacity.

SLUDGE AGE

Sludge age can affect discharge consistency and flocculant costs, especially for those systems treating aerobically digested sludge and extended aeration sludge. The longer these materials are aerated before dewatering, the more difficult they become to flocculate and dewater. Older sludge also require more polymer to flocculate. One explanation is that the individual sludge cells acquire a bond water sheath that helps keep the solids suspended.

If maximum discharge consistency has been chosen as the most important performance goal, then operators should work to maintain the least possible sludge inventory in the treatment plant that is consistent with proper operation of the particular biological process in sue. That is, excess sludge inventories should not be allowed to accumulate in the plant in an attempt to minimize feed rate to the press or reduce the hours of press run time. When possible for aerobic processes, sludge ages should be kept under 15 days to maximize cake dryness. This assumes that the dewatering system has adequate capacity to process the required sludge volume.

For plants using the extended aeration variation of the activated sludge process or those plants using a biological nutrient removal process, operators will need to develop a particular sludge wasting strategy that provides the desired liquid treatment performance but sill minimize sludge age to help attain drier press cakes.

Poor solids recovery from the press operation can directly contribute to sludge age problems. Uncaptured sludge solids are recycled into the treatment plant, thus adding to the plant's sludge inventory and providing an older, more difficult feedstock to dewater.

SLUDGE SEPTICITY/ODOR PROBLEMS

Aerobic sludge that have become septic respond to belt press dewatering in a manner similar to aerobic sludges with a high sludge age. Aerobic sludges held without aeration for 2 to 4 days can be up to 50% more costly to condition. Besides being more difficult to dewater and more costly to condition, septic sludges also present an odor problem that can cause unpleasant and potentially hazardous atmospheres within structures housing dewatering systems. Similar odor problems can occur while dewatering anaerobic sludge because they are likely to contain hydrogen sulfide, mercaptans, and related odorous compounds.

If possible, operators should try to eliminate sludge septicity problems at their source. Processing greater volumes of aerobic sludge per day will reduce the plant's sludge inventory and provide a fresher feed stock to the system. Again, this is applicable if the dewatering system has enough spare capacity and/or enough operating time can be scheduled to process the extra sludge volume. Decanting operations to thicken aerobic sludge before dewatering should be scheduled and controlled. Aeration should be stopped for no more than 18 hours before dewatering to ensure that the sludge stays fresh.

GREASE AND SCUM

Grease and scum are typically collected as floatable materials in primary and final clarifiers. If mixed with a fibrous sludge such as a raw primary, these materials do not pose a particular problem for the dewatering system. Co-dewatering with raw primary sludge is preferred because the inner structure of grease and scum cannot withstand applied belt tension. If too much tension is used, grease and sludge fibers can become embedded in the belt mesh, thus blinding the belt. Belt tension may need to be reduced with dewatering grease and sludge mixtures. Lower discharge consistency may have to be accepted as a consequence of dewatering grease and scum together with sludge. It may also be periodically necessary to steam clean the belts to help remove grease and scum deposits.

POOR SOLIDS RECOVERY

Poor solid recovery can be defined as system operation that provides less than 90% recovery of feed solids. Low solids capture can be easily observed in the gravity zone, in particular, the clarity of gravity recovery and, if left uncorrected, increases sludge age of biological sludge, making the material more difficult to dewater. Poor solids recovery can adversely affect performance in the rest of the treatment plant. For example, excessive quantities of return solids as a result of poor recovery could upset clarifier operation over time.

Poor solids recovery can be caused by inattentive operation of the dewatering system. Attempts to treat more sludge than the system's design capacity or skimping on polymer dosage will impair solids recovery. Minimizing the polymer dosage results in higher solids concentrations in the filtrate return flows. In addition, the flocs are weaker and more easily squeezed into the belt mesh. These solids are subsequently flushed from the belt and into the washwater return flow. By exceeding the recommended throughput, the chance for incidental sludge spillage into the drain pans increases, which increases the return flow solids content.

At certain times, such as after a major plant upset, excess sludge may need to be processed and dewatered quickly. This may require the rated capacity to be temporarily exceeded. During this time, process performance will suffer through wetter discharge and poorer solids capture.

Selection and procurement of polymer flocculants should always include solids recovery in the calculations of a product's cost effectiveness. This will help to ensure that sludge conditioning does not limit solids recovery.

BELT BLINDING

Belt blinding is an operating condition in which the belt wash system cannot thoroughly clean the belt mesh opening. Uncorrected blinding will interrupt filtrate drainage through the belt, causing ponding and eventual spillage and process upset. Grease and skimmings in sludges can enhance the tendency of sludge solids sticking in the belt mesh. Overdosing a sludge with polymer creates a sticky floc that is harder to rinse from the belt. In extreme cases, the polymer solution can directly seal off some of the belt mesh openings and thereby interfere with drainage. Exerting too much belt tension on the sludge can create belt blinding. Finally, insufficient wash water volume and/or pressure can cause inadequate belt cleaning. Operators can correct belt blinding in many cases by one or more of the following actions:

- decrease polymer feed rate,
- decrease belt tension
- increase belt wash flow/or clean clogged nozzles, and
- adjust the belt doctor blade

After belt blinding has been detected, sludge dewatering should be halted until the belt has been washed clean. Operators should check the wash header line pressure and flow rate if these variables are within the specific ranges suggested by the press manufacturer or belt fabric supplier. Low flow rates through the wash header could indicate that the spray nozzles are plugged and need to be cleaned.

If belt blinding persists, one should consider installing new spray nozzles that discharge a greater volume at the same pressure or perhaps consider changing to a finer mesh belt. In the U.S., companies that specialize in filtration fabrics for belt filter presses can offer expertise in picking a better fabric for a particular dewatering operation and sludge type. In changing to a finer mesh belt, however, one should expect that filtrate will not flow as freely as before. Therefore, throughput capacity will be somewhat diminished. In addition, washwater volume or pressure may have to be increased to provide a cleaning.

4.8 TROUBLESHOOTING GUIDE

	PROBLEM		PROBABLE CAUSE		CORRECTIVE ACTION
A.	Belt Limit alarm	1.	No air in tracking system	a.	Check air supply
		2.	Slurry extrusion trips limit	a.	Reduce feed rate
				b.	Increase belt speed NOTE: If limit switch is now OK but extrusion is seen in the high pressure zone - adjust polymer
B.	Loss of Air Alarm	1.	No air pressure	a.	Check air supply.
C.	Extrusion of slurry in gravity zone	1.	Rubber sealing worn	a.	Check rubber seals in gravity zone
				b.	Replace necessary
		2.	No polymer	a.	Check that polymer system is on
				b.	Adjust polymer flow rate.
D.	Poor drainage in gravity zone	1.	Poor flocculation	a.	See Problem F
		2.	Belt blinded	a.	See Problem R
E.	Slurry flowing over headbox	1.	Slurry feed too high	a.	Decrease slurry and polymer flow rates
				b.	Increase belt speed
		2.	Poor drainage	a.	See Problem D
F.	Poor flocculation	1.	Too little or too much polymer	a.	Check and adjust polymer feed rate
		2.	Dilution water feed rate incorrect	a.	Check and adjust dilution water feed rate
				b.	Adjust tank mixer speed
G.	Extrusion of slurry from wedge section	1.	Poor flocculation	a.	See Problem F
		2.	Throughput too high	a.	Reduce feed rate
				b.	Decrease belt tension
		3.	Belt speed to slow	a.	Increase belt speed
H.	Roller not turning	1.	No lubrication; bearing worn	a.	Call maintenance
I.	Floc breaking down under pressure	1.	Poor flocculation	a.	See Problem F
		2.	Too much pressure on slurry by belts	a.	See problem G-2
J.	Extrusion in high pressure zone	1.	Poor flocculation	a.	See Problem F
		2.	Too much pressure on slurry by belts	a.	Decrease belt tension
				b.	Increase belt speed
				c.	See problem G-2

	PROBLEM		PROBABLE CAUSE		CORRECTIVE ACTION
K.	Bulge in high pressure section	1.	Too much water/slurry in cake	a.	See Problem F
				b.	Reduce belt speed
		2.	Belts blinded	a.	See Problem Q
L.	Belt slips on drive roll	1.	Belt tension too low	a.	Increase belt tension (do not exceed recommended belt tensions)
		2.	Overload: too much slurry in machine.	a.	Shutdown machine: remove excess slurry and restart machine at lower feed rate.
M.	Cake sticking to belt	1.	Poor flocculation	a.	See Problem F
		2.	Doctor blades worn	b.	Replace doctor blades
		3.	Belt not being cleaned	a.	See Problem Q
N.	Doctor blades wearing heavily	1.	Misalignment of blades	a.	Align doctor blades
		2.	Too much doctor blade pressure on belt	a.	Adjust doctor blade pressure
O.	Drive system gear lock down	1.	No oil in system	a.	Lubricate
P.	No speed variation on main drive or mixer drive	1.	Faulty wiring in DC or AC panel speed control	a.	Repair wiring
		2.	Mechanical failure in drive	a.	Repair
Q.	Belts blinded	1.	Spray nozzles plugged	a.	Use shower cleaning wheel located on shower
		2.	Poor Flocculation	a.	See Problem F
R.	Belts wrinkling or folding	1.	Poor distribution	a.	See Problem T
		2.	Low belt tension	a.	Increase belt tension
		3.	Cake too thick	a.	Increase belt speed and/or decrease feed rate
S.	Poor distribution in Gravity Zone	1.	Plows or baffle mislocated	a.	Relocate plows
		2.	Belt speed incorrect	a.	Adjust belt speed
		3.	Machine not level		Level the machine
T.	Cake coming off machine is uneven	1.	Poor distribution	a.	See Problem S
U.	No sludge	1.	Sludge pump not operating	a.	Check sludge pump
		2.	Valve closed	a.	Check valves
		3.	Pipe clogged	a.	Clear pipe
		4.	Pipe leaking	a.	Repair leak
V.	Overload relays from drive system are on	1.	Drive is being overloaded	a.	See Problem L
		2.	Relay overload	b.	Replace relay

	PROBLEM		PROBABLE CAUSE		CORRECTIVE ACTION
W.	Low dryness in product cake	1.	Sludge application rate too high	a.	Check and adjust sludge pumping rate
		2.	Belt speed too high	a.	Check and adjust belt speed
		3.	Incorrect polymer dose	a.	Check and adjust polymer mixing and dosage
X.	Excessive belt wear	1.	Improper alignment of roll	a.	Check tracking of belt to see if it creeps off to one side
				b.	Adjust alignment of rolls
				c.	Check operation of automatic belt adjuster
				d.	Repair or replace adjuster
		2.	Sludge build-up on bottom of belt or on roller causing improper alignment	a.	Clean rolls or belt
Y.	Low solids capture	1.	Incorrect polymer dose	a.	Check and adjust polymer mixing and dosage
		2.	Solids running off the edge of the filter belt	a.	Check and adjust influent sludge pumping rate
		3.	Sludge application rate too high	a.	Check and adjust sludge feed rate

5.0 MAINTENANCE OF THE SMX®-S8-LP

5.1 SAFETY INSTRUCTIONS FOR MAINTENANCE WORK

For safety reasons, as well as for operating efficiency, personnel responsible for maintenance of the SMX®-S8-LP must be thoroughly familiar with the procedures outlined in this manual. Failure to follow recommended guidelines could result in personal injury or damage to the equipment. The following is a list of safety considerations while performing maintenance tasks:

- Removal of gratings, catwalks and guard rails increases the risks of accidents. All access equipment and components should be maintained in their intended positions.

- Before starting any maintenance work, all drives should be switched off and secured against being switched-on inadvertently by unauthorized persons. Electric current should be disconnected before removing safety guards.

- All connections for air, oil, water, limit switches, etc. should be removed from parts to be dismantled or serviced, even if this step is not explicitly mentioned in the maintenance instructions.

- When changing a roller, the bearing should be supported before being unscrewed from frames. Failure to do this could result in the bearing housing sliding off the end of the journal.

- When maintenance work calls for machine parts and/or protective devices to be removed, these components should be replaced immediately upon termination of the work and prior to restarting.

5.2 HOUSEKEEPING

The SMX®-S8-LP has been designed and manufactured to provide extended service life when operated and maintained properly. One of the most important factors in prolonging the life of the SMX®-S8-LP is practicing good housekeeping, that is, regular cleaning and visual inspections.

When the SMX®-S8-LP is operating as per design, the process is a clean one. All sludge and filtrate is completely contained within the dewatering zones and the drainage areas. Occasionally, upset conditions may occur which could result in spillage or extrusion. If left untreated, these spills could build up on certain components of the press, i.e., the tracking system or the belt limit switches, rendering them ineffective.

ANDRITZ recommends that the SMX®-S8-LP and all auxiliary components be cleaned thoroughly with a moderately-high-pressure water spray when spillage occurs and/or when stopping the machine for any length of time. The machine should be run for approximately 10 minutes without sludge while cleaning during shut-down, to thoroughly wash the belts. Use reasonable care when spraying around the seals of the bearings to avoid contaminating them with water and/or sludge.

Also, the area around and on the SMX®-S8-LP should be kept picked-up, for safety reasons as well as to avoid mishaps which could cause damage to the machine. A hand tool or piece of hardware inadvertently left on the belt could destroy the belt or do extensive damage to other components on the press.

A list of Routine Machine Checks is provided in Section 4.6. Please review these checks periodically as a reminder of the areas requiring regular visual inspection.

5.3 LUBRICATION

Strict adherence to Lubricant Specifications and Lubrication Schedules is essential to obtaining the maximum achievable life from a bearing. The bearings provided on the SMX®-S8-LP are described in the Materials of Construction in Section One of this manual. Information of Bearing Replacement is found in Section 5.5.5.

The life expectancy of a bearing will differ based upon a number of factors, such as the load placed on the bearing and its speed of rotation, but it is most affected by the type of lubricant used. The owner of the SMX®-S8-LP should consult ***ANDRITZ*** or a reputable bearing supplier before using a lubricant other than that originally supplied with the machine.

IMPORTANT: The SMX®-S8-LP is fitted with an oiler for all machine air system, as described in Section 4.3.3 of this manual. The oiler must be kept full at all times.

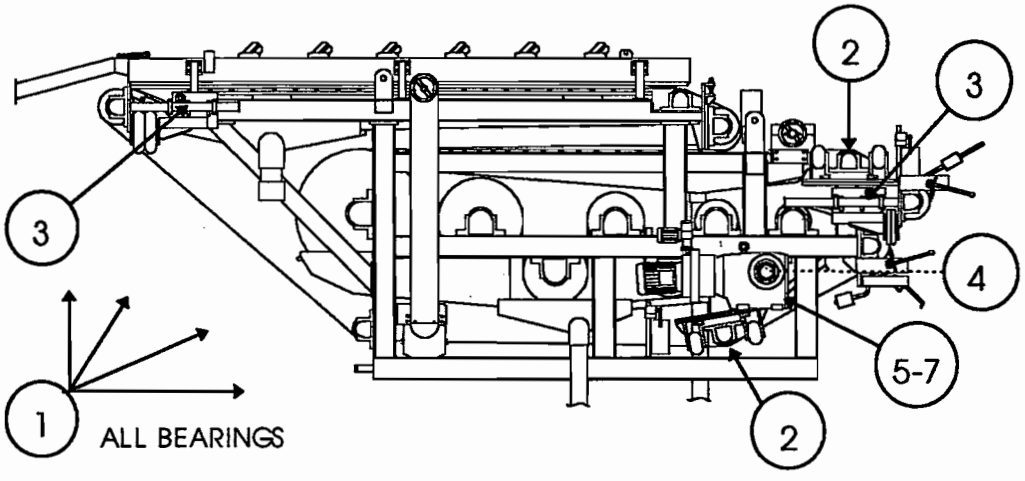
5.3.1 Lubricant Specification

REFERENCE SYMBOL	MOBIL	SHELL	TEXACO
A - Grease	Mobilith AW2	Aeroshell	Multifak E.P.
B - Oil	Mobilgear 630	Shell Omala Oil 220	Meropa 220
C - Grease	Mobilux EP2	Shell Alvania Grease R3	Multifak EP2

5.3.2 Lubrication Schedule

	Frequency	Lubricant
1. Grease bearings	80 hours	A
2. Grease tracking device	80 hours	A
3. Grease thrust rods on tensioning device	160 hours	A
4. Grease bull gears on drive system	160 hours	A
5. Check oil level in drive gearbox	80 hours	B
6. Change oil in drive gearbox	10,000 hours (2 years)	B
7. Repack bearings in drive gearbox	20,000 hours (4 years)	C

5.3.3 Lubrication Location



5.4 PREVENTIVE MAINTENANCE

All of the components of the SMX®-S8-LP are designed for maximum durability and operational longevity. As already discussed, keeping them clean and lubricated will promote extended life.

One additional aspect of good operations is the practice of periodic preventive maintenance. Machine parts that are designed for movement may become brittle or fixed, or may develop undesirable grooves or ridges if not periodically moved through their designated range of operation. Examples of components that should be fully activated on occasion are as follows:

- the sludge/polymer mixer (counter-weighted arm swung opened to closed)
- the chicane mounting assemblies (lifted on both sides)
- the doctor blade assembly (fully-opened to fully-closed)
- the belt shower nozzle-cleaning system (rotated fully-opened to fully-closed)
- the belt tensioning system (retracted completely with machine not running)
- variable speed drive assembly (low speed to high speed)
- auxiliary components (per manufacturer's recommended maintenance schedule)

Preventive maintenance, as described above, should help prevent much of the damage that occurs from aging, but more importantly, it will bring to light any items which require repair or replacement, before they cause any significant damage.

5.5 REPLACEMENT INSTRUCTIONS

NOTE: Be sure you completely understand the replacement operation you plan to perform before you attempt it.

Should you have any questions, or need any spare parts call the ***ANDRITZ*** Service Department at (817) 465-5611.

5.5.1 Replacement of Belts

If a belt is damaged too severely to be rotated, it should cut off and cleared completely from the machine. The new belt can be installed as outlined in Section 4.2 of this manual.

If the old belt can be rotated, it is easier to use the old belt to pull the new belt through the machine, as follows:

1) Position the new belt at the doctor blade end of the press.
2) Position the belt on the machine such that the arm is acessibley and can be held in place by the doctor blade.
3) Pull the pin from the clipper seam
4) Use the pin to connect the leading edge of the new belt to the trailing edge of the old belt.
5) Pull the new belt completely through the machine.
6) Make the new belt connection at the doctor blade.

5.5.2. Replacement of Doctor Blades

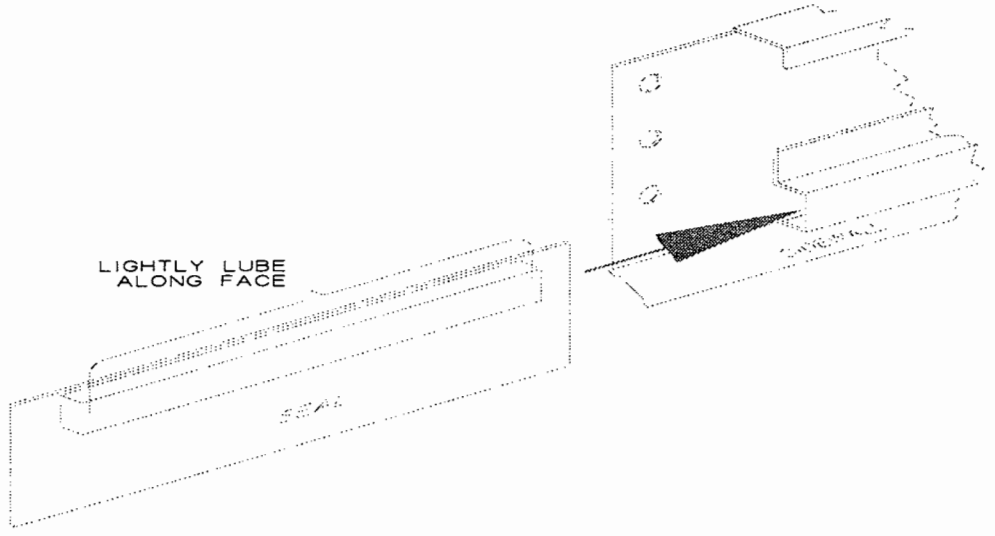
The doctor blades will occasionally need to be replaced, either due to damage or from normal wear over time. A worn or damaged doctor blade will result in poor separation of the dewatered sludge from the belt.

Either doctor blade is easily replaced by removing the bolts on the mounting plates that hold the doctor blade in place. Be certain to align the new doctor blade squarely with the roller and adjust the pressure on each side of the doctor blade assembly to the same settings.

5.5.3 Replacement of Seals

The seals used for containment in the gravity dewatering zone, the shower box and other places on the SMX®-S8-LP may also get damaged, wear out, or become ineffective from weathering. A bad seal will become apparent when it no longer contains the water or sludge as it was designed to do.

All seals on the SMX®-S8-LP utilize a slide-in type holder. To replace a bad seal, loosen the clamping screws, and remove the seal. Place a small amount of lubricant or light grease on the "fat" side of the new seal, and slide it to place. Tighten the screws before using.



5.5.4 Replacement of Bearings

The SMX®-S8-LP utilizes split-case, pillow-block design bearing housings. This allows the bearing insert to be replaced without completely removing the roller from the machine. Further, the roller alignment remains constant as the base of the housing does not move during the bearing replacement procedure.

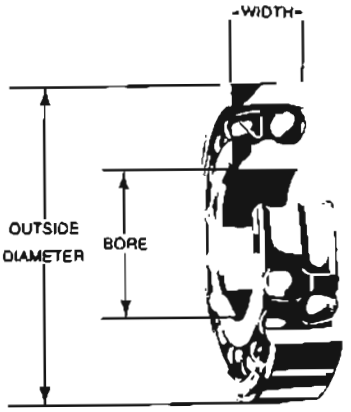
IMPORTANT: When mounting rollers on the machine, always place the fixed bearing on the drive side.

As with most bearings, damage occurs primarily due to the lack of lubrication. Conscientious adherence to the lubrication instruction will minimize maintenance requirements and optimize machine performance. See Section 5.3 of this manual to review lubrication information.

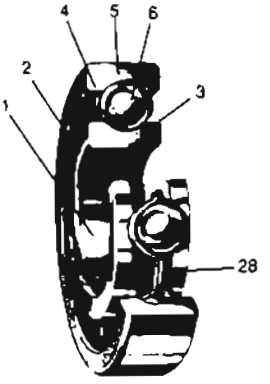
The insert that follows provides more information about procedures for replacement of bearings.

Bearing Terminology

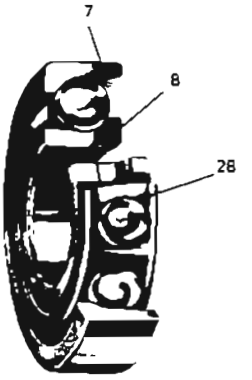
The illustrations below identify the bearing parts of eight SKF® basic bearing types. The terms used conform with the terminology section of the Anti-Friction Bearing Manufacturers Association, Inc. standards, and are generally accepted by anti-friction bearing manufacturers.



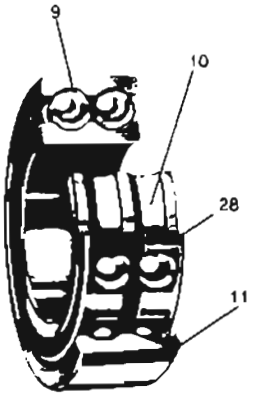
Self-Aligning Ball Bearing



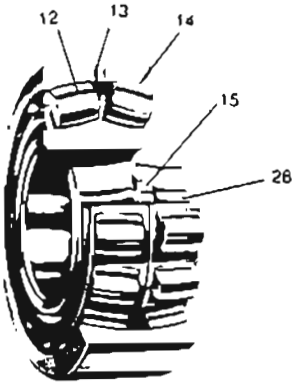
Single Row Deep Groove Ball Bearing



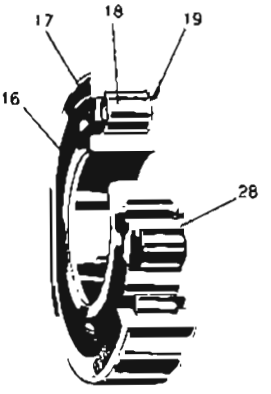
Angular Contact Ball Bearing



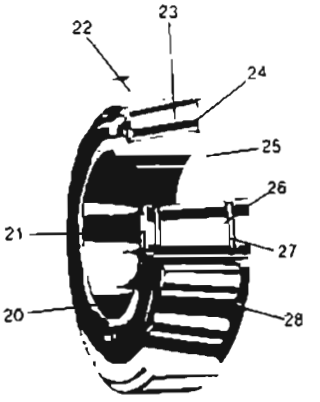
Double Row Deep Groove Ball Bearing



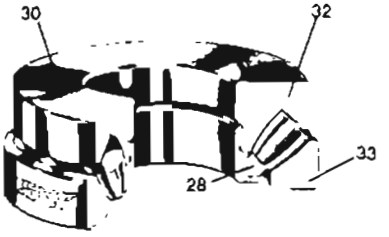
Spherical Roller Bearing



Cylindrical Roller Bearing



Tapered Roller Bearing



Spherical Roller Thrust Bearing

1. Inner Ring
2. Inner Ring Corner
3. Inner Ring Land
4. Outer Ring Land
5. Outer Ring
6. Ball
7. Counter Bore
8. Thrust Face
9. Outer Ring Raceway
10. Inner Ring Raceway
11. Outer Ring Corner
12. Spherical Roller
13. Lubrication Feature (Holes and Groove) (W33)
14. Spherical Outer Ring Raceway
15. Floating Guide Ring
16. Inner Ring Face
17. Outer Ring Face
18. Cylindrical Roller
19. Outer Ring Rib
20. Cone Front Face
21. Cone Front Face Rib
22. Cup (Outer Ring)
23. Tapered Roller
24. Cone Back Face Rib
25. Cone Back Face
26. Undercut
27. Cone (Inner Ring)
28. Cage
30. Face
32. Shaft Washer (Inner Ring)
33. Housing Washer (Outer Ring)

Mounting and Dismounting of Bearings

Nearly all rolling bearing applications require the use of an interference fit on at least one of the bearing rings, usually the inner. Consequently, all mounting methods are based on obtaining the necessary interferences without undue effort, and with no risk of damage to the bearing.

Fitting Practice

A ball or roller bearing has extremely accurate component parts which fit together with very close clearances. The inner ring bore and the outer ring outside diameter are manufactured within close limits to fit their respective supporting members — the shaft and housing. It follows that the shaft and the housing must also be machined to similar close limits. Only then will the required fits be obtained when the bearing is mounted. Shaft and housing fit tables are shown in a separate chapter beginning on page 15.

Internal Bearing Clearance

It is evident that a press (or interference) fit between the parts will stretch the inner ring. This holds true when mounting the bearing directly on the shaft or by means of an adapter sleeve. Thus, there will be a tendency to reduce the initial internal radial clearance in the bearing.

However, bearings are designed in such a way that if the recommended shaft fits are used and operating temperatures have been taken into account, the internal clearance remaining after mounting the bearing will be sufficient to ensure proper operation.

Mounting Methods

Three basic methods are used, the choice depending on factors such as the number of mountings, bearing type and size, magnitude of the interferences and, possibly, the available tools. SKF supplies tools for all mounting methods described here. For more details, see publication 711-110.

Cold Mounting

Mounting of a bearing without the application of heat is the most basic and direct mounting method. A pressing force of sufficient magnitude is applied against a face of the ring having the interference fit. This method is most suitable for cylindrical bore bearings of up to about 70 mm bore and for tapered bore bearings of up to about 250 mm bore.

Sometimes the interference specified for a cylindrical bore bearing of less than 70 mm bore is great enough to warrant the use of one of the other methods to be described. Three other situations may make it impractical or inadvisable to cold mount a bearing:

1. When the bearing face against which the pressing force is to be applied, either directly or through an adjacent part, is inaccessible.
2. When the distance through which the bearing must be displaced in order to seat it is too great.
3. When the shaft or housing seating material is so soft that there is risk of permanently deforming it during the mounting process.

Temperature Mounting

Temperature mounting is the technique of obtaining an interference fit by first introducing a temperature differential between the parts to be fitted, thus facilitating their assembly. The necessary temperature differential can be obtained in one of three ways:

1. Heating one part (most common).
2. Cooling one part.
3. Simultaneously heating one part and cooling the other.

Heating the Bearing

With an interference fit, it is necessary to introduce a temperature differential between the inner ring and the shaft, usually done by heating the bearing. In the case of a separable bearing, it is necessary to heat only the inner ring.

The bearing should be uniformly heated within a maximum safe temperature. It should never be heated with a direct flame or directly on a hot plate, and in general should not be heated above 120 °C (250 °F). Subjecting the bearing to temperatures above 120 °C (250 °F) for extended periods of time may reduce the hardness of the bearing.

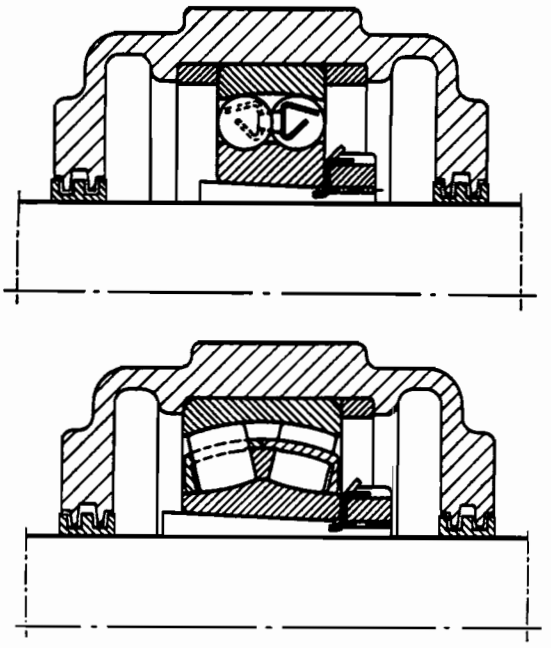
The electric oven, hot plate, and induction heater are probably the most convenient heat sources to use, depending on the size of the bearing. If a hot oil bath is used, both the oil and the container must be absolutely clean. Oil previously used for some other purpose should be thoroughly filtered. Quenching oil having a minimum flash point of 300 °F, transformer oil, or 10% to 15% water-soluble oil, are satisfactory heating mediums.

The quantity of oil used in a bath should be plentiful in relation to the volume of the bearing. An insufficient quantity heats and cools too rapidly, thus introducing the risk of inadequately or unevenly heating the bearing. It is also difficult in such a case to determine when and if the bearing has reached the same temperature as the oil. To avoid hot spots on the bearing, it is good practice to install a rack at the bottom of the bath. Sufficient time should be allowed for the entire bearing to reach the correct temperature. The bath should cover the bearing.

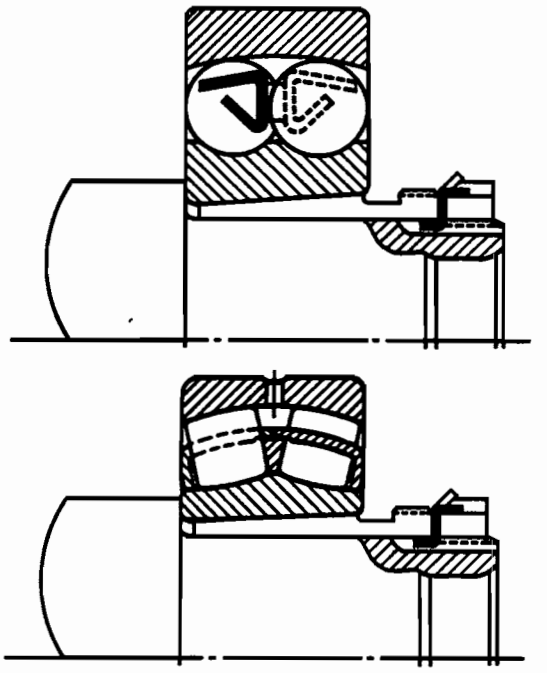
Heating the Housing

The bearing housing may require heating in cases where the bearing outer ring is mounted with an interference fit in the housing. Due to the fact that the outer ring is usually mounted with a lighter interference fit, the temperature difference required is usually less than that required for an inner ring.

A bearing housing may be heated in several ways. If the size of the housing bore permits, an inspection lamp can be inserted, the heat from the lamp usually being sufficient to produce the desired expansion. In some cases the shape and size of the housing allow the use of an electric furnace, but in other cases a hot oil bath is necessary.



Tapered Adapter Mountings (with Locknuts)



Tapered Adapter Mounting (with Removable Sleeve)

Mounting in the Housing

There is usually no difficulty encountered when mounting the bearing in the housing. In the case of a split housing, the shaft, with the bearing correctly mounted on it, is simply lowered into the housing, and the other half of the housing is lowered and secured. In the case of straight-through solid housings, the bearing rings generally have a loose fit with the housing, making it possible to push the shaft and bearing assembly into position.

Bearings having a loose fit on the shaft generally have a tight fit in the housing. In this case the bearing is first mounted in the housing either by hammering on a mounting sleeve or by pressing, and the shaft is then inserted into the bearing. If a tight fit is to be used both on the shaft and in the housing, both bearing rings may have to be mounted simultaneously, in which case the force must be applied to both rings so that none of it is carried by the rolling elements. Alternatively, the housing may be heated.

Bearings Requiring Axial Adjustment

Axial adjustment is necessary when the bearing type dictates it, or when axial movement and location of the shaft must be closely controlled. The types of bearings most frequently requiring this technique are tapered roller bearings, angular contact ball bearings, and thrust bearings.

Tapered roller bearings and angular contact ball bearings are available in constructions which, when mounted in duplex (side-by-side) with or without spacers, automatically provide the correct adjustment when the bearings are locked together. As a general rule, however, whenever these bearings are separated by a portion or portions of the housing or shaft, adjustment must be obtained at assembly either by shimming or by controlling the securing of the bearings. For more details, consult SKF.

Dismounting

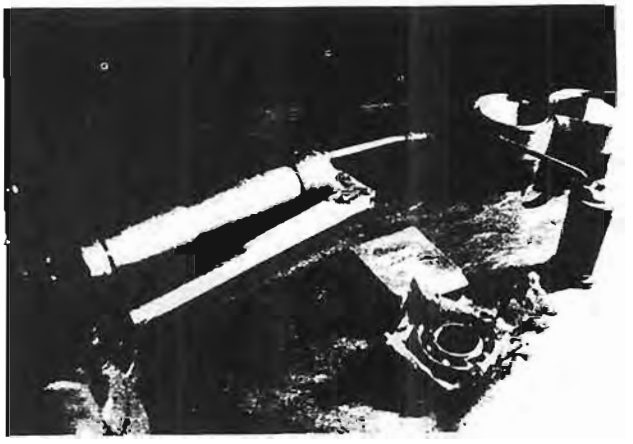
Dismounting of bearings may become necessary when a machine functions improperly or is being overhauled. Many precautions and operations are similar to the mounting of bearings. The methods (for instance the popular hydraulic removal technique for both tapered and cylindrical bores) and tools depend on many factors, such as bearing design, accessibility, type of fit, etc. For details consult SKF.

Mounting and Dismounting of Bearings

For Better Bearing Performance

Guidelines for Bearing Assembly, Maintenance and Inspection

Don't work under the handicap of poor tools, dirt, a rough bench, or cluttered area.



Clean tools and surroundings will help increase bearing performance.

Proper care begins in the stock room. Store bearings in original unopened packages, in a dry place. The bearing number is plainly shown on the box or wrapping. Before packaging, the manufacturer protected the bearing with a grease coating. An unopened package means continued protection. Do not open carton until ready to use.

Open package only when ready to install bearing. Handle bearing with clean, dry hands and with clean rags. Lay bearing on clean paper and keep covered. Never expose bearing on a dirty bench or floor. Never use a bearing as a gauge to check either the housing bore or the shaft fit.

Don't wash a *new* bearing—it is already clean and the slushing oil should not be removed. Old grease can be washed from a *used* bearing with a solvent but fluid and container must be clean. After this cleaning, wash the bearing out thoroughly with light oil and then relubricate. Bearings should be washed only when necessary.

Before mounting, be sure shaft size is within the specified tolerances recommended for the bearing. The bearing seat should be perfectly round and not tapered. It should be clean and free from nicks and burrs. Shaft shown is too worn to properly seat bearing—don't use it! Support shaft firmly in a clean place—if in a vise, protect it from vise jaws. Protectors can be soft metal, wood, cardboard or paper.

Oil-Injection (Hydraulic) Mounting

This is a refined method for cold mounting a tapered bore bearing. It is based on the injecting of oil between the interfering surfaces, thus greatly reducing the required axial mounting force. The pressure is generally supplied with a manually-operated reciprocating pump. The required pressure seldom exceeds 10,000 psi, and is usually much less.

The oil used for oil-injection mounting should be neither too thin nor too viscous. It is difficult to build up pressures with excessively thin oils, while thick oils do not readily drain from between the fitting surfaces and require a little more axial force for positioning the bearing. Oil having a viscosity of 300 cst at the operating temperature should be used. This method cannot be used unless provided for in the design of the mounting.

Mounting on the Shaft

Cylindrical Bore Bearings

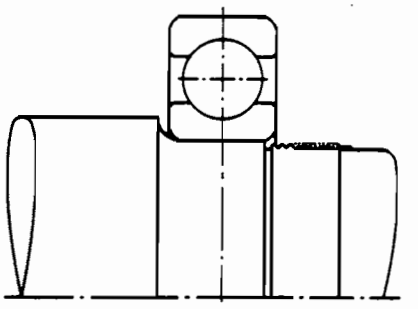
When mounted directly on the shaft, the inner ring should be located against a shaft shoulder of proper height. This shoulder must be machined square with the bearing seat and a shaft fillet should be used. The radius of the fillet must clear the corner radius of the inner ring. Specific values for recommended shoulder heights and fillet radii for each size bearing are given in the dimensional tables of all SKF product catalogs.

If the inner ring is loose on the shaft, creeping will occur. This will result in overheating, excessive wear and contact erosion between the shaft and the inner ring. The explanation of creeping action can be simplified by the use of this comparison. Compare the action of an internal gear in mesh with a planet pinion. If the planet pinion (representing the shaft) had one tooth less than the internal gear (representing the bearing inner ring), the latter would slip back one gear tooth in each full revolution of the shaft. Hence, the speed of the shaft (planet gear) would be greater than the speed of the inner ring (ring gear) and sliding would take place.

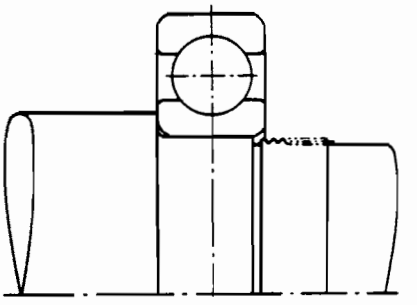
Therefore a preventive measure must be taken to eliminate creeping and its harmful results. Mount the inner ring with a sufficient press fit on the shaft. This will ensure that both inner ring and shaft act as a unit and rotate at the same speed. It is also desirable to use a locknut to clamp the inner ring against the shaft shoulder.

If the applied load is of a rotating nature (for example, vibrating screens where unbalanced weights are attached to the shaft), then the outer ring becomes the critical member. In order to eliminate creeping in this case, the outer ring must be mounted with a press fit in the housing. The rotating inner ring, when subjected to a rotating load, can be mounted with a slip fit on the shaft.

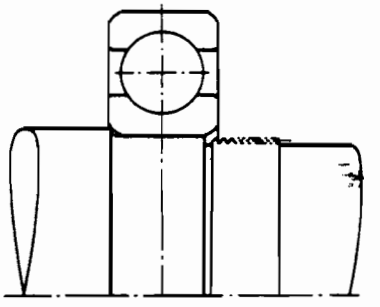
It is evident, therefore, that when the applied load is stationary with respect to the outer ring, a tight shaft fit is required. When the applied load is stationary with respect to the inner ring, a tight housing fit is required.



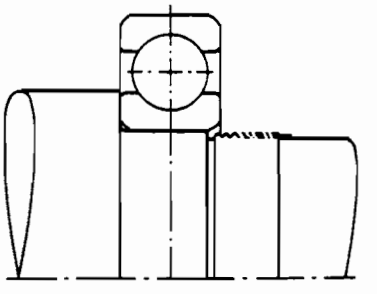
Shaft Fillet Too Large



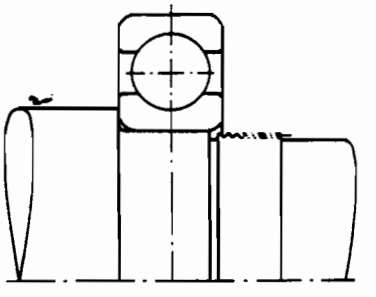
Correct Shaft Fillet



Shaft Shoulder Diameter Too Small



Shaft Shoulder Too Large



Correct Shaft Shoulder Diameter

Mounting and Dismounting of Bearings

Tapered Bore Bearings

Mountings of tapered bore bearings can be classified as either tapered shaft, in which the tapered seat is formed directly on the shaft, or tapered adapter, in which the taper is provided by a removable sleeve.

If the locating face is a shaft shoulder or a removable spacing ring located against a shaft shoulder, the final position of the adapter on the shaft is determined by the position of the bearing. If, on the other hand, the bearing is not so located on the shaft, the adapter is first positioned on the shaft and the position of the bearing relative to the shaft is then determined by the position of the adapter. The position of the bearing on a tapered shaft mounting is determined by the location of the taper on the shaft.

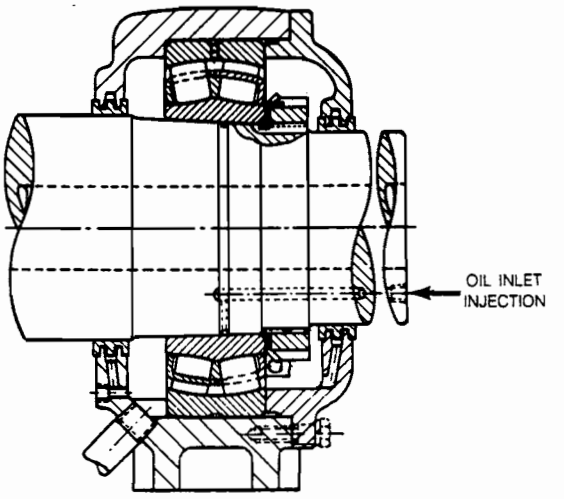
The mounting of any tapered bore bearing is effected by driving the bearing on its seat a suitable amount. This amount may be determined either by measuring the reduction in internal radial clearance (only in case of spherical roller bearings) or the axial advance (applicable to both spherical roller bearings and self-aligning ball bearings), or by feel. These methods and absolute values for reduction in clearance are discussed in detail in SKF product catalog in 640-810, Mounting Procedure for SKF Split Housing Pillow Blocks.

Drive-up is achieved with a force of sufficient magnitude applied directly to the face of the inner ring with the interference fit. This force is generated with one of the following devices:

1. Threaded lock nut
2. Bolted end plate
3. Hydraulic nut
4. Mounting sleeve

Tapered Shaft Mounting

The simplest method of mounting is on a tapered shaft. It requires that the shaft is manufactured with a matching tapered seat.



Tapered Shaft Mounting (with Locknut and Hydraulic Removal)

Adapter Mounting

In the case of adapter mounting without locating ring, the adapter is first positioned at the specified point on the shaft. This is done either with a template which automatically lays off the correct position from a shaft shoulder or component, or with a depth gauge.

Adapter mounting with a locating ring can be carried out in two ways. The bearing can be positioned against the ring and the adapter drawn through the bearing, or the bearing can be positioned at a distance from the ring equal to the required axial advance, and the bearing then driven against the ring.

An occasionally used variation of the adapter is sometimes known as a *removable sleeve* with the large end of the taper facing the locknut side. The bearing is seated against a shoulder, and the reduction in internal clearance or axial advance is obtained by driving the removable sleeve between the bearing and the shaft. Its O.D. is threaded at one end, allowing the sleeve to be removed quite easily with a nut.

Dimensional data of adapters, removable sleeves, locknuts and lockwashers can be found in various SKF product catalogs, such as 190-710, Product Service Guide.

To press bearing on shaft, fit tubular tool (from SKF Fitting Tool Kit) over the shaft and rest it on inner ring. Before pressure is applied to bearing, apply a coat of light oil or micronized graphite to the bearing seat and the bearing bore. Be sure bearing is square on shaft, then apply pressure by tapping end of pipe with hammer or using arbor press.

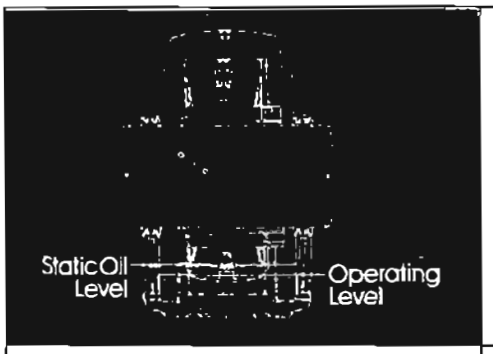
To shrink an open bearing on a shaft, expand bearing either by:
1. Boiling in emulsion of 10% to 15% soluble oil in water for 15 to 30 minutes. Be sure to place supports under bearing to isolate it from bottom of container, as contact will overheat bearing, or:
2. Heating in a clean temperature-controlled electric oven or on a hotplate to a maximum of 121 °C (250 °F) for about 15 minutes. Thoroughly heat bearing but do not overheat. This will prevent seizing on the cold shaft. After bearing is in place against shaft shoulder, lock it immediately with a locknut. Otherwise, in shrinking, bearing may move away from its proper position against shaft shoulder, or:
3. Using an induction heater (as shown on pages 90-91).

When mounting in a split housing, check bore of housing to see that it is within specified tolerances and is perfectly round. Bearing must not be pinched by a small bore or because of a cocked outer ring. Don't switch housing caps—they are not interchangeable. An undersized housing bore will pinch the bearing and cause early failure.

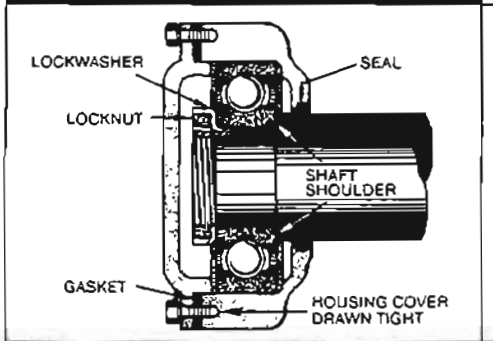
Some precautions must be exercised when mounting bearings in a solid housing; i.e., the outer ring should be perfectly square with the housing bore before any pressure is applied. Here again, the housing bore should be within the specified tolerances for the bearing size and should be perfectly round. The housing bore and bearing outside diameter should be coated with light oil or micronized graphite to facilitate assembly.

Cover an unfinished job, even if it is left for only a few hours. Rewrap each bearing with greaseproof paper to keep out dirt and moisture.

Guidelines (cont.)



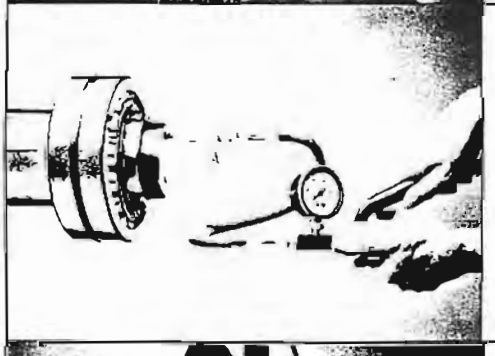
The type of lubricant usually depends on operating conditions—follow the machine builder's instructions. When oil is used, cover about half of bottom ball or roller. It is preferred that a sight oil gauge be used and marked so as to show static and operating oil levels. This helps to determine when additional oil is required. The operating level is *different* from the static level and can be determined only when the bearing is in operation. For more details see section on lubrication.



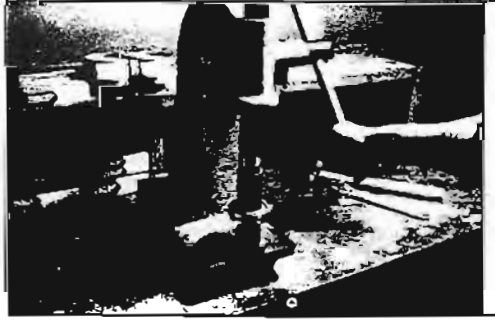
Be sure bearing is square with and held firmly against shaft shoulder. Secure it with a locknut and lockwasher. Housing covers must be tight to keep lubricant in and dirt out. After held bearing has been positioned, the free bearing should be located centrally in its housing to permit expansion and contraction of the shaft.

Small and medium-sized bearings may be cold dismounted using a conventional puller. If the bearing has been mounted with an interference fit on the shaft, the puller should preferably engage the inner ring.

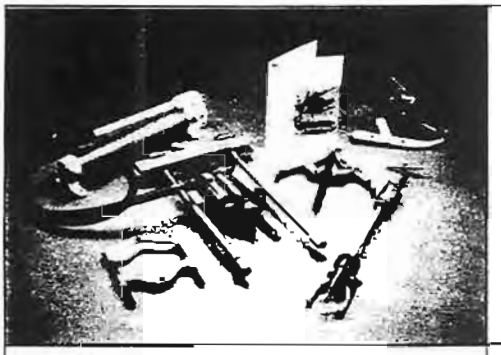
To avoid damage to the bearing seating, the puller must be accurately centred. The use of a self-centring puller eliminates the risk of damage and dismounting is simpler, also more rapid.



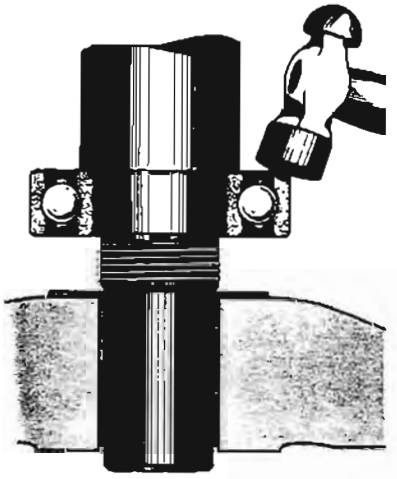
One of the easiest mounting and dismounting procedures, the SKF Oil Injection method is frequently used for larger sized bearings.



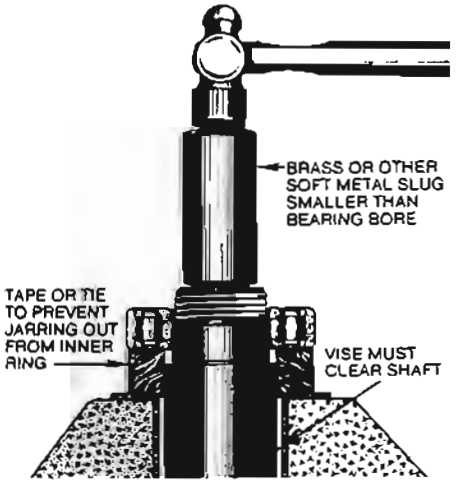
An arbor press is equally good for both mounting and removing bearings.



Bearing pullers may be used separately or in various combinations to pull or push complete bearings or individual rings.



Never pound directly on a bearing or ring. This may damage both shaft and bearing.



To drive shaft out of bearing, use a soft metal slug which will not mar the shaft. (Available in SKF Fitting Tool Kit.)

Mounting and Dismounting of Bearings

Inspection and Assembly of Used Bearings

Don't try to judge the condition of a bearing until after it has been cleaned. Never spin dirty bearings, but rotate them slowly while washing. Don't spin any bearings with an air hose. Rotate one ring by hand when using air to expose all parts of the bearing.

Bearings with a shield or seal on the one side only should be washed, inspected and handled in the same manner as bearings without shields or seals.

Bearings with shields or seals on both sides should not be washed. Wipe them off to keep dirt from working itself inside. Smooth turning bearings can be coated with protective lubricant, then wrapped and stored or used in their original application.

If a small tank with wire baskets for soaking and washing bearings is not available, a clean grease can or bucket filled with solvent can be used. Let the bearings soak long enough to loosen the grease and dirt (several hours or longer). Then slosh the bearing around near the top of the container, giving it a turn now and then until it is clean. Rinse it in a clean container of clean solvent. Petroleum solvents intended for bearing cleaning are preferred.

All solvents are highly flammable, and precautions should be taken to prevent fires.

A short, clean bristle brush from which the bristles will not come out or break off is helpful in removing dirt, scale or chips.

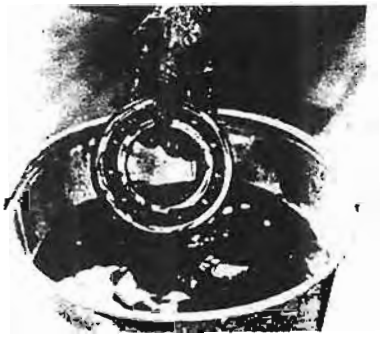
After the bearings have been thoroughly cleaned, inspect them immediately.

Inspected bearings that are considered good enough to be used again, but can't be reassembled in the equipment on the same day, should be dipped in slushing compound and stored overnight in a tightly covered pan.

If inspected bearings are to be stored more than a few days, dip them in a protective lubricant or coat all surfaces with a light grease, rotating them to work the grease thoroughly around the rolling members and on the raceways. Wrap the bearings in greaseproof paper and place in a clean box. Be sure to mark the outside of the package to identify the bearing.

Do not leave bearings in partial assemblies exposed. Keep them covered with greaseproof paper to prevent damage by moisture, dirt or other foreign matter.

Do not spin bearings before cleaning.
Dirt can cause serious scratching.



Soak bearings thoroughly in solvent.

Rinse them in clean solvent, light oil or kerosene.

Do not spin by force of air. Hold both rings.
Use clean, dry air.

MAINTENANCE SUMMARY FORM

EQUIPMENT ITEM: 1.0 Meter SMX®-S8-LP Belt Filter Press

MANUFACTURER: *ANDRITZ*-Ruthner, Inc.

MOTOR NAMEPLATE DATA: 460 Volt, 3 Phase, 60 Hz, 3.0 Hp, 1800 RPM, 182TC

REDUCER NAMEPLATE DATA: Helical Bevel, Ratio 236:1, Type KA96TR62LP182TC

MANUFACTURERS INFORMATION

NAME: *ANDRITZ*-Ruthner, Inc. **TELEPHONE NO.** (800) 433-5161 or (817) 465-5611

ADDRESS: 1010 Commercial Blvd. South, Arlington, Texas 76017

Service or Spare Parts Department - FAX (817) 472-8589

MAINTENANCE REQUIREMENTS

	MAINTENANCE	FREQUENCY	COMMENTS
•	Inspect belt for holes or tears	8 hrs	
•	Inspect doctor blades for wear	8 hrs	
•	Inspect roll coatings for tears	8 hrs	
•	Check wedge and wedge setting	8 hrs	
•	Visually inspect bearings	8 hrs	
•	Check air compressor system	8 hrs	
•	Check belt tracking device	8 hrs	
•	Check pneumatic system oiler	8 hrs	
•	Check spray wash system especially nozzles	8 hrs	
•	Check sludge/polymer	8 hrs	
•	Inspect pneumatic system for leaks	8 hrs	
•	Grease bearings	80 hrs	Lubricant A
•	Check main drive reducer lubricant level	80 hrs	
•	Change main drive reducer oil	8,000 hrs (1 year)	See Section 8.0, Lubricant B
•	Repack main drive motor bearings	16,000 hrs (2 years)	See Section 8.0, Lubricant C

LUBRICANT LIST

REFERENCE SYMBOL	MOBIL	SHELL	TEXACO
A - Grease	Mobilith AW2	Aero-Shell	Multifak E.P.
B - Oil	Mobilgear 630	Shell Omala Oil 220	Meropa 220
C - Grease	Mobilux EP2	Shell Alvania Grease R3	Multifak EP2

5.5.5 Replacement of Rollers

Occasionally the rollers may have to be removed from the SMX®-S8-LP due to roller covering failure or journal fatigue. The procedure will be dictated by the lifting devices available for the operation.

NOTE: It is not necessary to remove rollers for bearing replacement. The only time a roller will need to be removed from the machine is for roller covering replacement or roller assembly failure.

To remove a roller from the ***ANDRITZ*** SMX®-S8-LP:

1. Lock out the machine; implement all applicable safety precautions.

2. Remove the belt, roll it up and set it aside.

3. Remove auxiliaries mounted on or around the machine that may interfere with the operation (i.e., pull cords, filtrate pipe, conduit, etc.).

4. Attach a nylon sling (or two) to the roller capable of completing supporting the roller, or position the jacks to fully-support the roller.

5. Cinch up the lifting device until the slack is gone.

6. Remove the bolts from the bearing housing assembly to the mounting plate or bracket.

7. Remove the roller from the machine (The roller may have to be lowered onto supports and the sling or jack readjusted several times in order to keep the roller balanced as it is being removed).

8. The new roller is replaced in the reverse order of the previous steps.

All of these operations will be explained in more detail during the operator training sessions.

Ask your ***ANDRITZ*** representative or call the Service Department at (817) 465-5611 for information about our Roller Replacement Program.

6.0 RECORD KEEPING

6.1 LABORATORY ANALYSES

The performance of the dewatering system can be monitored using simple laboratory test procedures. Analyses of feed solids consistencies, dewatered sludge consistencies, filtrate quality, and polymer feed rates can be used for obtaining performance data.

Feed concentration is obtained by drying a known amount of sludge in a tared crucible, in an oven at approximately 212°F until all water is evaporated. Alternate methods may involve use of a moisture analyzer or microwave oven. Total solids (% TS) can be acquired in this manner.

$$\frac{\text{Weight of Dry Solids}}{\text{Weight of Sludge Sample}} \times 100 = \% \text{ TS}$$

A more accurate measurement of dewaterable solids is Susupended Solids (% SS). To obtain % SS, a known amount of sludge is filtered on a tared filter paper and dried in an oven or other appropriate device. Calculations of % SS are the same as for % TS.

Suspended solids may also be reported as parts per million (ppm) when reporting filtrate solids.

$$\frac{\text{Weight of Dry Solids}}{\text{Weight of Sludge Sample}} \times (1 \times 10^6) = \text{ppm}$$

Only suspended solids can be flocculated with polymer and dewatered using a belt filter press. The dissolved solids will remain in the liquid fraction or filtrate. Since only suspended solids may be flocculated and dewatered, only % SS are used for Solids Capture calculations.

Inorganic solids are frequently used to analyze sludge digestion and to document changes in sludge characteristics. Ash content or percent inorganic solids are determined by placing the dried solids in a furnace at 1112°F for 4 hours. After cooling, the sample is weighed.

$$\frac{\text{Weight of Ash}}{\text{Weight of Dry Solids}} \times 100 = \% \text{ Ash}$$

Given this data (% TS of feed, % SS of feed, % TS of cake, % SS of filtrate) and the operating parameters of the belt filter press gallons per minute (gpm) of feed, gpm of polymer, and polymer concentration), operating conditions and efficiency can be calculated. Specific gravity of solids and liquids is assumed to be 1.0.

CALCULATIONS

1. Throughput or Solids loading rate

$$\frac{FRS\left(\frac{gal}{min}\right) \times CFS\ (\%\ SS) \times 60\left(\frac{min}{hr}\right) \times 8.34\left(\frac{lbs}{gal}\right)}{100} = TP\left(\frac{lbs}{hour}\right)$$

FRS = Feed rate sludge
CFS = Concentration of feed sludge
.01 = converts from percent to actual throughput number
TP = Throughput

2. Flocculant (Polymer) consumption rate

$$FRF\left(\frac{gal}{min}\right) \times CF\left(\frac{lbs}{gal}\right) \times 60\left(\frac{min}{hr}\right) = FD\left(\frac{lbs}{hr}\right)$$

FRF = Feed rate flocculant
CF = Concentration of flocculant
FD = Flocculant dosage

Once the polymer Consumption rate is known, the flocculant consumption per tonne of dry solids can be calculated.

$$\frac{FD\left(\frac{lbs}{hr}\right)}{TP\left(\frac{tons}{hr}\right)} = FC\left(\frac{lbs}{ton}\right)$$

FC = Flocculant Consumption

3. Solids Capture Rate (efficiency)

A. Total Liquid Flow (TLF).

$$FRS\left(\frac{gal}{min}\right) + FRF\left(\frac{gal}{min}\right) + DW\left(\frac{gal}{min}\right) + WW\left(\frac{gal}{min}\right) = TLF\left(\frac{gal}{min}\right)$$

DW = Dilution Water
WW = Washwater

3. Solids Capture Rate continued.

B. Total Solids Loss (TSL)

$$\frac{TLF\left(\frac{gal}{min}\right) \times FS\ (\%\ SS) \times 60\left(\frac{min}{hour}\right) \times 8.34\left(\frac{lbs}{gal}\right)}{100} = TSL\left(\frac{lbs}{hour}\right)$$

C. Solids Capture Rate (efficiency)

$$\frac{TP - TSL}{TP} \times 100 = SCR\ (\%)$$

SCR = Solids Capture Rate

Frequent analysis of operating conditions will establish a baseline of operation as a reference point for optimization or improvements to the dewatering system.

6.2 Recommended Laboratory Daily Log Form

LAB DATA SHEET					
DATE					
Total Feed Solids (% T.S.)					
Suspended Feed Solids (% S.S.)					
Ash Content (% Ash)					
Cake Solids (% T.S.)					
Suspended Solids in Filtrate (% S.S.)					

6.3 OPERATOR RECORD KEEPING

Record keeping is one of the more important areas of operating a belt filter press. It enables operators to determine if they are operating the presses at their maximum efficiency in both production and cost. A daily log should be maintained to show the following:

a. Inlet consistencies
b. Slurry flow
c. Cake solids
d. Polymer type
e. Polymer feed consistency
f. Polymer flowrate
g. Polymer dilution water flowrate
h. Top belt gauge pressure
i. Top belt bellows expansion
j. Top belt pressing force
k. Bottom belt gauge pressure
l. Bottom belt bellows expansion
m. Bottom belt pressing force
n. Belt data
o. Cake thickness
p. Cake width

Please note that the items listed above are minimal recommendations; more may be added if the operators desire additional information. See Section 6 an example of an Operators Daily Log form data sheet.

The operator can determine the following from the above information.

a. Press throughput, in pounds or tons per hour.

b. Polymer consumption, in lbs/ton, used to arrive at the cost for producing each ton of cake.

The records will also serve to review past performance of the presses at various operating conditions. Other items that may be added to the records are items such as, total amount of sludge dewatered per day, total run time, lubrication records, temperature, filtrate flow, belt wash flow, capture rates, and type and life of belt used.

6.4 RECOMMENDED OPERATOR DAILY LOG FORM

DATE / DESCRIPTION													
INLET CONSISTENCY (% TS)													
SLUDGE FLOWRATE (GPM)													
CAKE SOLIDS (% T.S.)													
POLYMER TYPE (MFG)													
POLYMER FEED CONSISTENCY (% SOLUTION)													
POLYMER FLOWRATE (GPM)													
POLYMER DILUTION WATER FLOW RATE (GPM)													
TOP BELT GAUGE PRESSURE (PSIG)													
TOP BELLOWS EXPANSION (INCHES)													
TOP BELT PRESSING FORCES (PLI)													
BOTTOM BELT GAUGE PRESSURE (PSIG)													
BOTTOM BELLOWS EXPANSION (INCHES)													
BOTTOM BELT PRESSING FORCES (PLI)													
BELT SPEED (FPM)													
CAKE THICKNESS (INCHES)													
CAKE WIDTH (INCHES)													

7.0 BELT CLEANING SYSTEM

INSTALLATION OPERATION

and

MAINTENANCE INSTRUCTIONS

for

STATIONARY MANUAL BRUSH TYPE HEADERS

Spraying Systems Co.
East Coast Facility

A INSTALLATION INSTRUCTIONS

For headers with flat fan nozzles, it is important that the spray header is installed in such a way that the minimum spray height (dimension "SH" on the outline drawing) is guaranteed. This will guarantee both the proper functioning of the header and the approximate overlap of 8 to 12% of the sprays.

A rigid support should be supplied by the customer.

After connecting the water supply to the inlet, and the drain connection to the outlet, the spray header is ready for operation.

The nozzles are already located and installed in the proper position.

B START-UP

It is recommended that the pipe be filled slowly until a continuous spray pattern has been established in order to avoid any damage to the system (water hammer).

After the design pressure has been reached, the header should be flushed to ensure proper functioning and to pre-load the sealing so that no leaking occurs.

C OPERATING INSTRUCTIONS

To operate the flush-out valve, simply turn the handwheel first counter clockwise, one or two full turns to open the valve. Flush as long as cleaning cycle is necessary, and turn the handwheel clockwise to close the valve. This should be enough to clean all nozzles and the inside of the pipe.

If after one cleaning interval the spray pattern is not yet established, repeat the cleaning procedure.

Do not shut off water supply during cleaning procedure. It will ensure proper flush out as well as maintain reasonable spray pattern. For high pressure pipes it may be easier (but not necessary) to reduce the operating pressure to 40-80 psig before beginning the cleaning procedure.

For headers equipped with a Ball Valve, Reducing the pressure is optional. Simply open valve and complete the cleaning cycle as described. Close Ball Valve when cleaning cycle is complete.

F DISASSEMBLY INSTRUCTIONS

1) Ensure the header is isolated from the water supply and drained.

2) Remove the four screws and nuts from the valve housing.

3) Pull valve housing assembly away from pipe adaptor until brush coupling is visible.

4) Remove the snap ring and pin from the coupling and dis-assemble valve housing from brush assembly. Slide the snap ring onto the brush rod to facilitate later re-assembly.

5) Remove brush rod from pipe.

G ASSEMBLY INSTRUCTIONS

1) Insert the brush, with the non-coupling end first, into the header.

2) Slide the brush into the header and leave approximately 6 inches protruding.

3) Place the large "O" ring over the shaft (flange side of housing) to facilitate later assembly.

4) Slide the valve shaft into the coupling and orient the valve outlet in desired direction.

5) Insert the pin into the holes in the shaft and coupling.

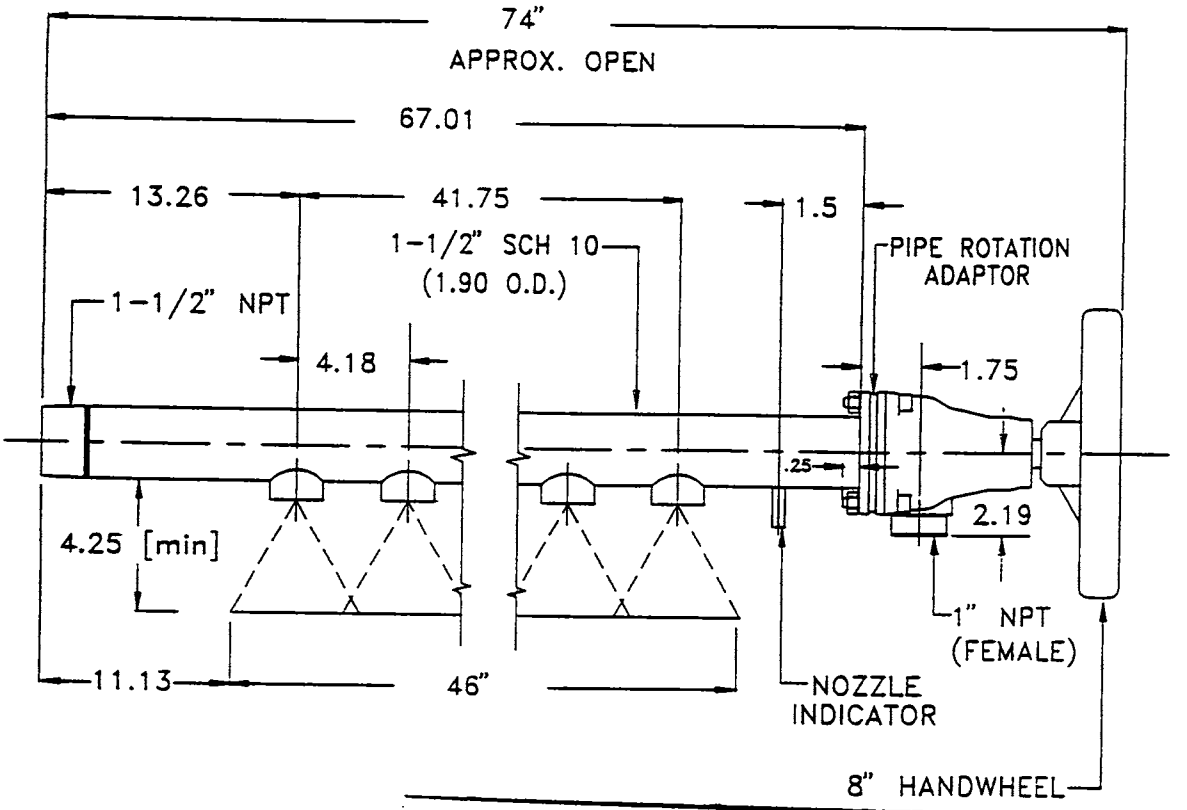
6) Place the snap ring over the ends of the pin (into the grooves).

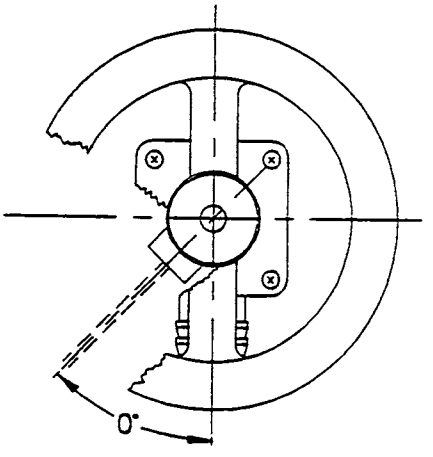
7) Slide the valve housing and square flange together making sure to properly seat the "O" ring.

8) Use 2 bolts & nuts to hold the housing and flange together.
(Tighten sufficiently to stop movement)

9) Close the valve.

10) Remove six consecutive nozzles (preferably the ones closest to the valve housing).





SIDE VIEW

(HANDWHEEL END)

CERTIFIED DRAWING

APPROVAL: David Hudson

DATE: 3-16-94

HEADER LOCATION = 1.0M GT/S8

MATERIAL = SEE QUOTE

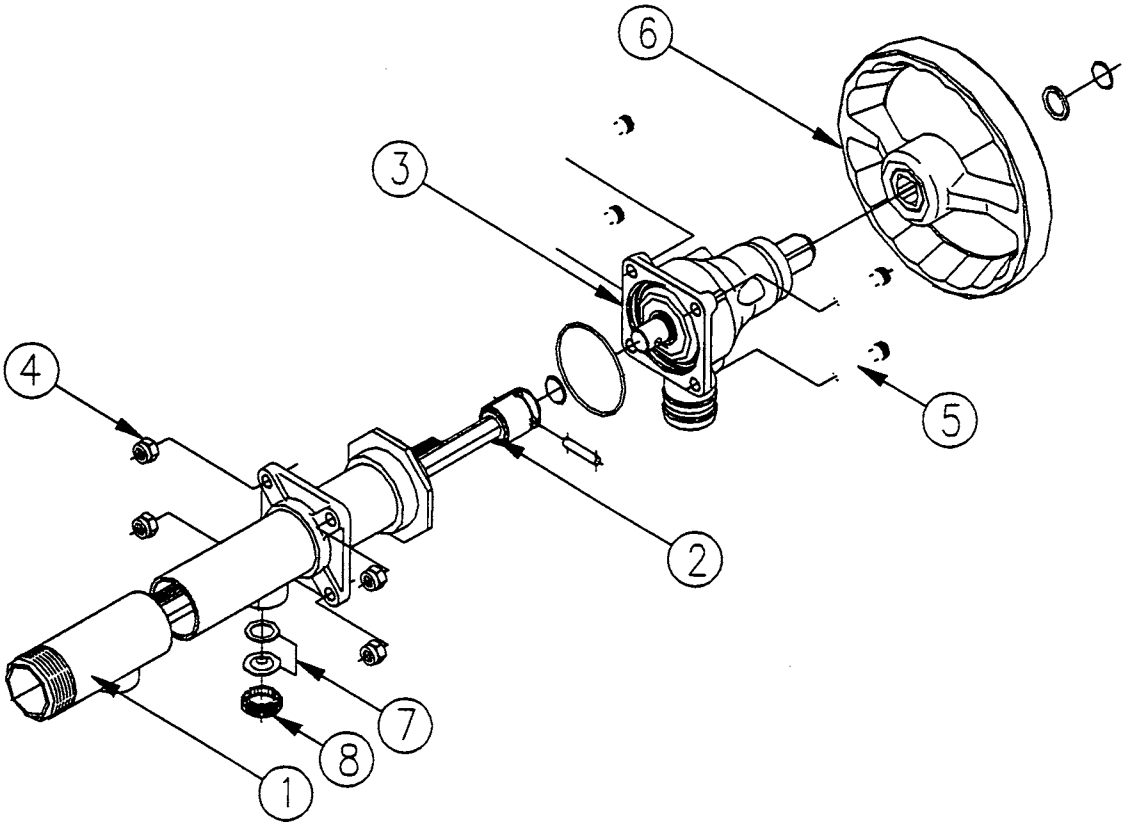
NO OF NOZZLES = 11 TYPE = FLAT FAN
ORIFICE = .099
ANGLE = 60°

OPERATION PRESSURE = 120 psig

TOTAL FLOW RATE = 23.7 gpm

CUSTOMER: ANDRITZ RUTHNER

DESCRIPTION PRODUCT OUTLINE BRUSH TYPE HEADER	RELEASED FOR PRODUCTION CUSTOMER APPROVAL: _____ DATE: _____	REF. DMM4620B-001 DMM4620B-002 DATE 07/24/91	DOCUMENT NO. P27061-27 SHEET 1 OF 1 REV. A Spraying Systems Co. East Coast Facility Hudson, NH 03051	APPR.

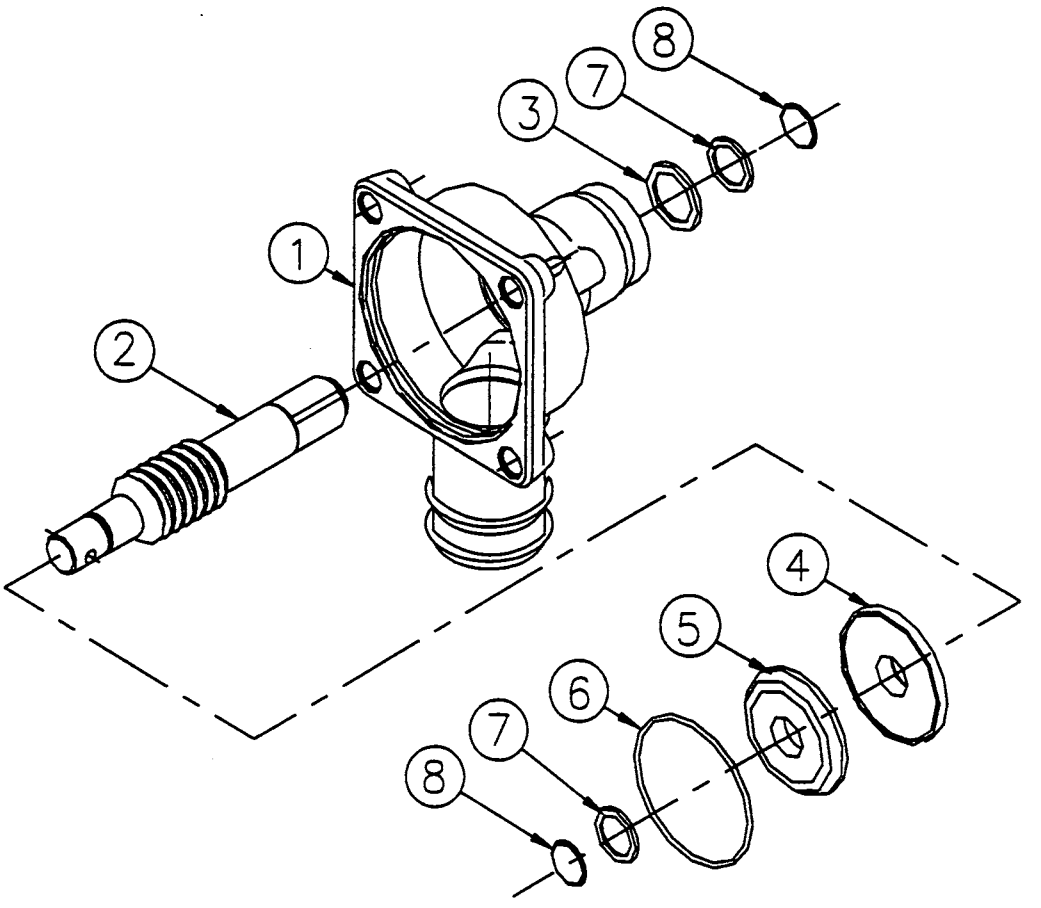


ITEM	QTY	PART NUMBER	DESCRIPTION
08	11	CP27044-01-CB	LOCKRING 316SS
07	11	27149-6012-317L	NOZZLE W/GASKET
06	1	CP27099-01-AL	HANDWHEEL ASSY ALUMINUM
05	4	CP27096-01-CB	CAP SCREW 316SS
04	4	CP27095-13-CB	SELF LOCKING NUT 316SS
03	1	CP27093-01-CB	VALVE HOUSING ASSY 316SS
02	1	27449-10-CP	BRUSH ASSEMBLY 316LSS
01	1		1-1/2" PIPE ASSEMBLY

CUSTOMER = ANDRITZ RUTHNER

DESCRIPTION	RELEASED FOR PRODUCTION	REF.	DOCUMENT NO.	APPR.
PARTS LIST BRUSH TYPE HEADER	CUSTOMER APPROVAL: _____ DATE: _____	DATE 06/02/92	L27061-27 SHEET 1 OF 1 REV. A	

Spraying Systems Co.
East Coast Facility Hudson, NH 03051



	ITEM	QTY.	MATERIAL	DESCRIPTION
*	08	2	(316SS)	RETAINING RING
*	07	2	(316SS)	WASHER
*	06	1	(VITON)	O-RING
*	05	1	(POLY-P)	VALVE SEAL
	04	1	(316SS)	BACK-UP RING
*	03	1	(POLY-U)	U-PACKING SEAL
	02	1	(316SS)	SHAFT
	01	1	(316SS)	HOUSING SUB ASSEMBLY

CP27093-01-KIT (SPARE PARTS KIT): INCLUDES ALL ITEMS MARKED WITH *

DESCRIPTION

PARTS LIST

VALVE HOUSING ASSY. FOR 1-1/2" & 2" HEADER (SIZE 1) W/VALVE SEAL & HOSE BARB OUTLET

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

REF.

DOCUMENT NO. L27093-01

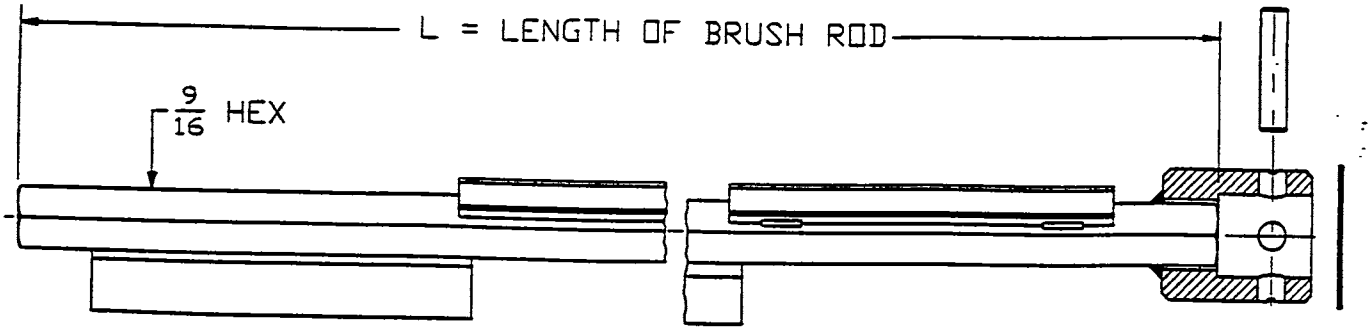
SHEET 1 OF 1

REV. H

APPR. TJW

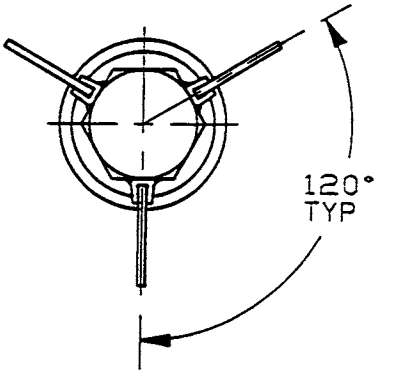
DATE 03/13/95

Spraying Systems Co.
East Coast Facility Hudson, NH 03051



VAR	L	NO. OF BRUSHES
27	163.25	27
26	157.25	26
25	151.25	25
24	145.25	24
23	139.25	23
22	133.25	22
21	127.25	21
20	121.25	20
19	115.25	19
18	109.25	18
17	103.25	17
16	97.25	16
15	91.25	15
14	85.25	14
13	79.25	13
12	73.25	12
11	67.25	11
10	61.25	10
09	55.25	09
08	49.25	08
07	43.25	07
06	37.25	06
05		05
04		04
03		03
02		02
01		01

VAR	L	NO. OF BRUSHES
45	271.25	45
44	265.25	44
43	259.25	43
42	253.25	42
41	247.25	41
40	241.25	40
39	235.25	39
38	229.25	38
37	223.25	37
36	217.25	36
35	211.25	35
34	205.25	34
33	199.25	33
32	193.25	32
31	187.25	31
30	181.25	30
29	175.25	29
28	169.25	28



SIDE VIEW

DESCRIPTION

PRODUCT OUTLINE

1-1/2" SCH.10
REPLACEMENT BRUSH

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

RELEASED FOR PRODUCTION

CUSTOMER APPROVAL: _____

DATE: _____

REF.

DATE 03/03/93

DOCUMENT NO. P27449-00

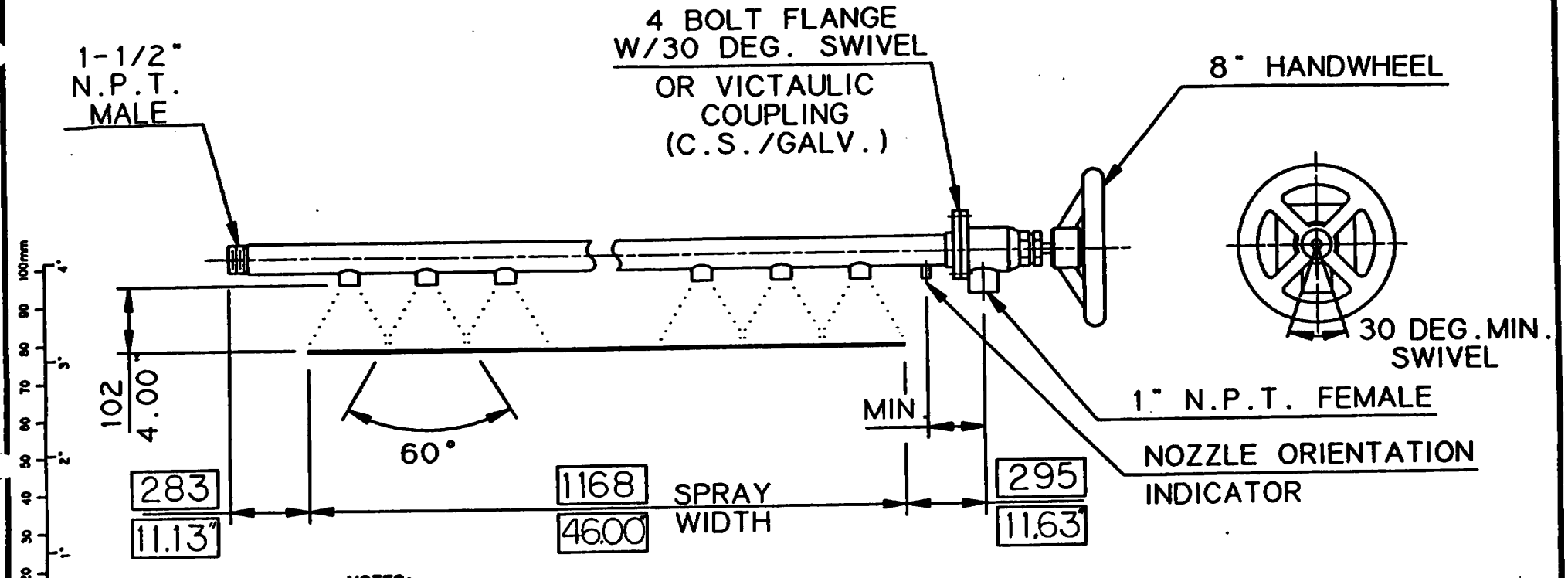
SHEET 1 OF 1

REV. B

APPR.

Spraying Systems Co.
East Coast Facility Hudson, NH 03051

ACAD



NOTES:

1. PIPE MATERIAL.....	304SS	
2. NOZZLE MATERIAL.....	316SS	
3. NO. OF NOZZLES.....	11	
TYPE.....	FLAT FAN	
SIZE ORIFICE...	2.5	.098"
ANGLE.....	60°	
4. OPERATING PRESSURE.....	120	psig
5. TOTAL FLOW RATE.....	23.7	gpm

CAD DRAWING ORIGINAL - DO NOT ALTER HARDCOPY

NO	REVISION	BY	DATE

Drawn by: SDM Date: 12-27-90
Appr by: Date: 1/10/91
THIRD ANGLE PROJECTION

ANDRITZ RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5611

CAD

Scale: N.T.S.
Group: 1.0GT/58
Code:
Replaces Dwg. No: 45718-001

Customer: -
File name: DMM4620B
P.O. No.: -
Job No.: -
Item: SHOWER PIPE
Drawing No.: DMM4620B-001
Rev.: 0

Plot Time: 12/27/90 - 4:07p

8.0 DRIVE INFORMATION

0607.00-A01-37

ANDRITZ-RUTHNER, INC.

1.0M SMX®-LP MAIN BELT DRIVE LIST

PONDEROSA FIBRES

ANDRITZ JOB # 612-690

BELT SPEED 4.7-18.7 FPM

1 ea. RIGHT HAND MACHINE

1 ea. LEFT HAND MACHINE

REDUCER:
ANDRITZ PART NUMBER - **RD-3H236RAH/C-E01**

EURODRIVE RIGHT ANGLE HELICAL BEVEL REDUCER
(SHAFT MOUNTED)
TYPE: KA96TR62LP182TC
GEAR RATIO: 236:1
OUTPUT RPM: 7.5 @ 60 Hz.
NO FEET, TORQUE ARM TO BE FURNISHED BY EURODRIVE
LP ADAPTER FOR 182TC FRAME MOTOR.
[1]* MOUNTING POSITION: H1
ONE UNIT "A" SIDE OPEN (RIGHT HAND MACHINE).
ONE UNIT "B" SIDE OPEN (LEFT HAND MACHINE)
INCH BORE 2.750",

MOTOR: (BY **CUSTOMER**)

3 HP, 460V, 3 PH., 60 HZ., 1800 RPM, 1.15 SERVICE FACTOR, TEFC, NEMA DESIGN B, CLASS F INSULATION, 40°C AMBIENT, CONTINUOUS DUTY, CORRO DUTY, PREMIUM EFFICIENCY, C-FACE, ONE UNIT ASSEMBLY F1,
ONE UNIT ASSEMBLY F2.

VARIABLE FREQUENCY DRIVE: (BY **CUSTOMER**)

3 HP, 460 VAC, 3 PHASE INPUT, CONSTANT TORQUE, CAPABLE OF SUPPLYING 150% TORQUE FOR ONE MINUTE, ENCLOSURE SUITABLE FOR

[1] * JOB SPECIFIC INFORMATION TO BE ENTERED IN PURCHASING COMMENTS.

0607.00-A01-36

ANDRITZ-RUTHNER, INC.

TANK MIXER DRIVE LIST

PONDEROSA FIBRES

ANDRITZ JOB # 612-690

SPEED 28-137 RPM

TANK MIXER DRIVE: (BY ***ANDRITZ***)

DRV-M-3H4V14-E01
EURODRIVE HELICAL-BEVEL GEAR REDUCERS
TYPE KAF66BD25DT100LS4
GEAR RATIO: 14.05
OUTPUT RPM: 28-137 RPM
MOUNTING POSITION: H5 "A" SIDE OPEN, HANDWHEEL 180, CONDUIT BOX 270.
MOTOR: 3HP, 230/460V, 3 PH., 60 HZ., 1700 RPM, 1.15 SERVICE
FACTOR,CONTINUOUS DUTY, NEMA DESIGN B, CLASS F INSULATION.

Gearmotors and Gear Reducers

OPERATING INSTRUCTIONS

01 805 02 US

GENERAL

These operating instructions are intended to help you install and operate the drive. For trouble free service, proper installation and operation are essential. Additionally, these instructions contain important recommendations on maintenance.

Before shipment every SEW-Eurodrive gear unit is thoroughly tested, checked and properly packed. However, please inspect the drive immediately upon arrival for shortage or transit damage. Note the damage or shortage on the freight bill of lading and file a claim with the carrier. Additionally, notify SEW-Eurodrive of the shortage or damage.

LUBRICANTS

All gearmotors and gear reducers are supplied with the correct grade and quantity of lubricating oil for the specified mounting position. Exceptions include reducers shipped without input assemblies. The recommended lubricants are found on page 5.

LONG TERM STORAGE

If the drive is not installed immediately, it should be stored in a dry, protected area. Add a rust preventative such as Mobil Vaprotec Concentrate 60032-0 to the standard lubricating oil. The rust preventative will need replenished at intervals as specified by its manufacturer. After removal from storage, the gear unit should be drained and filled with a proper lubricant (see Page 5).

Drives which are used for standby service should also have a rust preventative added to the lubricating oil and should be stored as a sealed gearcase.

INSTALLATION OF COMPONENTS ON DRIVE SHAFTS

Do not hammer on the shafts. Hammering can cause brinelling of the reducer's bearings shortening the bearing life. We recommend heating the components to approximately 175°F (when possible) and sliding them on the shaft. This will reduce possible damage to the reducer's bearings.

TABLE 1. Standard Shaft Tolerances

Diameter (inch)	Solid Shaft Tolerances (inch)	Hollowshaft Tolerance (inch)
1.500 and smaller	+0.0000/-0.0005	+0.0005/-0.0000
Larger than 1.500	+0.000/-0.001	+0.001/-0.000
For metric shafts consult our catalogs		

Shaft couplings should be properly aligned to prevent vibration, coupling wear, and premature failure of the shaft bearings.

To prevent the output shaft and bearings from being subjected to excessive loads, the maximum overhung load, as shown in SEW-Eurodrive catalogs, should not be exceeded. Please consult our engineering department if the load may exceed the recommended figure given or where there are combined radial and axial loads. In such cases, the exact operating conditions must be stated including speed, direction of rotation, position, magnitude and direction of the external radial and axial loads being applied.

SHAFT MOUNTED REDUCERS

SEW-Eurodrive recommends the use of a light coating of Never-Seez® (or equivalent) on the keyed output shaft. The Never-Seez® lubricant may prevent rusting and fretting corrosion between the reducer hollowshaft and the shaft of the driven machine. The lubricant will aid in shaft removal when necessary.

For additional information on shaft mounted reducers, drive shaft configuration and tolerances, ask for SEW-Eurodrive Tech Sheets K-003-01, K-003-02, K-003-03.

INSTALLATION AND OPERATION

The drive installation site should be selected to ensure:

- Ambient temperatures below 40°C (104°F).
- Unimpeded flow of air to the motor and variable speed units.
- Accessibility to the drain, level and breather plugs.
- Adequate space for removal of brakemotor fanguard for brake adjustment and maintenance.

The drive unit should be mounted on a flat, vibration damping, and torsionally rigid structure. Careful alignment is critical. Mounting to an uneven surface will cause housing distortion. The flatness tolerance of the supporting surface should not exceed:

- For gear units size 80 and smaller — 0.004 inch.
- For gear units above size 80 — 0.008 inch.

For transportation the units are supplied as sealed gearcases, i.e., in place of the breather plug, a plastic capped socket head plug is installed. The breather plug accompanies the unit in a poly bag. After final installation, install the breather plug in place of the plastic capped plug. In addition, the oil level should be checked. Remove the red painted oil level plug. The oil level is correct when the surface of the oil is level with the lowest point of that tapped hole. The exceptions are the units R30/32 and S30/31 which remain sealed in any position.

After installation, the actual mounting position should be confirmed (with the diagrams on pages 2 - 4) against the mounting position shown on the gear reducer nameplate. Additionally, the locations of the breather plug and oil level plug must agree with these diagrams for the specified mounting position. Adequate lubrication is only guaranteed if the unit is mounted in the specific nameplated mounting position and it agrees with the pictures on Pages 2 - 4.

Please refer also to the Motors and Brakemotors; VARIMOT®; or VARIGEAR® operating instructions for additional information on those units.

MAINTENANCE

Oil levels and oil quality should be checked at regular intervals, determined by usage and the environment. Grease and oil should be changed per the recommendations on page 5.

Check coupling alignment, chain or belt tension, and mounting bolt torque periodically. Keep the drive relatively free of dust and dirt.

SEW EURODRIVE

SOUTHEAST MANUFACTURING & ASSEMBLY CENTER
1295 Old Spartanburg Highway/Lyman SC 29365
(803) 439-7537 Fax: (803) 439-0566

SOUTHWEST ASSEMBLY CENTER
3950 Platinum Way/Dallas TX 75237
(214) 330-4824 Fax: (214) 330-4724

MIDWEST ASSEMBLY CENTER
2001 West Main Street/Troy OH 45373
(513) 335-0036 Fax: (513) 222-4104

EAST COAST ASSEMBLY CENTER
200 High Hill Road/Bridgeport NJ 08014
(609) 467-2277 Fax: (609) 845-3179

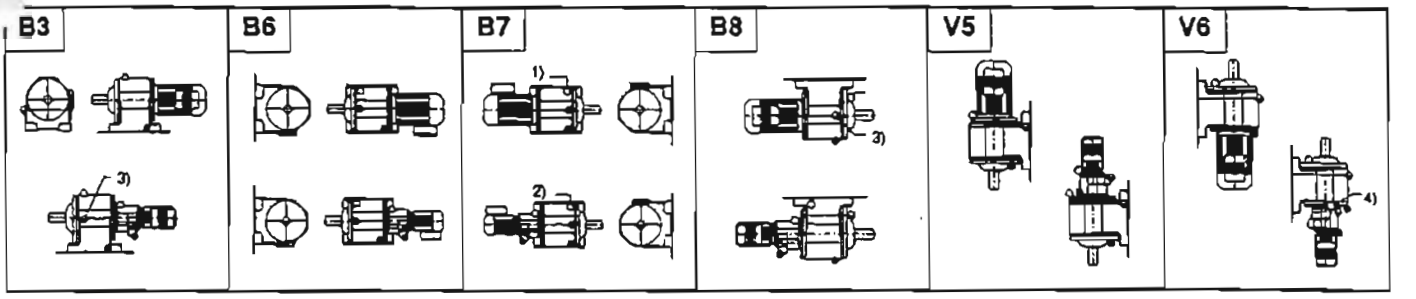
WEST COAST ASSEMBLY CENTER
30599 San Antonio Road/Hayward CA 94544
(510) 487-3560 Fax: (510) 487-6381

MOUNTING POSITIONS

For proper lubrication, be sure that the orientation of the gear reducer, as installed, matches the diagram shown for the mounting positions as specified on the gear reducer's nameplate.

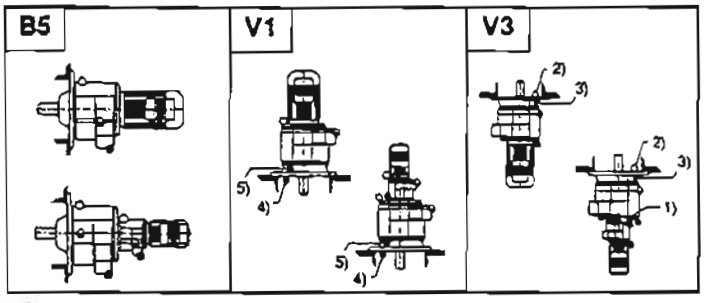
Mounting Surface
Mounting Surface of the Torque Arm
Breather Plug
Oil Level Plug
Oil Drain Plug

40 - R163, R63R42 - R163R102



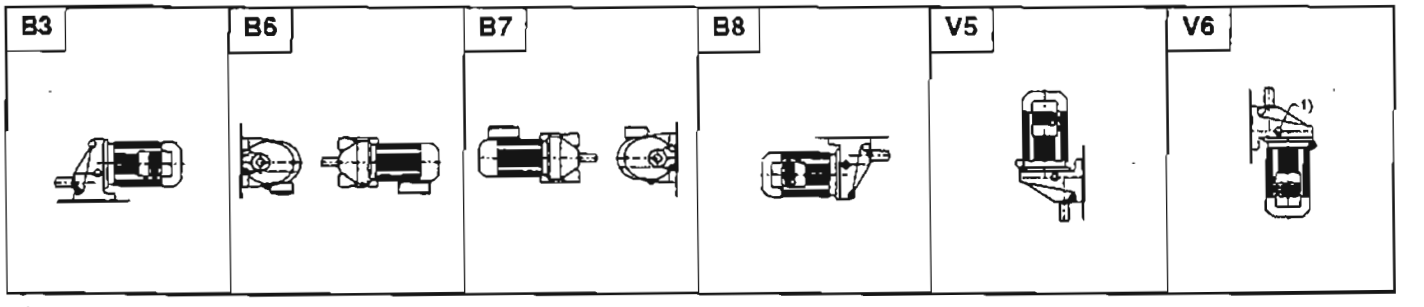
1) Breather plug provided only on R132-R163
2) Breather plug provided only on R133R72/73 - R163R102
3) Level plug on opposite side for R60, R80
4) Breather plug provided only on R62/63R42/43, R133R82

RF40 - RF163, RF63R42 - RF163R102



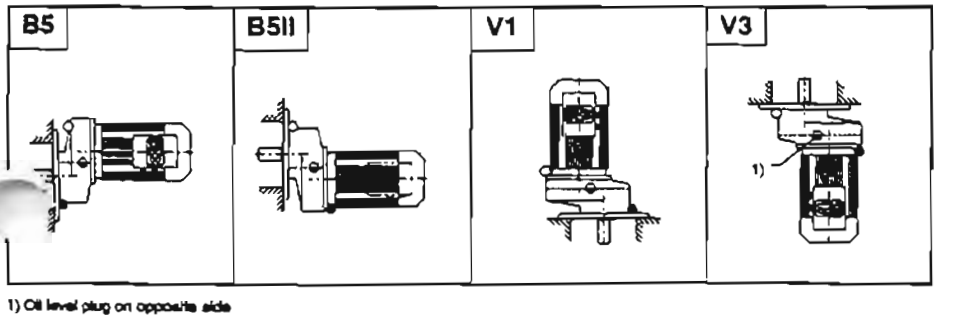
Breather plug provided only on RF62/63R42/43, RF133R82
Fig. I Flange breather plug
Fig. II Flange breather plug
4) Fig. I Flange drain plug
5) Fig. II Flange drain plug

RX61 - RX101



1) Oil level plug on opposite side

RXF61 - RXF101



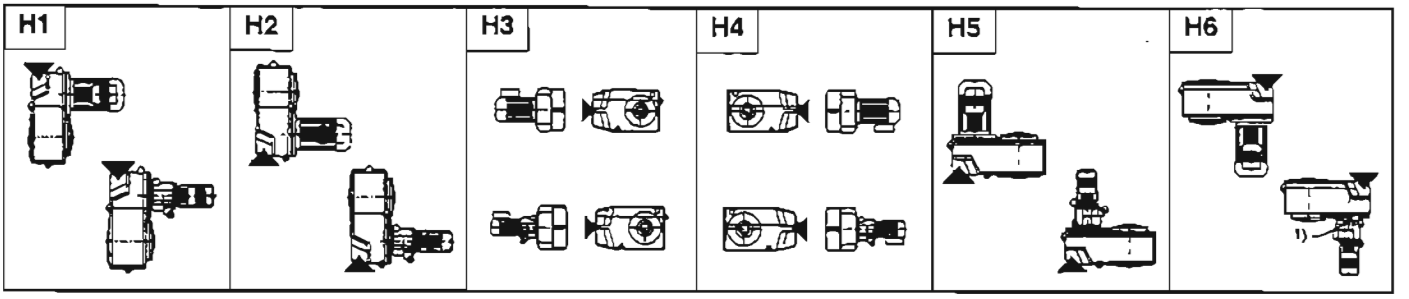
1) Oil level plug on opposite side

MOUNTING POSITIONS

For proper lubrication, be sure that the orientation of the gear reducer, as installed, matches the diagram shown for the mounting positions as specified on the gear reducer's nameplate.

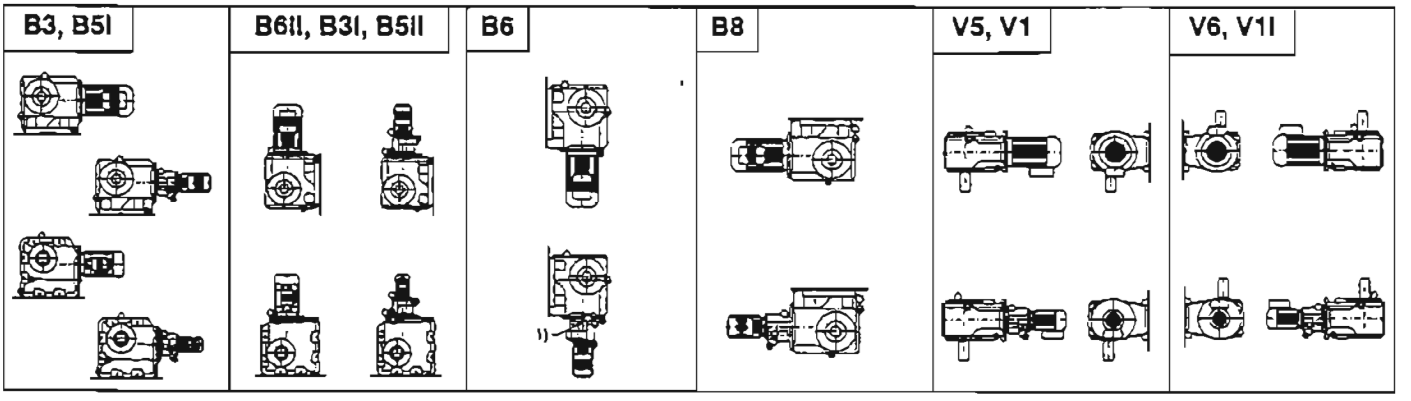
Mounting Surface
Mounting Surface of the Torque Arm
Breather Plug
Oil Level Plug
Oil Drain Plug

FA40 - FA100, FA60R42 - FA100R73, FAF40 - FAF100, FAF60R42 - FAF100R73



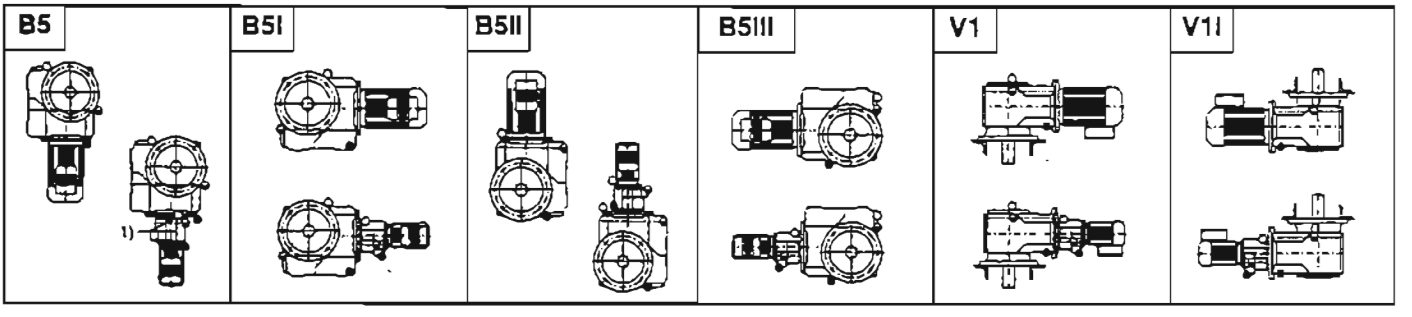
1) Breather plug provided only on FA60R42/43

K46 - 186, K66R42 - K186R102



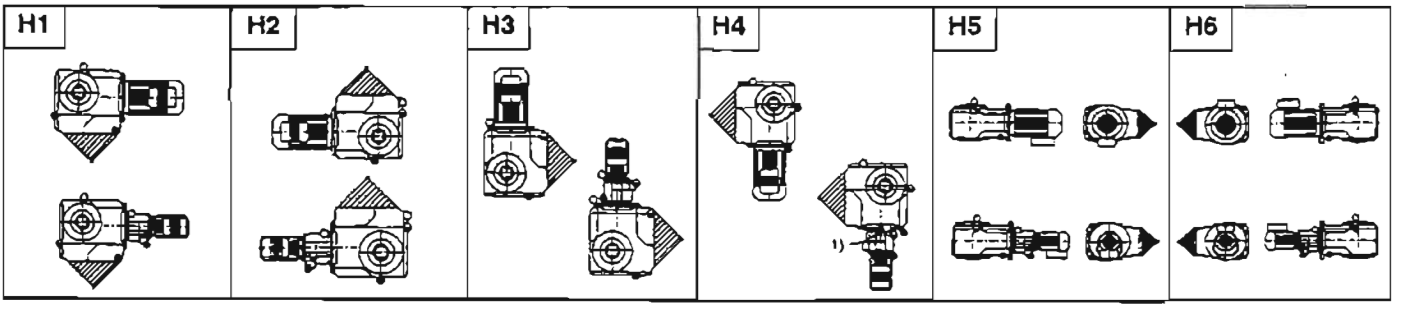
1) Breather plug provided only on KB5R42/43

KF46 - KF156, KF66R42 - KF156R102



1) Breather plug provided only on KF66R42/43

KA46 - KA156, KA66R42 - KA156R102, KAF46 - KAF156, KAF66R42 - KAF156R102



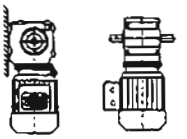
1) Breather plug provided only on KA66R42/43

MOUNTING POSITIONS

For proper lubrication, be sure that the orientation of the gear reducer, as installed, matches the diagram shown for the mounting positions as specified on the gear reducer's nameplate.

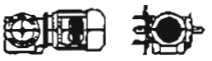
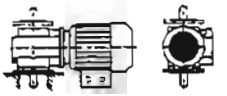
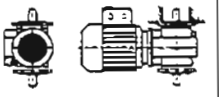
Mounting Surface
Mounting Surface of the Torque Arm
Breather Plug
Oil Level Plug
Oil Drain Plug

S32

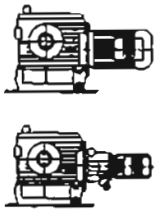
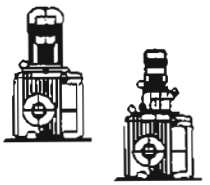
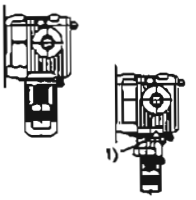
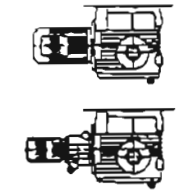
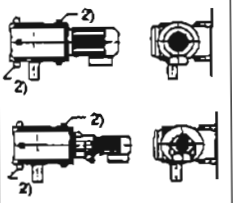
B3, B6I	B3I, B6II	B6, B8I	B8	V5, V5I
				

SF32

Note: Only SF units are shown. Location of plugs in SA/SAF units are the same as in SF

B5, H4	B5I, H1	B5II, H3	B5III, H2	V1, H5	V1I, H6
					

S42 - S92, S62R42 - S92R63

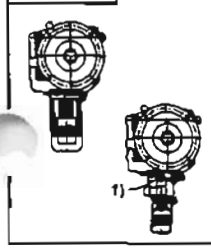
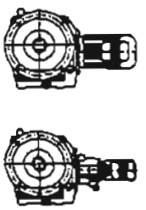
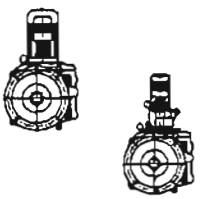
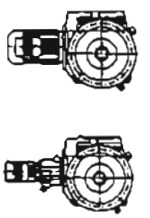
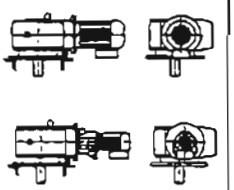
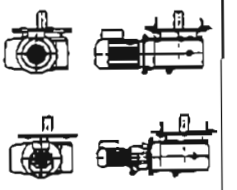
B3, B6I	B3I, B6II	B6, B8I	B8	V5, V5I
				

1) Breather plug provided only on S62R42/43

2) Breather and drain location with A side up

SF42 - SF92, SF62R42 - SF92R63

Note: Only SF units are shown. Location of plugs in SA/SAF units are the same as in SF

B5, H4	B5I, H1	B5II, H3	B5III, H2	V1, H5	V1I, H6
					

1) Breather plug provided only on SF62R42/43

LUBRICANTS

LUBRICATION SCHEDULE FOR SEW-EURODRIVE GEAR UNITS									
[1]Gear Reducer Type	Lubrication Type	Ambient air temperature range °F	kin viscosity at 40°C (cSt) approx.	GULF Oil Co.	CHEVRON Oil Co.	AMERICAN Oil Co.	MOBIL Oil Co.	SHELL Oil Co.	TEXACO Oil Co.
R40 - R163 FA K	Oil	+104 to +32	220	Gulf EP. Lubricant S100	Chevron Non-Leaded Gear Compound 220	Permagear EP220	Mobilgear 630	Shell Omala Oil 220	Meropa 220
		+77 to +5	155	Gulf EP. Lubricant S60	Chevron Non-Leaded Gear Compound 150	Permagear EP150	Mobilgear 629	Shell Omala Oil 100	Meropa 150
S32	Oil	+140 to +32	430				SHC 634 (Synthetic)		
S42 - S92	Oil	+104 to +32	680	Gulf EP. Lubricant HD 680	Chevron Non-Leaded Gear Compound 680	Permagear EP680	Mobilgear 636	Shell Omala Oil 680	Meropa 680
		+77 to +5	220	Gulf EP. Lubricant HD 220	Chevron Non-Leaded Gear Compound 220	Permagear EP 220	Mobilgear 630	Shell Omala Oil 220	Meropa 220
General	Synth. Oil	+176 to +5	Consult Factory For Use of Synthetic Oils						
	Synth. Grease	+200 to -40	Consult Factory For Use of Grease Filled Reducers						
Ball & Roller Bearings	Grease Used for normal application Temp. range—20°F to 250°F			Gulfcrown Grease EP. No.2	Chevron Dura-Lith EP2	Amolith Grease No. 2 EP	Mobilux EP2	Alvania Grease R3	Multifak EP2

1)Applies to all reducers with or without motor and input shaft.

Oil levels and oil quality should be checked at frequent intervals, depending on usage. Oil changes are required at intervals of 10,000 operating hours or every two years, whichever comes first. If a synthetic oil lubricant is used then this period can be extended to 20,000 operating hours or every four years, whichever comes first. In applications where hostile operating conditions exist, such as high humidity, corrosive environment, or large temperature changes, the lubricant should be changed at more frequent interval

The gear units R30/32 and S30/31 are supplied with a synthetic oil which is good for the life of the reducer.

Grease packed bearings should be cleaned and regreased every 10,000 hours or 20,000 hours for synthetic grease. Input (high speed) bearings should not be overgreased. They should be filled with grease not to exceed 1/3 of the bearing's free volume. For output bearings and bearings with replaceable grease shields, fill to 2/3 of their free volume.

ATTENTION

When the recommended lubricant is not available, it is permissible to use a lubricant having equivalent characteristics but we do not recommend that lubricants of different brands be mixed. Under no circumstances should synthetic lubricants be mixed with one another, or with one having a mineral base.

LUBRICANTS

Oil Capacities in (US) Gallons

Parallel Helical Gear Units "R"

Gear Unit	Mounting Position									
	B3 [1]	B5 [1]	B5II	B6 [2]	B7 [2]	B8 [2, 3]	V1	V3	V5	V6
RX/RXF61	0.21	0.11	0.18	0.11	0.13	0.18	0.16	0.13	0.24	0.13
RX/RXF71	0.42	0.21	0.37	0.26	0.26	0.42	0.32	0.24	0.53	0.26
RX/RXF81	0.66	0.34	0.66	0.42	0.42	0.71	0.58	0.40	0.82	0.48
RX/RXF101	1.6	0.92	1.6	1.1	1.0	2.0	1.2	0.95	2.3	1.1
RUF63	—	0.13	—	—	—	—	0.53	—	—	—
RUF73	—	0.32	—	—	—	—	0.98	—	—	—
RUF83	—	0.69	—	—	—	—	2.1	—	—	—
RUF92/93	—	1.1	—	—	—	—	3.4	—	—	—
RUF102/103	—	1.1	—	—	—	—	5.4	—	—	—
RUF132/133	—	2.5	—	—	—	—	8.3	—	—	—
RUF142/143	—	3.3	—	—	—	—	13	—	—	—
RUF152	—	4.2	—	—	—	—	16	—	—	—
RUF163	—	4.8	—	—	—	—	21	—	—	—
R/RF32	0.29 gallon									
R/RF40	0.08	0.08	—	0.16	0.18	0.16	0.26	0.26	0.26	0.26
R/RF42/43	0.08	0.08	—	0.16	0.16	0.16	0.26	0.24	0.29	0.24
R/RF60	0.16	0.16	—	0.42	0.40	0.29	0.53	0.50	0.53	0.55
R/RF62/63	0.16	0.13	—	0.32	0.34	0.29	0.53	0.50	0.58	0.50
R/RF70	0.34	0.32	—	0.55	0.61	0.55	0.98	0.92	0.98	0.95
R/RF72/73	0.34	0.32	—	0.55	0.61	0.55	0.98	0.92	0.98	0.95
R/RF80	0.74	0.69	—	1.2	1.3	1.1	2.1	2.0	2.1	2.0
R/RF82/83	0.74	0.69	—	1.2	1.3	1.1	2.1	2.0	2.1	2.0
R/RF92/93	1.3	1.1	—	2.0	2.2	2.0	3.4	3.3	3.6	3.4
R/RF102/103	1.8	1.6	—	3.1	3.3	3.0	5.4	5.0	5.7	5.3
R/RF132/133	2.7	2.5	—	5.0	5.3	5.0	8.3	8.5	8.6	8.7
R/RF142/143	4.0	3.3	—	7.7	8.2	7.5	13	13	14	14
R/RF152	5.2	4.2	—	12	13	11	16	16	20	21
R/RF163	5.7	4.8	—	13	14	13	21	22	23	23

1) On compound gear units having mounting position B3 or B5, the larger gear unit is to be provided with the oil filling of the B7 mounting position.
2) On compound gear units having mounting positions B6, B7, or B8 the smaller gear unit is to be provided with the oil filling of the B5 mounting position.
3) On compound gear units having mounting position B8, consult SEW Engineering for oil capacity of the larger (output) gear unit.

the SNUGGLER® Shaft Mounted Helical Gear Units "FA"

Gear Unit	Mounting Position					
	H1	H2	H3	H4	H5	H6
FA/FAF40	0.40	0.26	0.45	0.37	0.50	0.55
FA/FAF60	0.82	0.58	0.95	0.82	1.2	1.0
FA/FAF70	1.9	1.2	1.8	1.6	2.2	2.0
FA/FAF80	3.0	1.9	3.2	2.7	3.7	3.6
FA/FAF90	5.0	3.4	5.9	4.6	6.3	6.9

Right Angle Helical-Bevel Gear Units "K"

Gear Unit [1]	Mounting Position													
	B3, H1, B5I	B3I, B6II	B5	B5II	B5III	B6	B8	V1, V1I	V5	V6	H2	H3	H4	H5, H6
K46	0.16	0.53	0.32	0.48	0.37	0.32	0.40	0.34	0.40	0.40	0.37	0.48	0.32	0.34
K66	0.24	0.85	0.63	0.87	0.74	0.61	0.69	0.82	0.79	0.82	0.66	0.79	0.58	0.79
K76	0.50	1.5	1.1	1.6	1.3	1.1	1.3	1.7	1.6	1.6	1.2	1.5	1.1	1.6
K86	0.69	2.4	1.9	2.6	2.3	1.9	2.2	2.6	2.5	2.5	2.1	2.4	1.9	2.5
K96	1.4	4.9	3.8	5.2	4.3	3.7	4.2	5.3	5.2	5.2	4.1	4.9	3.7	5.2
K106	2.4	8.5	6.2	8.9	7.4	6.1	7.1	8.7	8.5	8.5	6.9	8.3	6.1	8.5
K126	3.6	14	10	14	13	11	13	15	15	15	13	14	11	15
K156	7.0	24	18	25	22	17	21	26	26	26	21	24	18	26
K/KH166	8.2	31	—	31	—	—	—	25	—	—	—	—	—	—
K/KH186	15	51	—	51	—	—	—	41	—	—	—	—	—	—

1) Gear unit size 46-156 also applies for KF, KA and KAF

Right Angle Helical-Worm Gear Units "S"

Gear Unit [1]	Mounting Position															
	B3, B6I	B3I, B6II	B5	B5I	B5II	B5III	B6, B8I	B8	V1A, V1IB	V1B, VIA	V5, V5I	H1	H2	H3	H4	H5, H6
S31	0.07	0.07	0.09	0.09	0.09	0.09	0.07	0.07	0.09	0.09	0.07	0.07	0.07	0.07	0.07	0.07
S32	0.07	0.16	0.11	0.07	0.16	0.14	0.11	0.14	0.11	0.11	0.11	0.07	0.14	0.16	0.11	0.11
S42	0.05	0.26	0.21	0.11	0.32	0.21	0.29	0.16	0.21	0.16	0.16	0.11	0.21	0.29	0.20	0.18
S52	0.08	0.40	0.26	0.12	0.45	0.32	0.42	0.29	0.29	0.21	0.24	0.12	0.29	0.40	0.26	0.24
S62	0.16	0.74	0.61	0.24	1.0	0.61	0.66	0.42	0.61	0.55	0.42	0.24	0.61	0.92	0.55	0.53
S72	0.29	1.3	1.1	0.40	2.0	1.3	1.4	0.87	1.2	1.1	0.82	0.40	1.1	1.6	0.92	0.95
S82	0.55	2.6	1.7	0.87	2.9	1.6	2.9	1.6	1.8	1.5	1.5	0.87	1.5	2.7	1.6	1.6
S92	1.0	5.2	3.3	1.5	5.9	3.6	5.4	2.9	3.1	2.8	2.8	1.5	3.3	5.4	3.1	3.2

1) Gear Unit sizes 31-92 also applies for SF, SA and SAF

Service and Repair Instructions
Right-Angle Helical Bevel Reducers

Type K/KF/KA/KAF 66-126

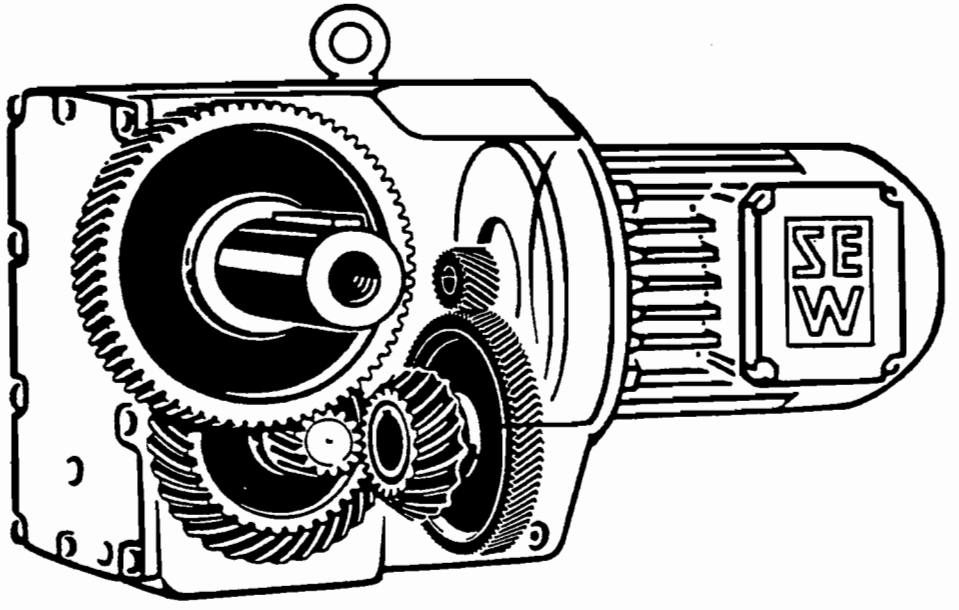


Table of Contents

SEW EURODRIVE

K-004-01
March 1989
Supercedes: Jan. 1989

Notes

Introduction

SEW-Eurodrive Helical-Bevel Gear Units are part of the SEW-Eurodrive Modular System and can be combined with other SEW-Eurodrive helical gear units, mechanical variable speed units, AC motors, or with an input shaft assembly. The helical-bevel gearmotor and gear units can be supplied with foot or flange mounting in single or double output shaft configuration or with the hollowshaft design for shaft mounting.

The SEW-Eurodrive Helical-Bevel Gear Units can be repaired by the average maintenance department equipped with the normal lifting, pressing and pulling equipment, and hand tools. Before proceeding with the repair, one should consider whether to repair or replace with a new drive. Small drives are often more economically replaced than repaired.

Under no circumstances should repairs be made to the helical-bevel gear units still under warranty without authorization from SEW-Eurodrive.

Workmanship and Safety

The SEW-Eurodrive gear unit is a precision device and must be treated as such during repair. The work area should be kept clean and free of clutter. Good safety practices for lifting and removing parts must be followed. As parts are removed they should be placed where they will not be lost or damaged. Parts should only be washed in clean solvent. Exercise extreme caution when using any type of solvent and follow the manufacturers guidelines for use and handling exactly.

Gear teeth, keyways, edges on gearcase parts, etc. can be very sharp and capable of inflicting serious cuts. Suitable protective clothing and proper eye and face protection should be worn when working on any SEW-Eurodrive equipment.

Replacement Parts

Generally SEW-Eurodrive does not recommend the stocking of renewal parts for the gear units. Many parts, such as bearings and seals, recommended as spare parts by many manufacturers have a limited shelf life unless maintained in a closely controlled environment. Often through sound preventative maintenance programs, problems can be detected early and repairs can be planned with factory "fresh" renewal parts.

SEW-Eurodrive has developed exacting specifications and tests on all parts used in the gear units to ensure proper and safe performance. Only original equipment parts should be used in the repair of the gear unit.

To assure continued safe operation of your helical-bevel gear reducer, all internal keys and dowels should be purchased only from SEW-Eurodrive. Bearings and shaft seals are marked with the manufacturer's type and name and should be replaced only with identical parts or exact equivalents. If it is necessary to replace threaded fasteners they must be replaced with the same grade.

Replacement parts are available through your nearest SEW-Eurodrive distributor or from the nearest SEW-Eurodrive facility listed on the back cover. To ensure continued safe operation of the SEW-Eurodrive gear unit never attempt to rework or duplicate parts at a local machine shop or substitute parts different from factory original.

To assist SEW-Eurodrive in supplying the exact parts you need, when placing an order please provide the following:

1. Nameplate model number and S.O. number.
2. Description and part number of the parts being ordered along with the item number on the Parts Lists.

When selecting the necessary parts for repair, please bear in mind:

1. When completely disassembling the gear unit, the oil seals, bearing closing caps, and gaskets will be destroyed and these parts must be replaced with new parts.
2. If a gear has failed, the mating gear may also be damaged and should be closely inspected or replaced. It is generally a good practice to always replace the keys securing the gears to the shaft with new parts.
3. Should a bearing or gear fail, abrasive steel particles may have been thrown throughout the gearcase. The gearcase must be thoroughly cleaned out and all bearings, gears, shafts, and gear housing should be closely inspected before ordering replacement parts to be sure all parts needed are ordered.

Tools and Equipment

Tools, equipment, and material needed to repair the SEW-Eurodrive helical-bevel gear unit will depend on the unit size and type and the nature of the repair, but may include:

1. Metric wrenches and sockets
2. Torque wrenches
3. Metric socket head wrenches
4. Punches and cold chisels
5. Snapring pliers
6. Hand and hydraulic presses
7. Lifting equipment
8. Pry bars
9. Soft and hard faced hammers
10. Wood or plastic blocks or wedges
11. Depth gauges, indicators, and feeler gauges
12. Sealants
13. Proper lubricants

General Repair Procedures

Bearings

Bearings must be removed and installed on shafts by pressing only on the inner race or in bearing bores by pressing only on the outer race with a pressing tool of the proper size. Do not hammer on any bearing during installation or removal. To facilitate installation, the inner and outer races of taper roller bearings can be heated to 80°C to 100°C.

Bearings used within the helical-bevel gear units may be either grease or oil lubricated depending upon the mounting position. Bearings that employ shields and/or external nilos rings are grease lubricated and must be packed with grease during assembly.

Input grease lubricated bearings should have only 1/3 of their free volume filled with grease in order to avoid overheating the bearing. For output bearings and bearings with replaceable grease shields fill to 2/3 of the free volume.

If reusing a grease lubricated bearing, thoroughly clean the old grease from the bearing with an appropriate solvent prior to repacking. Only use a solvent made especially for cleaning grease from bearings. Gasoline is not a suitable solvent.

When installing nilos rings or bearings with shields they must be in the same position as when removed from the gear unit.

Oil Seals

Shaft oil seals are easily damaged by dirt, exposure to solvents, and rough handling. The steel cases are easily bent. Seals should be kept wrapped and away from the immediate work area until they are to be installed. Never reuse an oil seal.

Shaft extensions with keyways should be taped and care should be taken when installing seals over shaft shoulders without chamfers to avoid damaging the seal lip during installation. Seals should be installed with sleeve-type press fitting tools and an arbor press to assure smooth uniform installation pressure. Seals must be installed square to the shaft. Prelubricating the seal lip and seal bore with the same oil that will be used in the gearcase aid in the installation of the seal.

A thin coat of anaerobic joint sealant on the seal outside diameter, especially those with an exposed steel casing, will help assure a leak-free installation.

Gears

Removing and installing gears requires the proper tools to prevent damage. Screw type gear pullers should be used with care to avoid damaging the gear teeth. On the larger gear units hydraulic presses are required to change the output gear. To aid the installation of gears, heat the gears to 120°C to 140°C and drop them into place on the shafts.

Flanges and Tenons

After disassembly, clean all mating flanges and tenons of sealant and/or gasket material. Inspect the mating surfaces for any damage resulting from the disassembly procedure. File smooth any nicks or raised areas. Failure to properly prepare mating surfaces may result in oil leakage in the repaired unit.

Sealants

SEW-Eurodrive uses various anaerobic sealants and gasket sealants in the assembly of the helical-bevel gear unit.

The output covers and flanges must be sealed with Loctite™ 574, a liquid anaerobic sealant. All other mating flanges and tenons can be sealed with any good quality anaerobic sealant or RTV silicone sealant that is designed for high temperature automotive engine use and is impervious to the gear oil. A gasket sealant should be used with all gaskets to assure leak-free operation after repair.

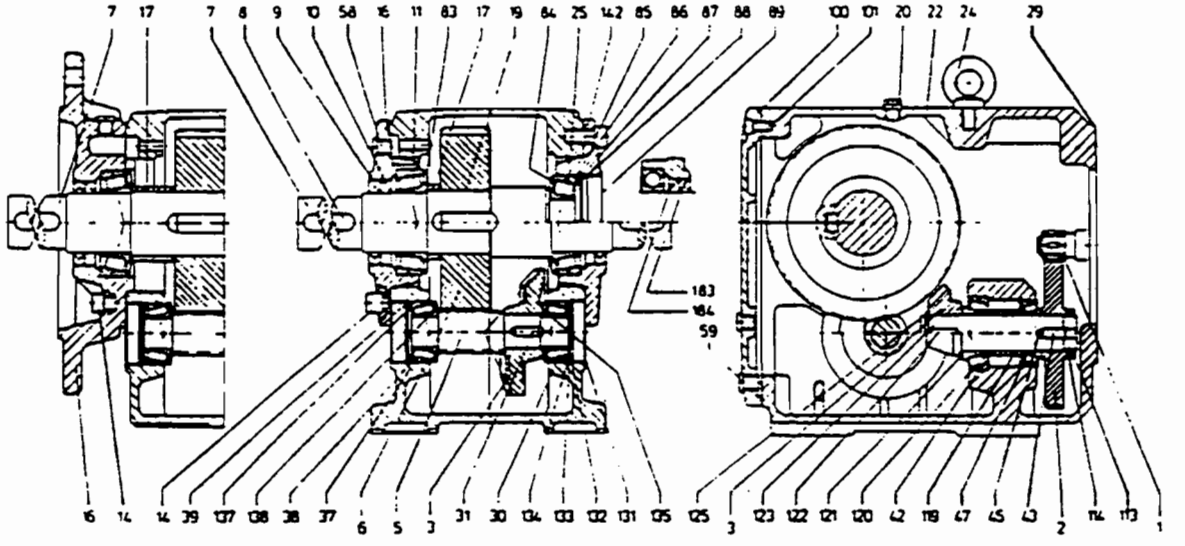
Follow the sealant manufacturer's guidelines for application and cure time. All surfaces to be sealed must be clean and free of oil and grease. Use the sealant sparingly. Normally an 1/8 inch continuous bead is sufficient to seal the mating surfaces. Apply the sealant to the machined surface of the gear housing between the bolt holes and the inside (oil side) edge of the housing. Any through tapped holes in the machined surface must have the top threads of the tapped hole coated with a suitable thread sealant. For easy disassembly later be sure to use only a thread sealant on the tapped holes and not a thread locking adhesive/sealant.

Preparation for Repair

Remove the helical-bevel gear unit from the driven equipment. Remove any sprockets, belt sheaves, couplings, and keys from the input or output shaft extensions. Clean the outside of the drive thoroughly before moving it into the work area.

Drain the oil from the gearcase and discard the oil appropriately. Do not reuse the oil. If the drive is still warm, use extreme care when draining the oil as hot oil can cause severe burns.

Before disassembly inspect the input and output shafts for nicks or damage caused by set screws, clamps, etc. Smooth the shaft extensions with a fine toothed file as necessary. It is generally a good idea to completely wrap the shaft extensions with one or two layers of plastic electrical tape to protect the shafts as well as the hands.



Typical Parts Breakdown View for K/KF66-126 (K/KF96 shown)
See appropriate Parts List for your specific gear unit.

Disassembly

Input Device

The helical-bevel gear unit may have a motor, input cover assembly, C-Face adapter, mechanical VSD, etc. as the input to the gearcase. All input devices are removed and replaced by the same procedures.

When working with the input device take care not to damage the attached pinion. Pull the input device straight out until the tenon is disengaged and then swing the input device to bring the gears out of mesh.

1. Support the input device so that it will not fall when it is removed. Use of slings is recommended.

2. Remove the bolts and/or nuts securing the input device to the gearcase.
3. Place a sharp cold chisel on one side of the gearcase where the input device flange mates with the gearcase and strike the chisel sharply with a heavy hammer to break the seal. As soon as one side separates, move to the other side of the gearcase and use the chisel and hammer to separate that side.
4. Use slender pry bars to complete the separation of the input device from the gearcase.

Output shaft and gear

5. Remove end cover #100 by removing the socket head screws #101. It will be necessary to use a sharp cold chisel and a heavy hammer to break the seal between the end cover and the gearcase.
6. Remove the output flanges and/or sealing flanges #16 and #85 by removing the socket head screws items #14 and #142 respectively. It may be necessary to use a sharp cold chisel and a heavy hammer to break the seal between the gearcase housing and the output flanges and/or sealing flanges.
   On K/KF126 it will be necessary to remove closing flange #97 by removing the socket head screws #96.
7. Turn the gearcase on its side so that the bevel gear #3 is on the bottom side.
8. Support the output gear #6 with blocks between the gearcase and the output gear so that as the output shaft is pressed out the output gear does not move.
9. Place the gearcase in a press and press the output shaft out of the gearcase while supporting the output shaft so that it does not fall.
10. After the output shaft has been pressed out, the output gear can be removed from the gearcase.
11. Remove and discard the oil seals #9 (#10) and #183 (#184) from the flanges. Also at this time remove any snaprings #88, thrust washer #87, shims #86, nilos rings #83 and #84, and closing caps #89 from the flanges as required by the nature of the repair.
12. Remove bearings #11 and #25 from the output shaft #7 and/or from the flanges #16 and #85 as the case may be.

Bevel gear and shaft

13. Remove both closing caps #131 by placing a sharp chisel or punch near the center of the closing cap and striking the chisel sharply to puncture the closing cap and pry out.
14. Remove snaprings #39 and #132, shims #38 and #134, and thrust washers #133 and #137.
15. Turn the gearcase on its side so that the bevel gear #3 is on the top side.
16. Support the bevel gear with blocks between the gearcase and the bevel gear so that as the pinion shaft #5 is pressed out the bevel gear does not move.
17. Place the gearcase in a press and press the pinion shaft #5 out of the gearcase while supporting the shaft so that it does not fall.
18. Remove bearings #30 and #37, and nilos rings #135 and #138 from the gearcase housing and/or pinion shaft #5 as required.

Bevel pinion and shaft

19. Remove snapring #115 and shims #116 or lock nut #113 and locking washer #114.
20. Stand the gearcase on its end with gear #2 on top. Support the gear #2 with blocks between the gearcase and the gear so that as the bevel pinion shaft #3(#123) is pressed out the gear #2 does not move.
21. Place the gear case in a press and press the bevel pinion shaft #3(#123) out of the gearcase while supporting the shaft so that it does not fall. Inner race and rollers of bearing #42 and spacer #119 will come out with the bevel pinion shaft #3(#123).
22. Remove gear #2, roller bearing, #45, snapring #47, spacer #117 (if present), and outer race of bearing #42.
23. Bevel pinion shaft:

    2 piece

    Remove snapring #125 and press pinion shaft out of bevel pinon. Remove spacer #119, inner race of roller bearing #42, and shims #120 and #121 from bevel pinion shaft.

    1 piece

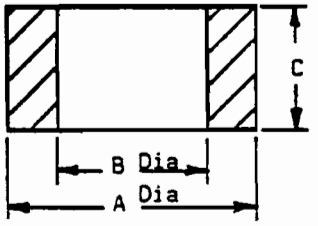
    Remove spacer #119, inner race of bearing #42, and shims #120 and #121 from bevel pinion shaft (Bevel pinion and shaft are one piece).

Assembly

1. Oil all bearing bores before installing bearings.
2. Bevel pinion and bevel gear are matched and, if required, must be replaced as a set.

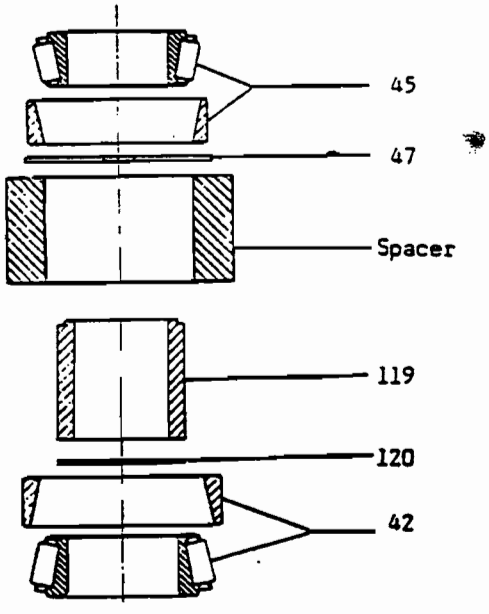
Bevel pinion and shaft

2. Determine the shimming required for bearings #42 and #45.
   a) Make a spacer to the appropriate dimensions.

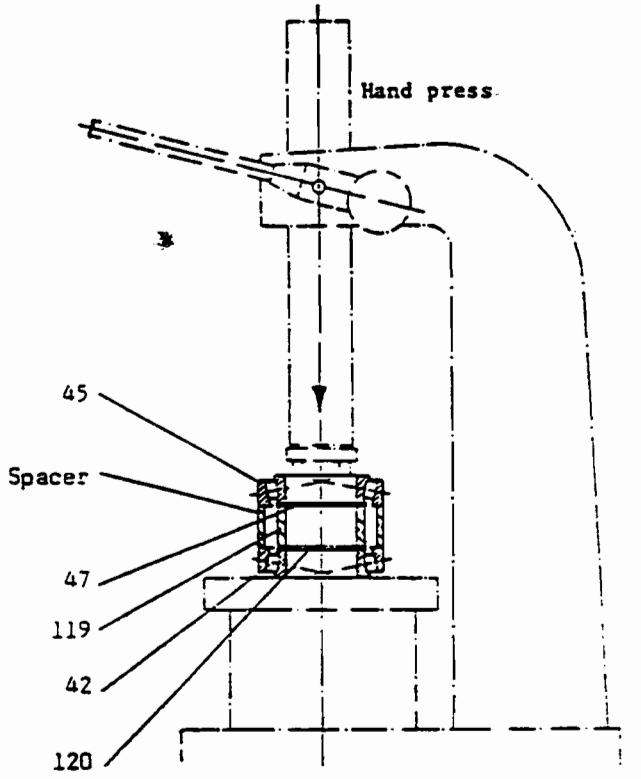


Gearcase Size	Dimensions in millimeters		
	A	B	C +.005
66	56	38	23.010
76	70	50	26.310
86	90	66	38.510
96	95	72	46.310
106	130	100	44.800
126	160	125	53.510

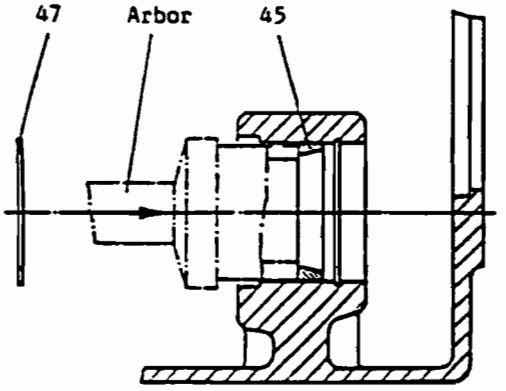
b) As shown, stack the bearing #42, spacer #119, shims #120, snapring #47, spacer made in a), and bearing #45 in a hand press. Initially use 0.5mm shims #120 for K66-K106 and 0.7mm shims #120 for K126.



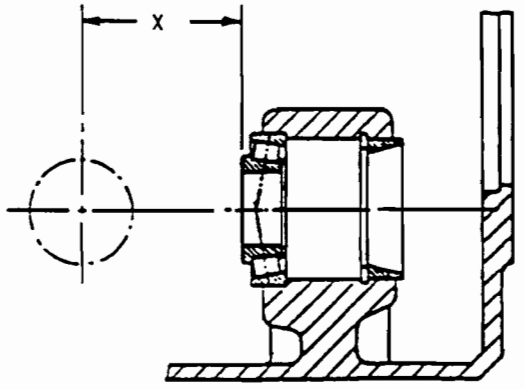
c) With the hand press apply slight pressure to the stack while rotating the bearings. Shims #120 are either added or removed until the spacer #119 and the one made in a) are well secured between the two bearings and the bearings rotate with ease.



3. Press outer race of bearing #45 into bearing bore.



4. Install snapring #47 and push outer race of bearing #45 against the snapring.
5. Press outer race of bearing #42 into place.
6. Determine the shimming required for bevel pinion #3.
   a) Place inner race of bearing #42 into position and secure in place by means of an appropriate clamp.



   b) Measure the distance X in millimeters from the face of the inner race of bearing #42 to the centerline of the cross bore for shaft #5.

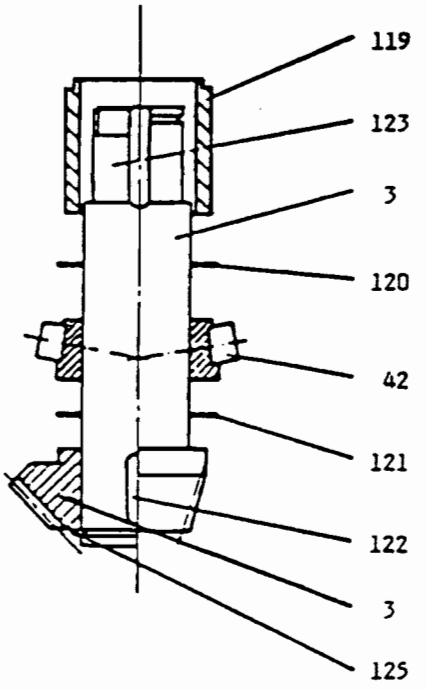
   The difference between the value X and the dimension inscribed on the bevel pinion #3 is compensated for by means of shims #121. (X must always be greater than the value shown on the bevel pinion or assembly will not be possible).

7. Bevel pinion

   a. 2 piece

   Install snapring #125, and key #122 onto shaft #123. Press on bevel pinion #3, install shims #121 as determined in step 6, press on inner race of bearing #42, install shims #120 as determined in step 2, and install spacer #119 onto shaft #123.

   If spacer #119 has relief it must be toward bearing #45.

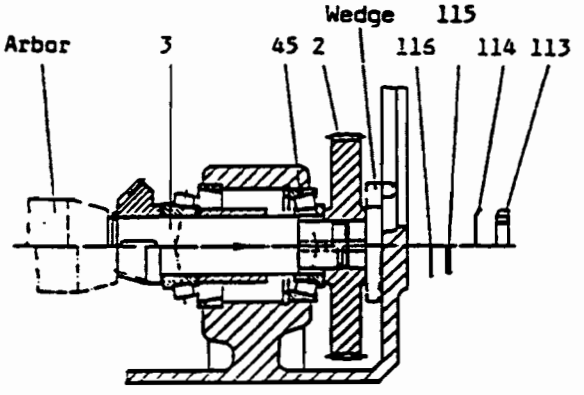


   b. 1 piece

   Install shims #121 as determined in step 6, press on inner race of bearing #42, install shims #120 as determined in step 2, and install spacer #119 onto shaft #3.

8. Place preheated inner race of bearing #45 in its outer race.
9. Install key #43 in gear #2.

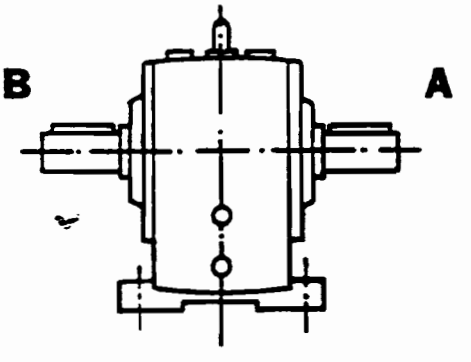
10. Place preheated gear #2 (and spacer #117 on K/KF/KA/KAF 126 only) in position and trap with a wooden or plastic wedge. Slide bevel pinion assembly into bearing bore and press completely together.



11. After bearing races and gears are completely cooled down:
    a) K66-86 - Install shims #116 to eliminate any free float and install snapring #115.
    b) K96-126 - With gear #2 blocked so that it does not rotate, install locking washer #114 and lock nut #113 and tighten securely. Secure nut in position by bending over a tang on locking washer.

Bevel Gear and Shaft

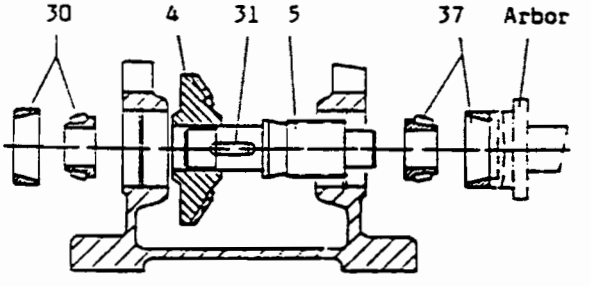
12. From the gear reducer nameplate, determine the mounting position. The mounting position designation consists of a series of letters and numbers with the suffix letters A and B to indicate output shaft and/or flange position. When looking at the helical-bevel reducer from the end opposite the input side, the right hand side is A and the left hand side is B.



In the standard assemblies the bevel gear is always on the opposite side of the gear reducer from the output shaft and/or flange position.

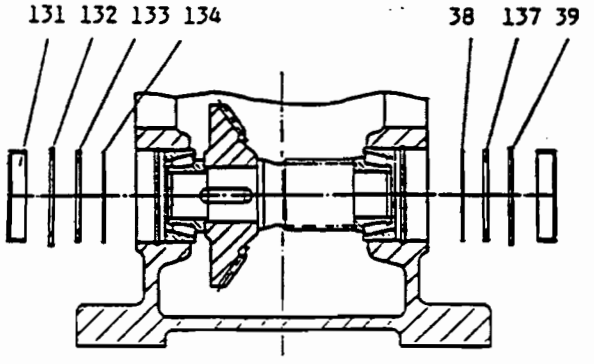
Gearcase	Output Shaft At	Flange At	Bevel Gear At
K, KF	A	A	B
K, KF	B	B	A
K double extended shaft	A&B	-	B
KFF	A&B	A&B	B
KA	-	-	B
KAF	-	A	B
KAF	-	B	A

13. Install key #31 in keyway on pinion shaft #5.
14. Place the preheated bevel gear inside the housing on A-side or B-side as determined in step 12. Then slide pinion shaft #5 into bevel gear.
    NOTE: Bevel pinion and bevel gear are matched and, if required, must be replaced as a set.
15. For mounting positions V5, H5, and V1 install nilos ring #135 on pinion shaft #5.
16. For mounting positions V6, V1I, and H6 install nilos ring #138 on pinion shaft #5.
17. Slide the preheated inner races of bearings #30 and #37 onto the pinion shaft #5.



18. Press the outer races of bearings #30 and #37 into the housing.

19. After the bevel gear and bearings are completely cooled down set the circumferential backlash (tooth clearance) of the bevel gear set to the appropriate value. Install shims #38 and #134, thrust washers #133 and #137, and snaprings #39 and #132 on both sides in such a way to achieve the prescribed backlash. With proper backlash setting, sufficient shims are installed so that the snaprings can only be installed with difficulty.



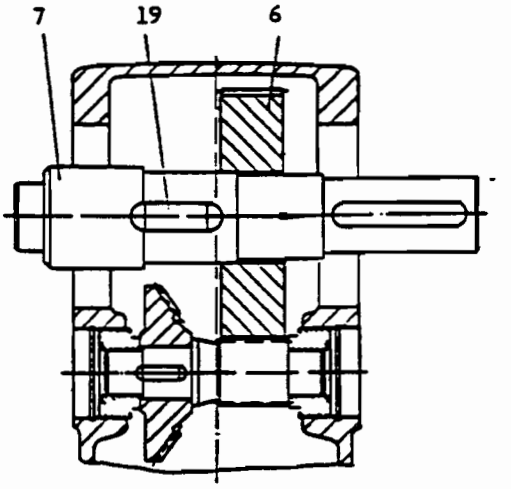
Gearcase Size	Circumferential Backlash (tooth clearance) (mm)
66	0.08-0.11
76	0.08-0.11
86	0.10-0.13
96	0.10-0.13
106	0.12-0.14
126	0.14-0.17

20. Install closing caps #131.

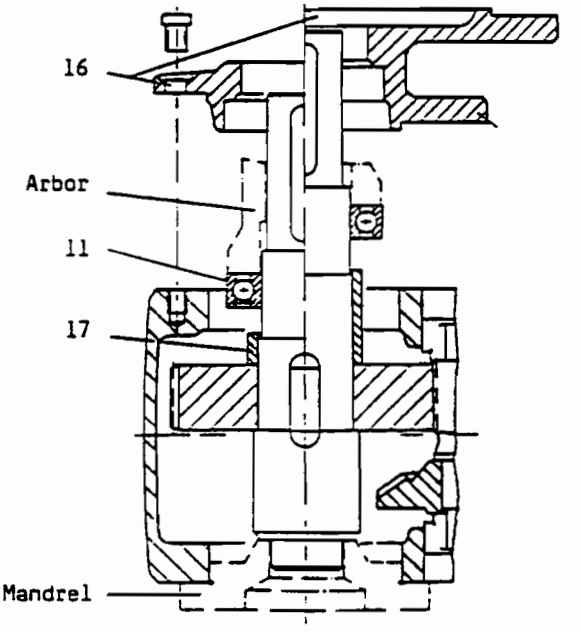
K/KF66 and 76

Output gear and shaft

21. Jam the bevel gear with a wooden or plastic wedge to prevent rotation.
22. Install key #19 in keyway on output shaft #7.
23. Place preheated gear #6 into position inside the housing and slide shaft #7 into gear #6.

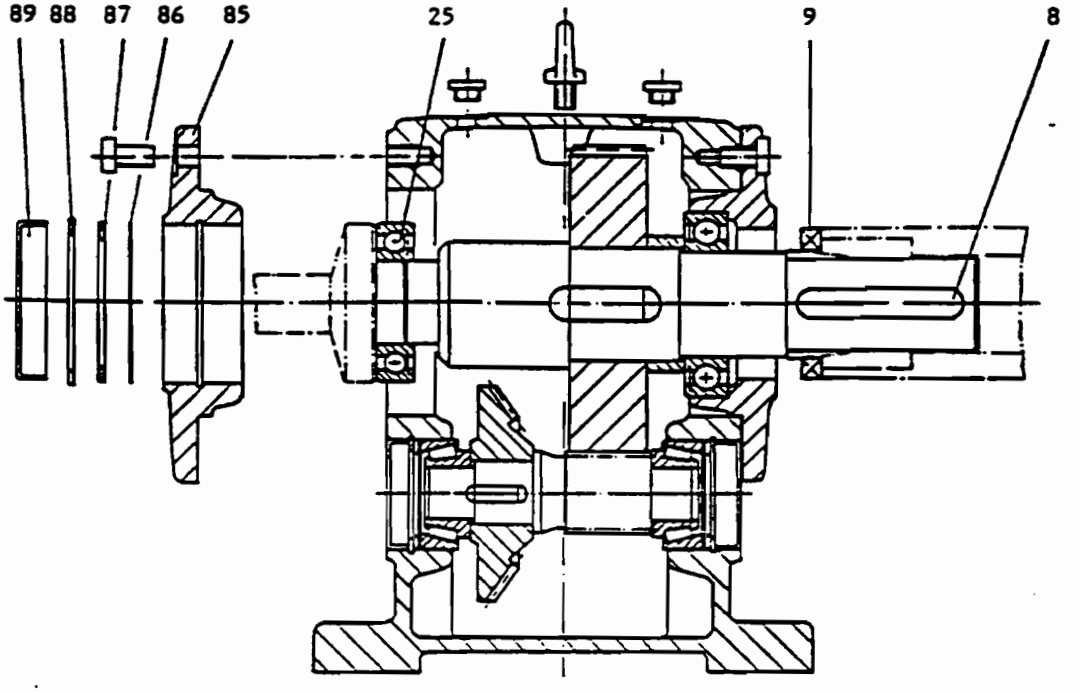


24. Rotate the housing on its side and support the shaft #7 as shown.



25. Install spacer #17.
26. Press on bearing #11. Be sure to prelubricate the bearing before installation.
27. Install sealing flange or output flange #16 and secure with the socket head screws #14. (Provide surface sealing).

28. Turn housing upright. Press on bearing #25. Be sure to prelubricate the bearing before installation.



For single shaft extension

29. Install sealing flange #85 and secure with the socket head screws #142. (Provide surface sealing).
30. Install shims #86 to eliminate any free float, thrust washer #87, and snapring #88.
31. Install closing cap #89.
32. Install oil seals #9 (#10) in the sealing flange or output flange #16.

For double shaft extension

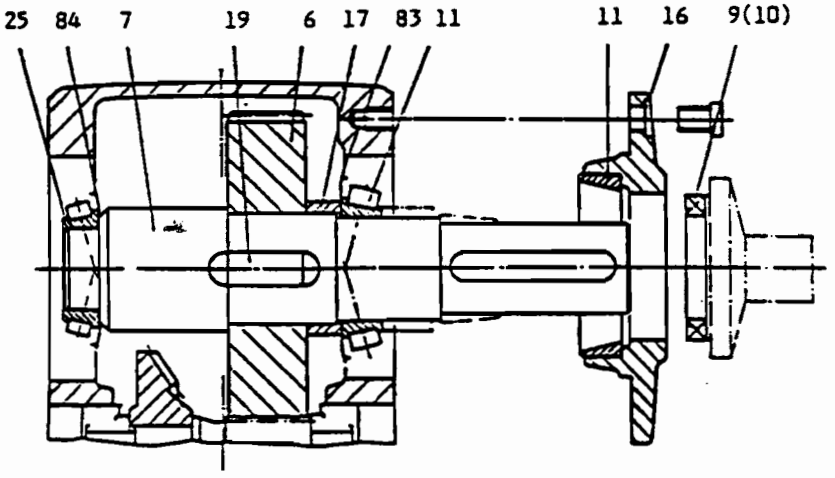
29. Determine the required number of shims #86.
    a) Measure the distance from the housing sealing surface to the face of the bearing #25.
    b) Measure the distance from the flange sealing surface to its bearing locating shoulder.
    c) The difference between the distances in a) and b) is the amount of shims #86 required.
30. With the appropriate number of shims #86, install the sealing flange or output flange #85 and secure with socket head screws #142. (Provide surface sealing).
31. Install oil seals #9 (#10) and #183 (#184) in the sealing flanges or output flanges #16 and #85.

K/KF 86-126

Output gear and shaft

21. Jam the bevel gear with a wooden or plastic wedge to prevent rotation.
22. Install key #19 in keyway on output shaft #7.
23. Place preheated gear #6 into position inside the housing and slide shaft #7 into gear #6.

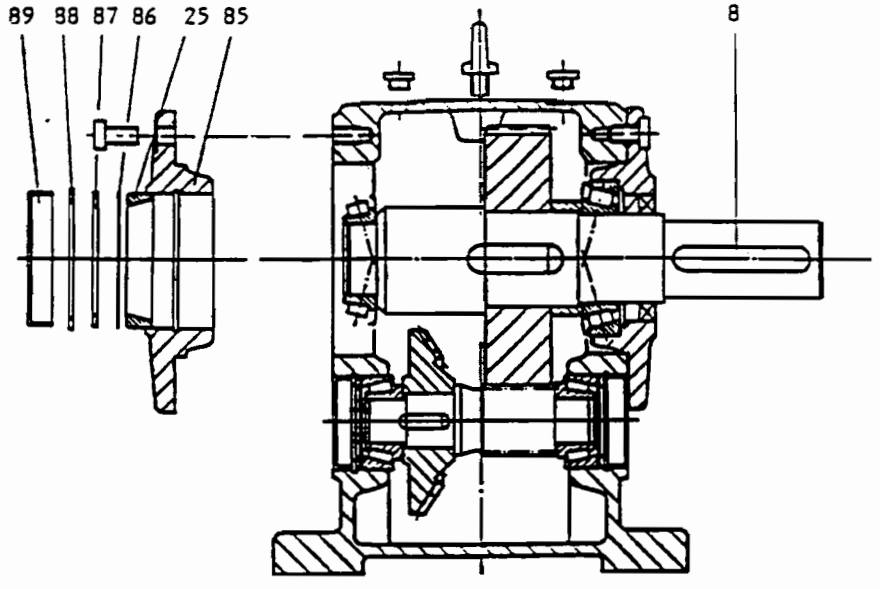
24. Install spacer #17, nilos rings #83 and #84, and preheated inner races of bearings #11 and #25 onto output shaft #7.



25. Press outer race of bearing #11 into sealing flange or output flange #16.
26. Install sealing flange or output flange #16 and secure with socket head screw #14. (Provide surface sealing and lubricate bearing).

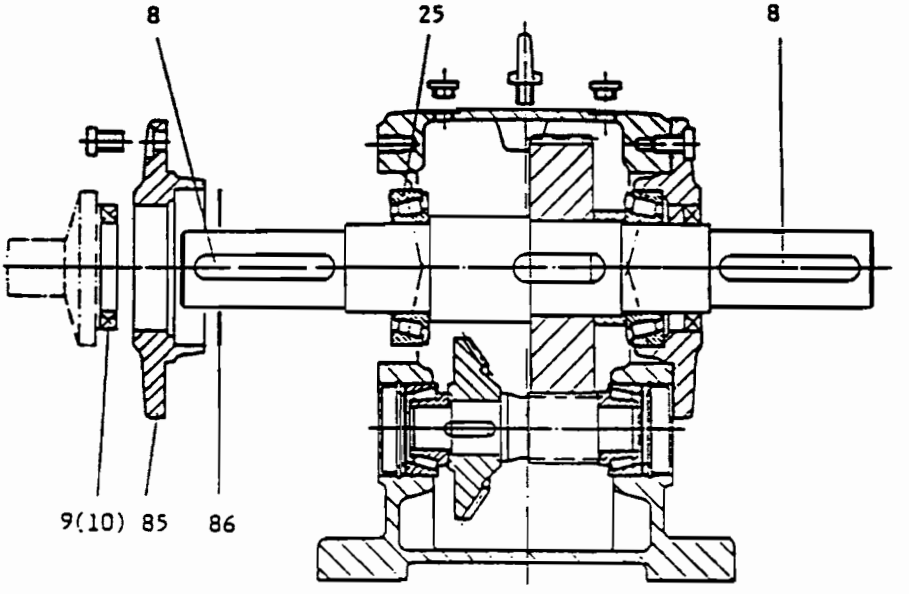
For single shaft extension

27. Install sealing flange #85 and secure with socket head screws #142. (Provide surface sealing).
28. Lubricate the bearing #25 and install the outer race of bearing #25 into the sealing flange #85.
29. For K/KF86-106
    a) Install the shims #86, thrust washer #87, and snapring #88. Use sufficient shims so that the snapring can only be installed with difficulty.
    b) Install closing cap #89.
29. For K/KF126
    a) Determine the required number of shims #86.
        1) With the outer race of bearing #25 in place, measure the distance from the housing sealing suface to the face of the bearing #25.
        2) Measure the distance from the closing flange #97 sealing surface to its bearing locating shoulder.
        3) The difference between the distances in a) and b) is the amount of shims #86 required.
    b) With the appropriate number of shims #86, install the closing flange #97 and secure with socket head screws #96. (Provide surface sealing).
30. Install oil seals #9 (#10) in the sealing flange or output flange #16.



For double shaft extension

27. Determine the required number of shims #86.
    a) With the outer race of bearing #25 in place, measure the distance from the housing sealing surface to the face of the bearing #25.
    b) Measure the distance from the flange #85 sealing surface to its bearing locating shoulder.
    c) The difference between the distances in a) and b) is the amount of shims #86 required.



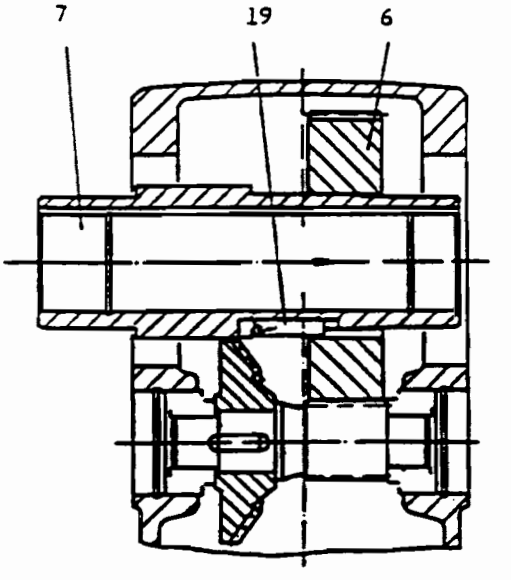
28. Install the appropriate number of shims #86 and press outer race of bearing #25 into sealing flange or output flange #85.
29. Install sealing flange or output flange #85 and secure with socket head screws #142. (Provide surface sealing).
30. Install oil seals #9 (#10) and #183 (#184) in the sealing flanges or output flanges #16 and #85.

KA/KAF 66-126

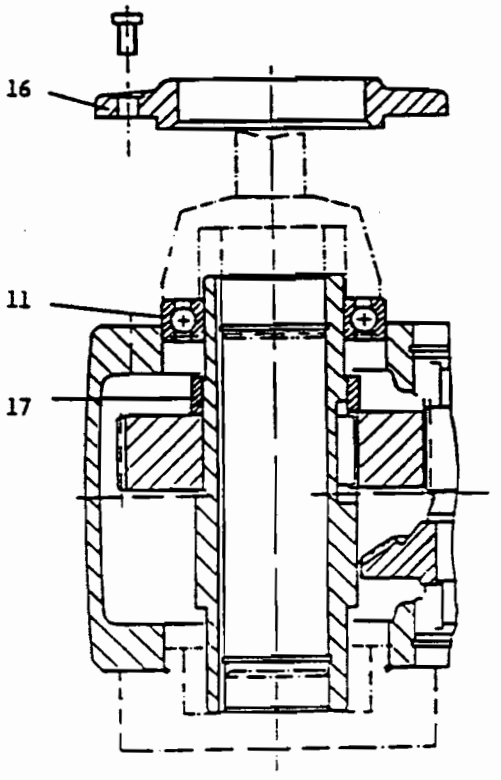
Output gear and shaft

21. Jam the bevel gear with a wooden or plastic wedge to prevent rotation.
22. Install key #19 in keyway on output shaft #7.

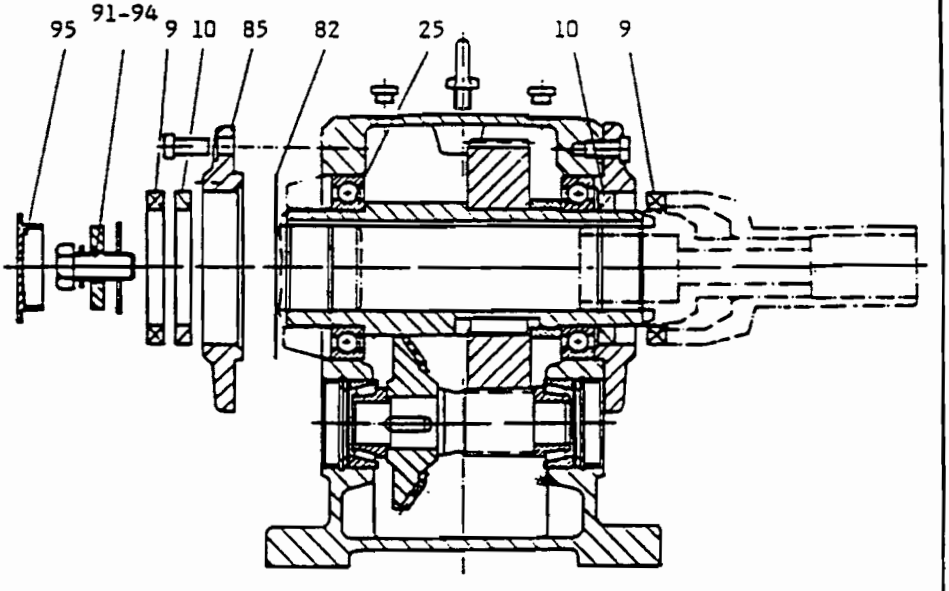
23. Place preheated gear #6 into position inside the housing and slide shaft #7 into gear #6.



24. Rotate the housing on its side and support the shaft #7, as shown.



25. Install spacer #17.
26. Press on bearing #11. Be sure to prelubricate the bearing before installation. For KA/KAF 106-126, install nilos ring #83 before installing bearing #11.
27. Install sealing flange or output flange #16 and secure with the socket head screws #14. (Provide surface sealing).
28. Turn housing over and press on bearing #25. Be sure to prelubricate the bearing before installation. For KA/KAF 106-126, install nilos ring #84 before installing bearing #25.
29. Determine the required number of shims #82.
    a) Measure the distance from the housing sealing surface to the face of the bearing #25.
    b) Measure the distance from the flange #85 sealing surface to its bearing locating shoulder.
    c) The difference between the distances in a) and b) is the amount of shims #82 required.



30. With the appropriate number of shims #82, install the sealing flange or output flange #85 and secure with socket head screws #142. (Provide surface sealing).
31. Install oil seals #9 (#10) and #183 (#184).
32. Install snapring #91, disc #92, lockwasher #93, and hex head bolt #95 into the hollowshaft.
33. Install closing cap #95.

Final Assembly

34. Install cover #100 and secure with socket head screws #101. (Provide surface sealing).
35. Install key #8 into keyway on output shaft #7.
36. Screw in eyebolt, oil level and drain plugs, and breather. See Mounting Positions chart for correct location of oil plugs.
37. Place input gasket #29, if required, in place and install the input assembly. Secure input assembly with appropriate bolts and/or nuts.
38. Fill with proper lubricant. See Lubricant Schedule for recommended lubricants and approximate quantities.
39. Trial run and test for unusual noises and/or oil leaks.

Lubrication

Schedule

LUBRICATION TYPE	AMBIENT[1] AIR TEMPERATURE RANGE °F	KIN VISCOSITY AT 40°C (cSt) APPROX.	GULF OIL CO.	CHEVRON OIL CO.	AMERICAN OIL CO.	MOBIL OIL CO.	SHELL OIL	TEXACO - CO.
Oil	+104 to +32	210	Gulf E.P. Lubricant S 100	Chevron Non-Leaded Gear Compound 220	SPARTAN EP 220	Mobilgear 630	Shell Omala Oil 220	Meropa 220
	+77 to +5	145	Gulf E.P. Lubricant S 60	Chevron Non-Leaded Gear Compound 150	SPARTAN EP 150	Mobilgear 629	Shell Omala Oil 100	Meropa 150
Grease Used for normal application temp. range — 20°F to 250°F			Gulfcrown Grease E.P. No. 2	Chevron Dura-Lith BEACON 3	ESSO Multipurpose Grease BEACON 2	Mobilux EP2	Shell Alvania Grease R 3	Multifak EP-2

Mineral oils and greases should be changed every 10,000 operating hours or 2 years. Repack high speed (input) bearings to 1/3 of the available free bearing space. Repack low speed (output) bearings to 2/3 of the available free space.

Synthetic oils and greases should be changed every 20,000 operating hours or 4 years.

Under severe operating conditions (e.g. high humidity, aggressive environment, large temperature fluctuations or high ambient temperatures) shorter oil change intervals are necessary.

[1]Consult factory for ambient temperatures outside the ranges shown.

Quantity in (US) Gallons

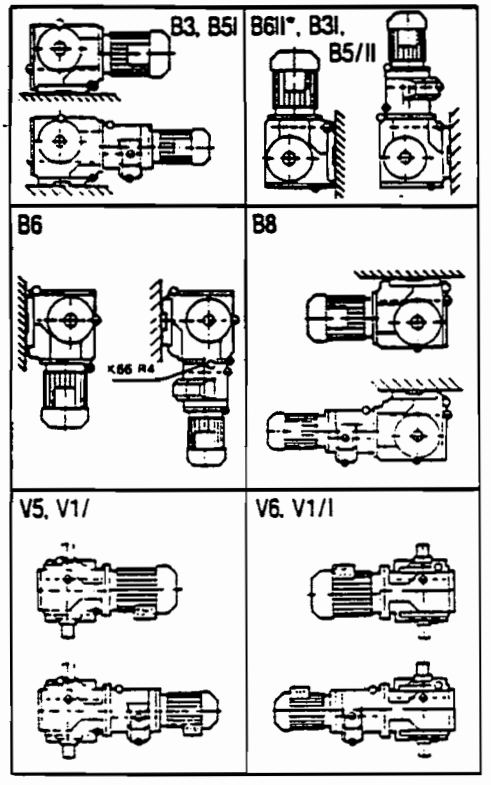
FRAME SIZE		MOUNTING POSITIONS													
		B3, H1 B5I	B3I B6II	B5	B5II	B5III	B6	B8	V1 V1I	V5	V6	H2	H3	H4	H5, H6
K, KF, KA	66	0.24	0.90	0.63	0.90	0.79	0.63	0.79	0.82	0.87	0.87	0.77	0.87	0.61	0.85
K, KF, KA	76	0.45	1.64	1.32	1.69	1.56	1.29	1.51	1.64	1.74	1.74	1.45	1.59	1.24	1.69
K, KF, KA	86	0.66	2.51	2.11	2.62	2.51	2.06	2.40	2.75	2.64	2.64	2.27	2.38	1.93	2.51
K, KF, KA	96	1.27	4.76	3.65	4.91	4.39	3.57	4.23	5.18	5.02	5.02	4.10	4.62	3.43	4.89
K, KF, KA	106	2.11	8.45	6.47	8.72	7.66	6.34	7.40	8.72	8.45	8.45	7.13	8.19	6.08	8.19
K, KF, KA	126	3.70	15.85	11.89	14.80	14.27	11.62	13.74	16.91	16.38	16.38	13.21	15.32	11.10	15.85

Note: The capacities are approximate, being dependent on the gear ratio.

Weight of oil: Approximately 7.5 lbs/gallon.

Mounting Positions

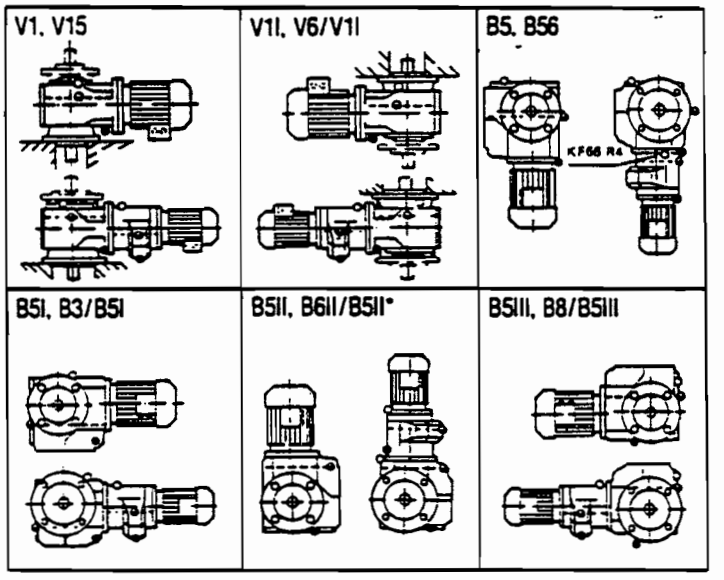
K66 - K126
K66R.. - K126R..



*K66-K126 Reducers: B6II mounting positions are non-ventilated.

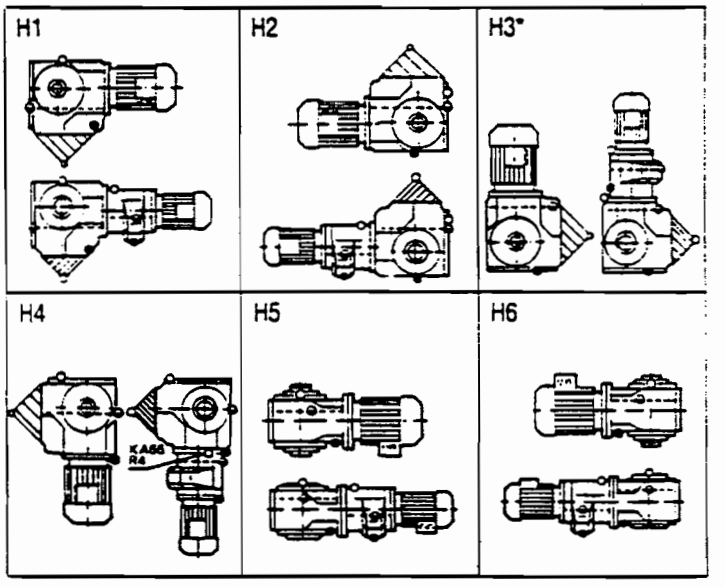
Symbols:
Mounting surface
Breather Plug
Oil - Level Plug - Red
Drain Plug - Blue

KF66 - KF126
KF66R.. - KF126R..



*KF66-KF126 Reducers: B5II, B6II/B5II mounting positions are non-ventilated.

KA66 - KA126
KA/KAF66R.. - KA/KAF126R..



*KA66-KAF126 Reducers: H3 mounting positions are non-ventilated.

Tightening Torques for Metric Threaded Fasteners

Hex Head or Hex Socket Screws (Normal Thread Series)

Thread Size	Torque (lb-in) for Grade 4.8	Grade 6.8	Grade 8.8	Grade 10.9	Hex Head Socket Wrench Size (mm)
M5	27	40	53	75	8
M6	50	73	97	125	10
M8	115	170	220	310	13
M10	220	320	425	610	17
M12	-	575	760	1060	19
M14	-	895	1195	1680	22
M16	-	1400	1860	2610	24
M18	-	1930	2565	3540	27
M20	-	2725	3630	5135	30
M24	-	4715	6285	8850	36
M27	-	6990	9295	13275	41
M30	-	9645	12850	17700	46
M36	-	16650	22150	31400	55

Oil Plugs

Thread Size	Torque in lb-in
M10x1	105
M12x1.5	175
M22x1.5	710
M33x2	1150
M42x2	1415

Notes

SEW
EURODRIVE

SEW-Eurodrive, Inc.
2001 West Main Street
Troy Ohio 45373
Tel: (513) 335-0036
Telex 687-4204
Telefax (513)222-4104

SEW-Eurodrive, Inc.
30599 San Antonio Road
Hayward, CA 94544
Tel: (415) 487-3560
Telefax (415)487-6381

SEW-Eurodrive, Inc.
496 Spartanburg Hwy
Lyman, SC 29365
Tel: (803) 439-7537
Telefax (803)439-0566

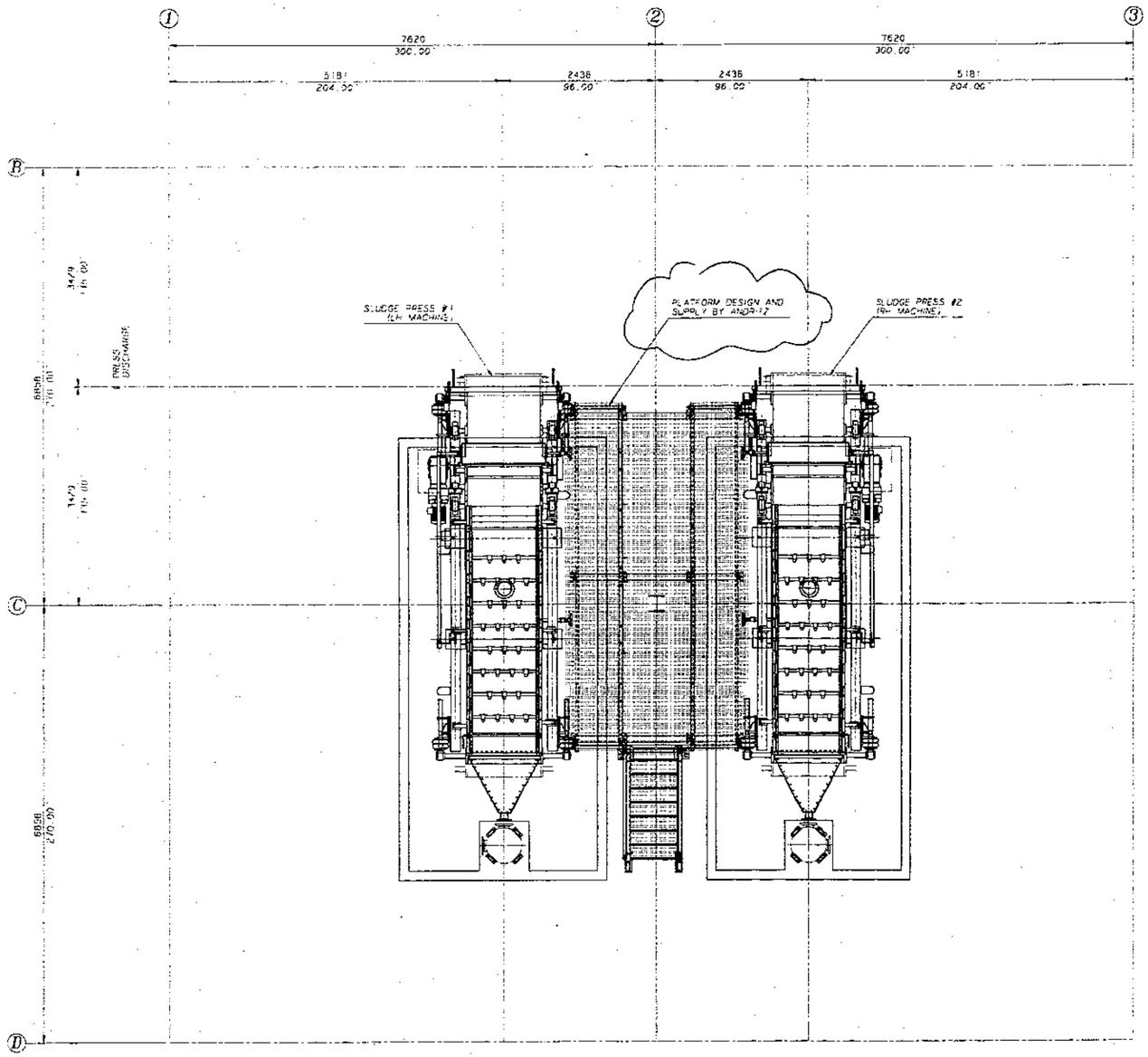
SEW-Eurodrive, Inc.
3950 Platinum Way
Dallas, Texas 75237
Tel: (214) 330-4824
Telefax (214)330-4724

SEW-Eurodrive, Inc.
200 High Hill Road
Bridgeport, NJ 08014
Tel: (609) 467-2277
Tel: (215) 563-3575
Telefax (609)845-3179

Printed in USA

3-89 12M

9.0 CERTIFIED MECHANICAL DRAWINGS



CERTIFIED CORRECT FOR INSTALLATION

DATE 2-22-94

PROJECT No. 612-6556

NO	REVISION	BY	DATE

ANDRITZ AUTOMATION INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone (817)465-5611
CAD

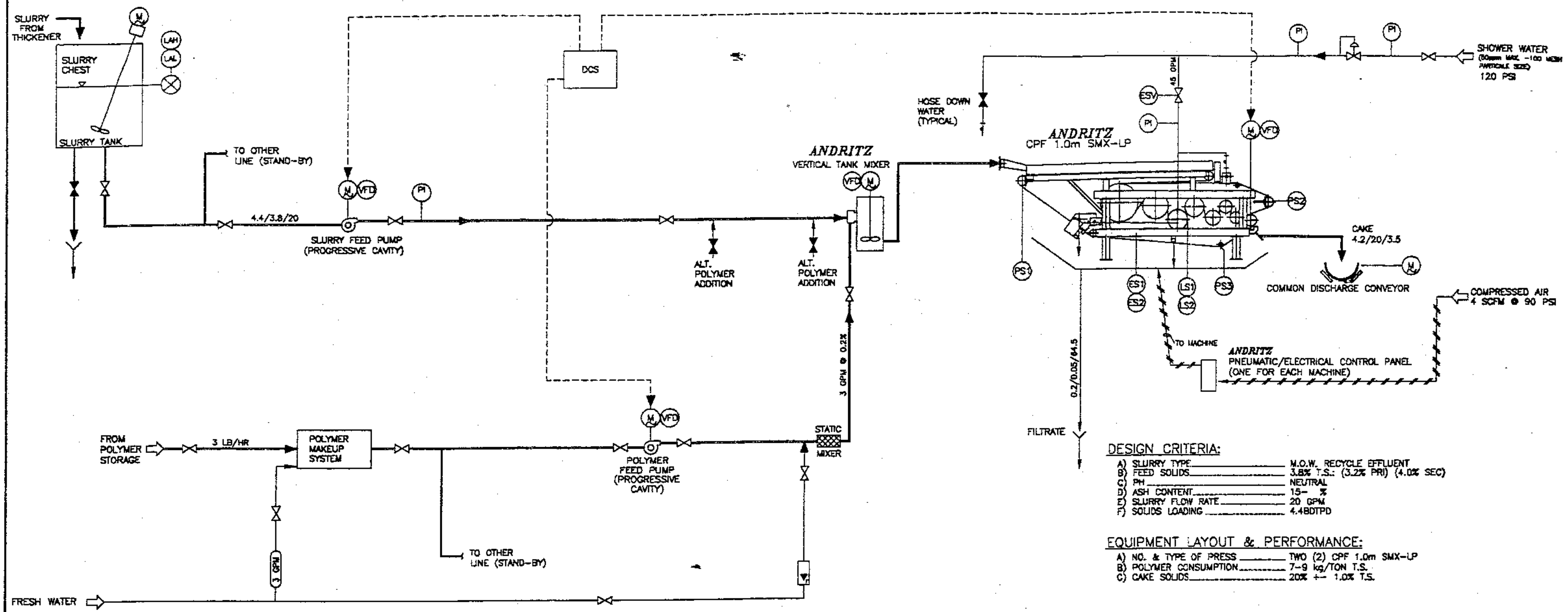
PONDEROSA FIBRES

CPP 1.0m SMX-58-HP

PLANT LAYOUT

M612690-6

0



DESIGN CRITERIA:

A) SLURRY TYPE .... M.O.W. RECYCLE EFFLUENT
B) FEED SOLIDS .... 3.8% T.S. (3.2% PRI) (4.0% SEC)
C) PH .... NEUTRAL
D) ASH CONTENT .... 15- %
E) SLURRY FLOW RATE .... 20 GPM
F) SOLIDS LOADING 4.4BDTPD

EQUIPMENT LAYOUT & PERFORMANCE:

A) NO. & TYPE OF PRESS .... TWO (2) CPF 1.0m SMX-LP
B) POLYMER CONSUMPTION .... 7-9 kg/TON T.S.
C) CAKE SOLIDS .... 20% +- 1.0% T.S.

NOTES:

1) FLOW INDEX (EXCEPT WHERE OTHERWISE NOTED) BDTPD / CONSISTENCY % / FLOW GPM.

PONDEROSA FIBRES OF PENN. L.L.C.
NORTHHAMPTON, PA.
CONTRACT No. 22024-10000-607-51
SLUDGE DEWATERING PLANT

0607.00-A01-30

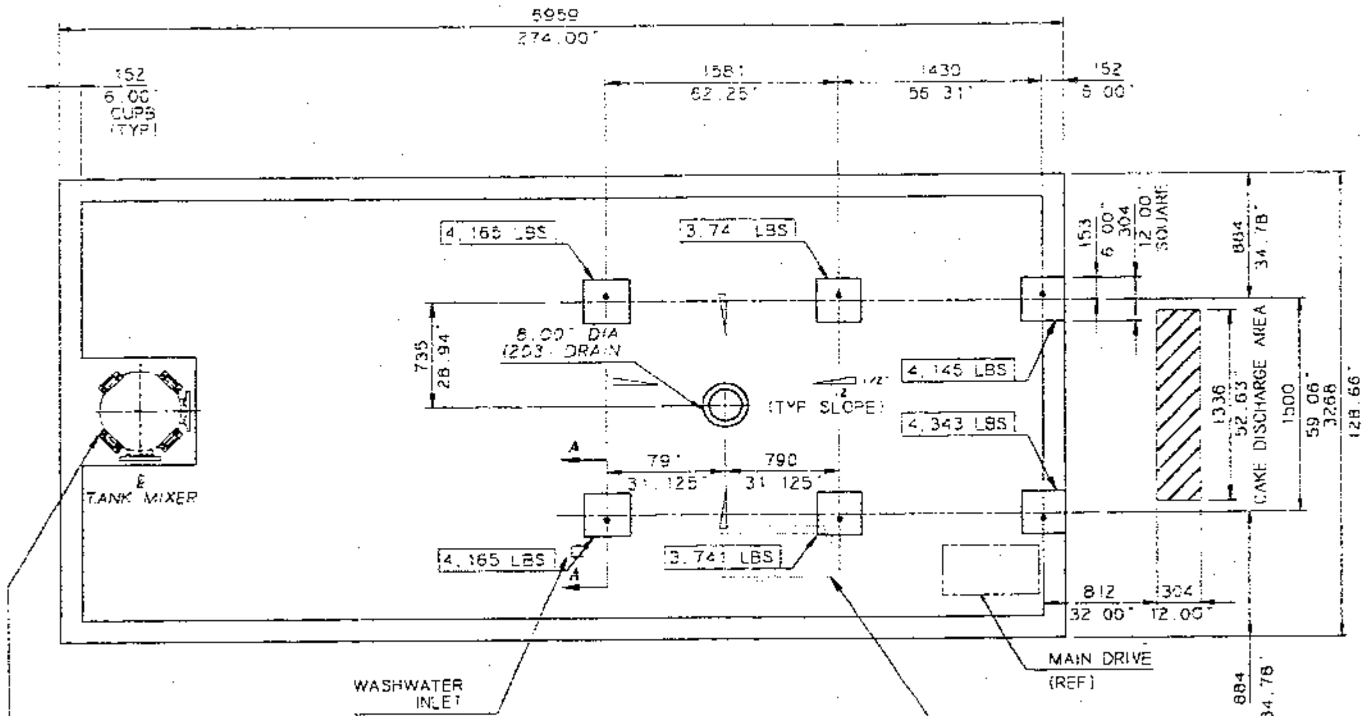
LEGEND AND NOTES:

Symbol	Meaning
	PUMP
	MOTOR
	TRANSMITTER
	ROTAMETER
	NORMALLY OPEN
	NORMALLY CLOSED
	FLEXIBLE HOSE CONNECTION
	PNEUMATIC LINES

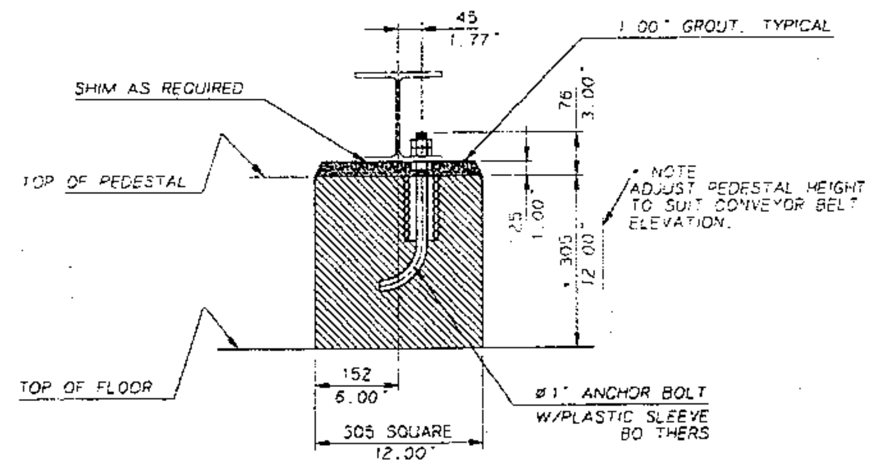
ESV - ELECTRONIC SOLENOID VALVE
LIC - LEVEL INDICATING CONTROLLER
LAL - LEVEL ALARM LOW
LAH - LEVEL ALARM HIGH
PI - PRESSURE INDICATOR
SCR - DC DRIVE
VFD - VARIABLE FREQUENCY DRIVE

NO.	REVISION	BY	DATE
2	CERTIFIED & REVISED PER CUSTOMER REQUEST	DT	6/28/95
1	REVISED PER CUSTOMER REQUEST	DT	5/15/95

Drawn by: KLK — Date: 5/9/95
Appr. by: NAT — Date: 5/11/95
THIRD ANGLE PROJECTION
ANDRITZ RUTHNER, INC.
Scale: NONE
Dwg. No.: M-316
CERTIFIED CORRECT FOR INSTALLATION
BY: — DATE: 6/28/95
PROJECT No. 612-690
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. TRANSMITTALS
Customer: PONDEROSA FIBRES
File name: FS-690-2
Job No.: 612-690
Name: RECOMMENDED FLOW DIAGRAM
Drawing No.: FS-612690-2
Rev.: 2



FOUNDATION PLAN



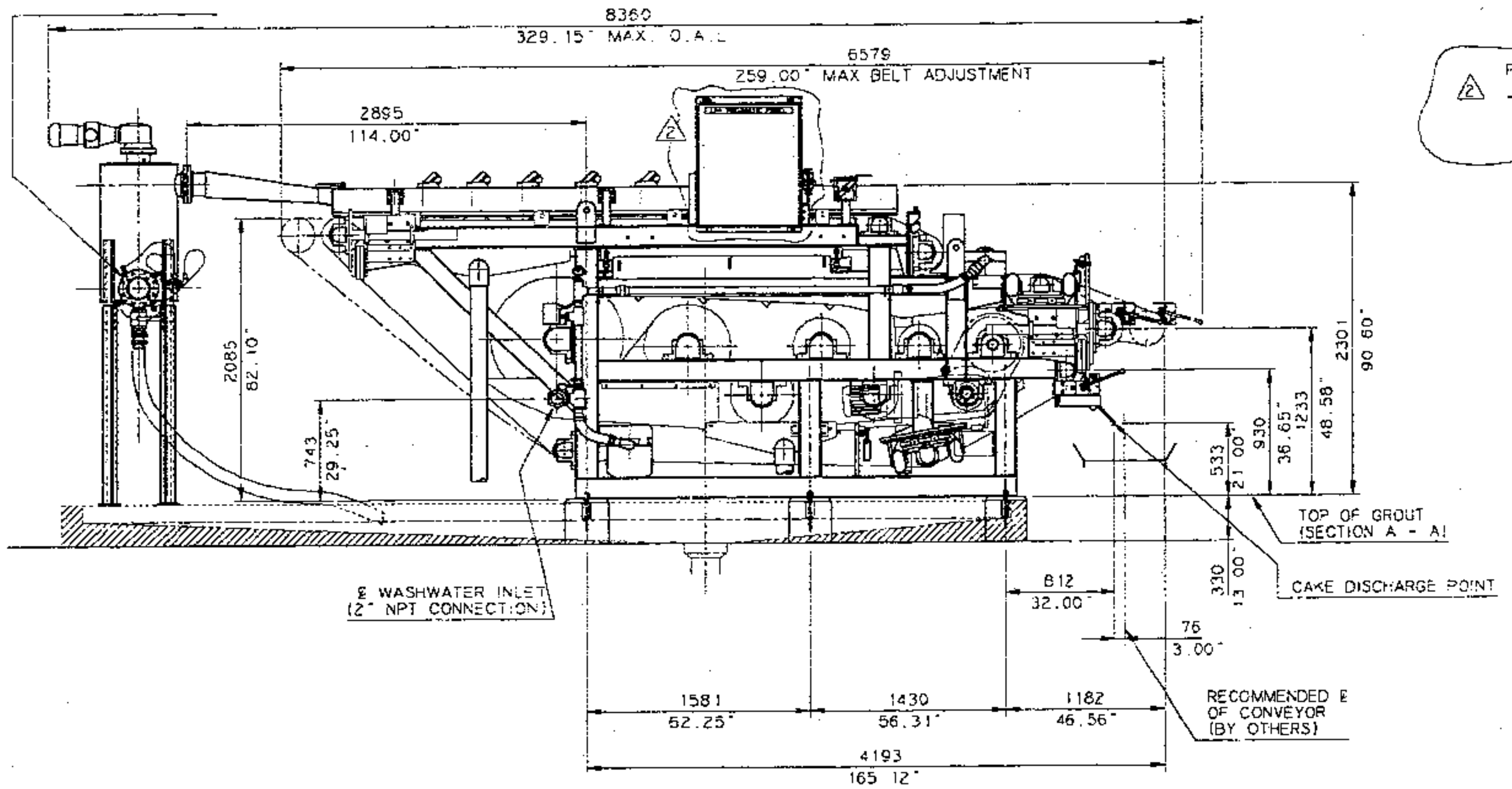
SECTION A-A

GENERAL NOTES & INFORMATION

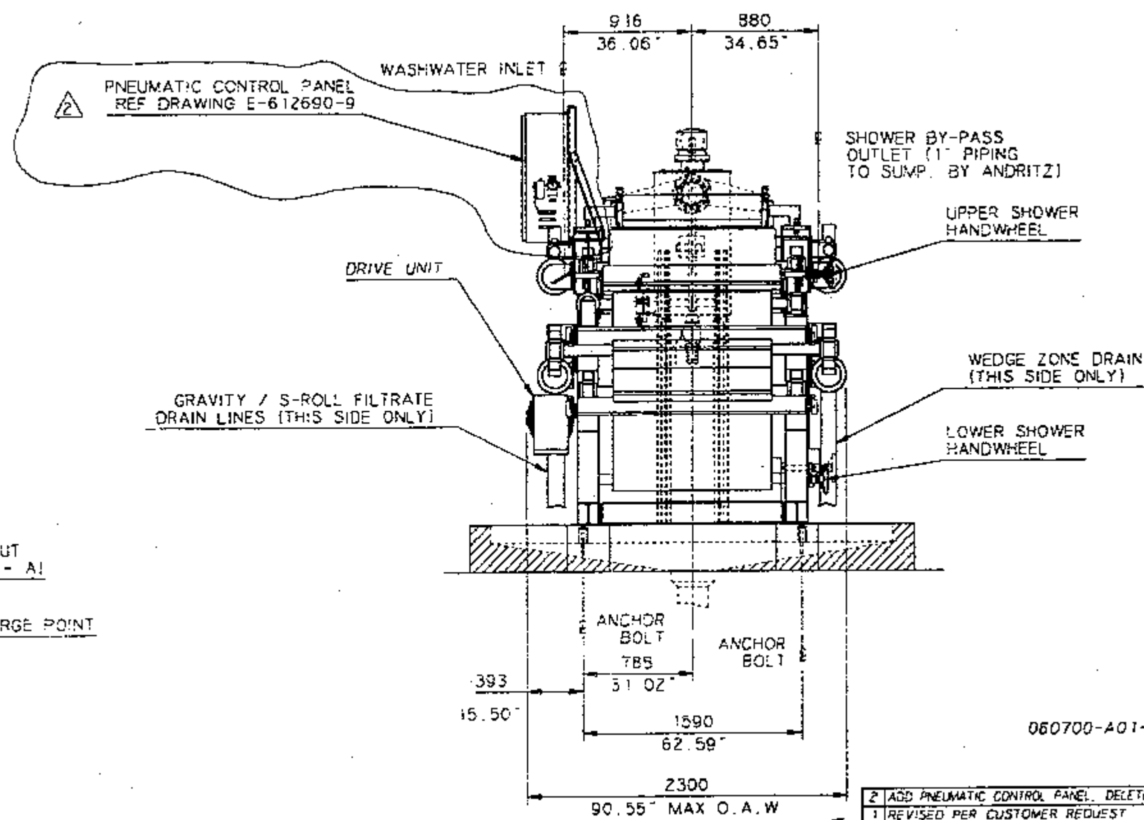
1. THE LOADINGS INDICATED INCLUDE VIBRATION EFFECTS.
2. THE FOUNDATION DESIGN SHOWN INDICATES MINIMUM REQUIREMENTS FOR CLEARANCE AND DRAINAGE. ACTUAL FOUNDATION DESIGN AND CONSTRUCTION TO BE FURNISHED BY OTHERS.
3. MINIMUM UTILITIES REQUIRED TO BE FURNISHED BY THE OPERATOR. THE FIGURES BELOW ARE FOR THE MACHINE ONLY. ANY ANCILLARY EQUIPMENT WILL REQUIRE ADDITIONAL UTILITIES
   a. AIR - FOUR (4) CUBIC FEET PER MINUTE OF CLEAN AIR @ 90 P.S.I.G
   b. WATER - 50 GALLONS PER MINUTE AT AMBIENT TEMPERATURE AND 120 PSIG
4. DRY WEIGHT OF THE MACHINE: 21,300 LBS
   WET WEIGHT: 24,300 LBS
5. RIGHT HAND MACHINE - AS SHOWN
   LEFT HAND MACHINE - OPPOSITE AS SHOWN
   ONE MACHINE RIGHT HANDED
   ONE MACHINE LEFT HANDED

ANDRITZ
CERTIFIED CORRECT FOR INSTALLATION
BY S. Eaton DATE 10/06/95
PROJECT No. 612-690

FEED INLET
(4"-150 LB FLANGE)



SIDE ELEVATION



END ELEVATION

060700-A01-#13

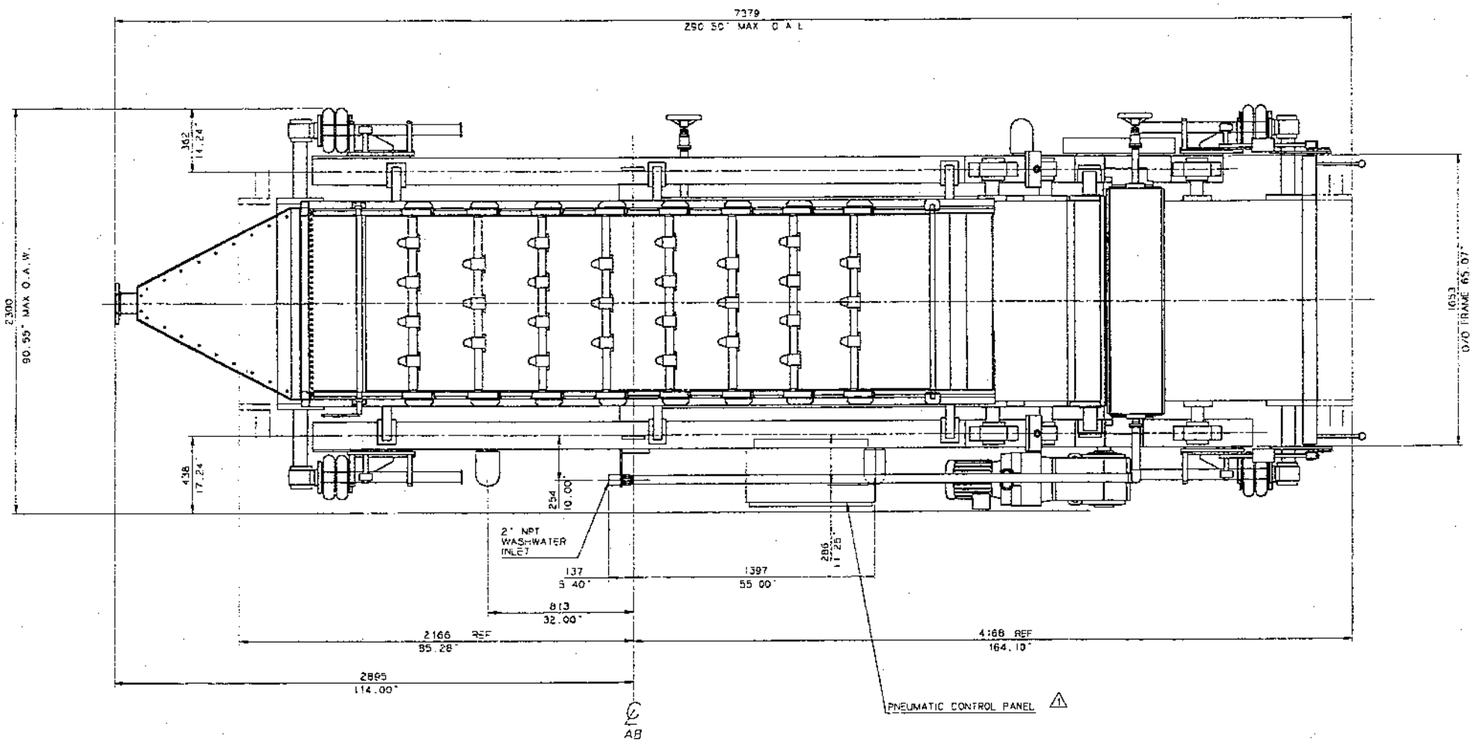
NO	REVISION	BY	DATE
2	ADD PNEUMATIC CONTROL PANEL, DELETED TERM BOX	SLH	10-06-95
1	REVISED PER CUSTOMER REQUEST	RRB	06-28-95

Drawn By: G. HILL — Date: 3/10/95
THIRD ANGLE PROJECTION

ANDRITZ RUTHNER, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone (817)465-5611
CAD

Scale: 20
File name: F690-3
Job No: 612-690
Customer: PONDEROSA FIBRES
Item: CPF 1.0m SMX-S8-LP
RH FOUNDATION PLAN
Drawing No.: F612690-3
Rev.: 2

CAD DRAWING ORIGINAL - DO NOT ALTER HARDCOPY



NOTES:

1. ALL DIMENSIONS IN MILLIMETER WITH INCHES BELOW.
2. RIGHT HAND MACHINE AS SHOWN
   LEFT HAND OPPOSITE AS SHOWN
   ONE MACHINE TO BE RIGHT HANDED.
   AND ONE MACHINE TO BE LEFT HANDED.

1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone: (817)465-5811
Telefax (817)472-6589

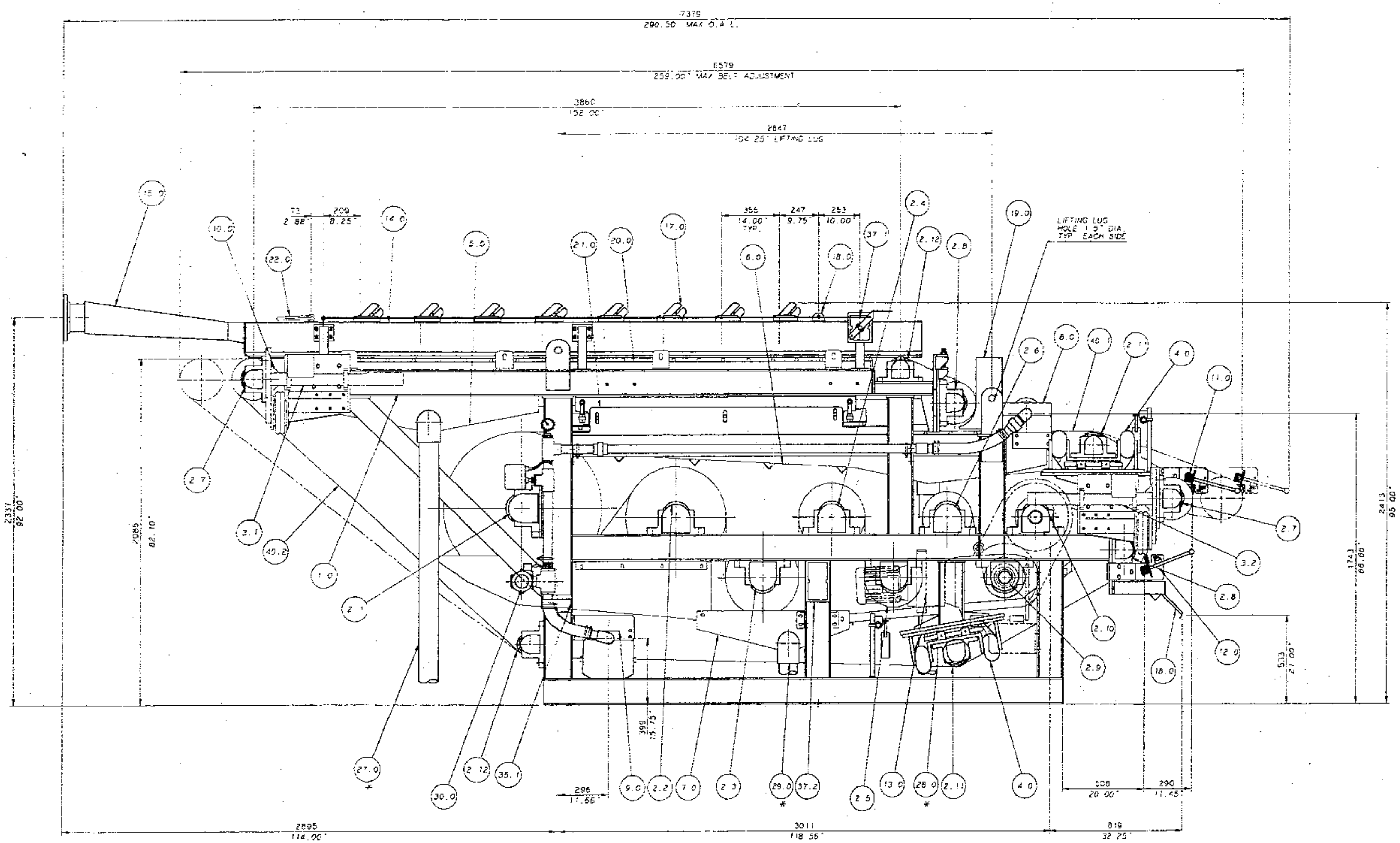
CERTIFIED CORRECT FOR INSTALLATION
BY _____ DATE: 10/06/95
PROJECT No.: 612-690
THESE DWGS REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG SUBMITTALS

0607.00-001-#12

NO	REVISION	BY	DATE
1	ADDED PNEUMATIC CONTROL PANEL, DELETED TERM BOX	SLH	10-06-95

Drawn by: C. HALL — Date: 5/10/95
THIRD ANGLE PROJECTION
Scale: 1:12
Group:
Code:
Customer: PONDEROSA FIBRES
Machine: CPF 1.0m SWR-SB-LP
File Name: A6690-5
Job No.: 612-690
Drawing No.: M612690-5
Rev.: 1
Title: RH PLAN VIEW

END DRAWING ORIGINAL - DO NOT ALTER HARDCOPY



1.0 FRAME ASSEMBLY
2.1 ø914 (36") "S"-ROLL ASSEMBLY
2.2 ø610 (24") "S"-ROLL ASSEMBLY
2.3 ø457 (18") "S"-ROLL ASSEMBLY
2.4 ø406 (16") "S"-ROLL ASSEMBLY
2.5 ø356 (14") "S"-ROLL ASSEMBLY
2.6 ø305 (12") "S"-ROLL ASSEMBLY
2.7 ø254 (10") TENSIONING ROLL ASSEMBLY (2)
2.8 ø254 (10") DEFLECTION ROLL ASSEMBLY (2)
2.9 ø241 (9 1/2") DRIVE ROLL ASSEMBLY (1)
2.10 ø241 (9 1/2") DRIVE ROLL ASSEMBLY (1)
2.11 ø165 (6 1/2") TRACKING ROLL ASSEMBLY (2)
2.12 ø152 (6") DEFLECTION ROLL ASSEMBLY (2)
3.1 GRAVITY ZONE BELT TENSIONING ASSEMBLY
3.2 LOWER FRAME BELT TENSIONING ASSEMBLY
4.0 BELT TRACKING DEVICE
5.0 GRAVITY ZONE FILTRATE PAN
6.0 WEDGE ZONE FILTRATE PAN
7.0 S-ZONE FILTRATE PAN
8.0 UPPER SHOWER ASSEMBLY
9.0 LOWER SHOWER ASSEMBLY
10.0 TENSION ROLL CHUTE ASSEMBLY
11.0 UPPER DOCTOR ASSEMBLY
12.0 LOWER DOCTOR ASSEMBLY
13.0 DRIVE ASSEMBLY
14.0 HEADBOX ASSEMBLY
15.0 DISTRIBUTION CHUTE
16.0 DISCHARGE CHUTE ASSEMBLY
17.0 PLOW CHICANE ASSEMBLY (8 ROWS)
18.0 SLUDGE LEVELER
19.0 SPLASH GUARD
20.0 GRAVITY ZONE GRID ASSEMBLY
21.0 WEDGE ZONE GRID ASSEMBLY
22.0 FLOATING WEDGE
27.0 GRAVITY ZONE FILTRATE DRAIN (ON BOTH SIDES)
28.0 WEDGE ZONE FILTRATE DRAIN (ON FAR SIDE)
29.0 S-ZONE FILTRATE DRAIN (ON NEAR SIDE)
30.0 SHOWER INLET PIPING
31.0 UPPER SHOWER DRAIN (NOT SHOWN)
32.0 LOWER SHOWER DRAIN (NOT SHOWN)
33.0 UPPER SHOWER BACKWASH PIPING (FAR SIDE)
34.0 LOWER SHOWER BACKWASH PIPING (FAR SIDE)
35.1 PNEUMATIC MANIFOLD
37.1 E-STOP SWITCH (BOTH SIDES)
37.2 ELECTRICAL TERMINAL BOX
45.1 TOP BELT
45.2 BOTTOM BELT

ANDRITZ
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017

CERTIFIED CORRECT FOR INSTALLATION
BY [signature] DATE 6-30-95
PROJECT No. 612-690
THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. SUBMITTALS

NOTE:

1. ONE MACHINE RIGHT HANDED.
ONE MACHINE LEFT HANDED.
RIGHT HAND MACHINE AS SHOWN.
LEFT HAND MACHINE OPPOSITE AS SHOWN.

* DRAIN PIPE LENGTHS TO BE DETERMINED AT JOBSITE. (SEE INSTRUCTIONS PROVIDED IN PVC SOLVENT AND PRIMER CONTAINER). SUPPORT BRACING TO BE PROVIDED BY OTHERS. 5 PLACES.

0607.00-A01-#11

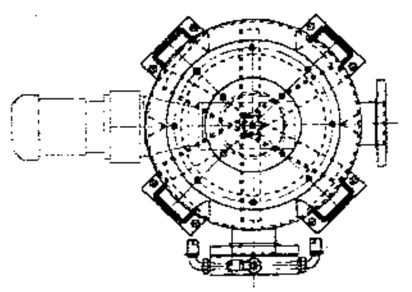
NO	REVISION	BY	DATE
1	REVISED PER CUSTOMER REQUEST	GEH	06-09-95

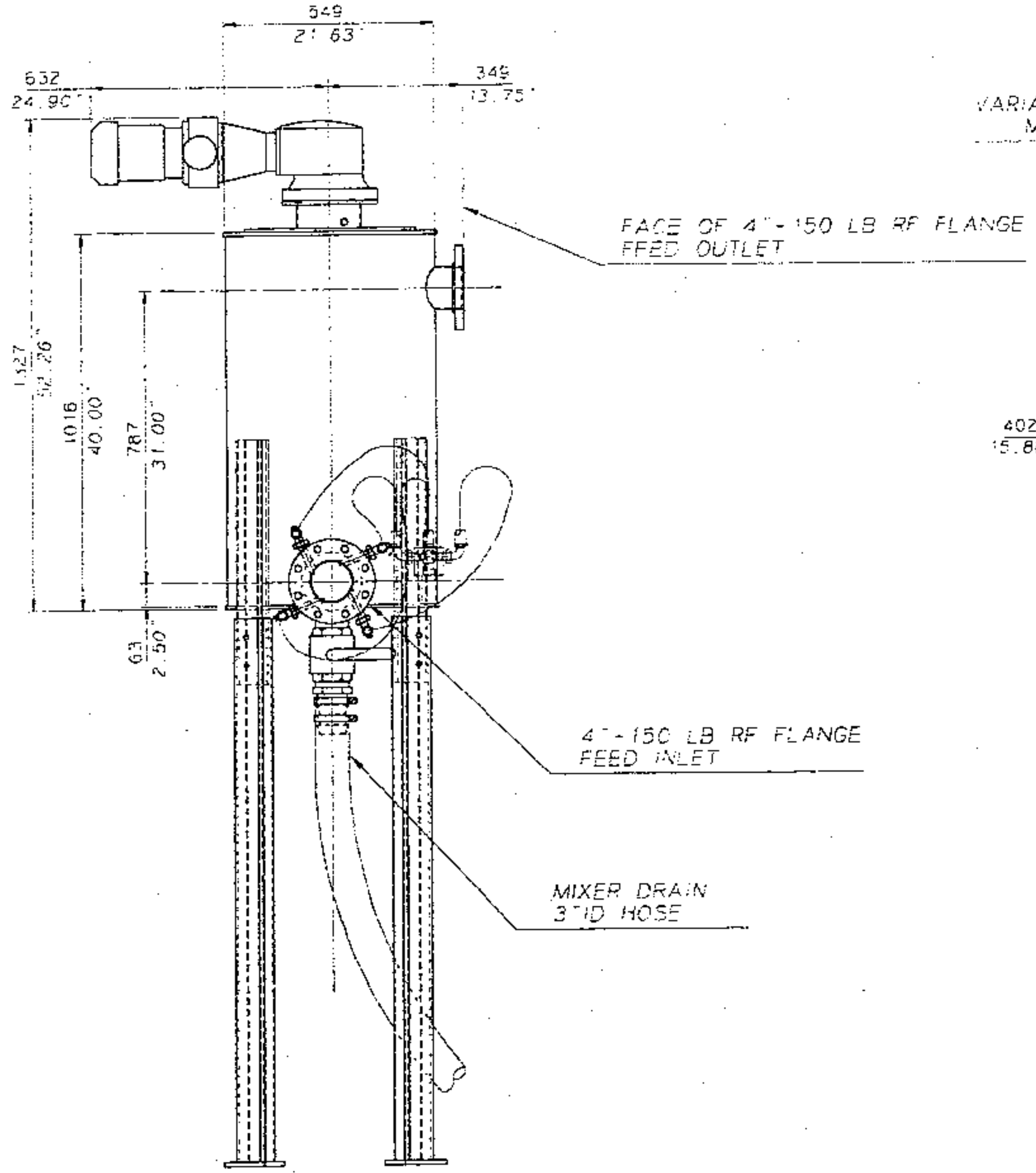
Drawn by: G. HALL Date: 5/10/95

ANDRITZ AUTOMATION, INC.
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone (817)465-5611

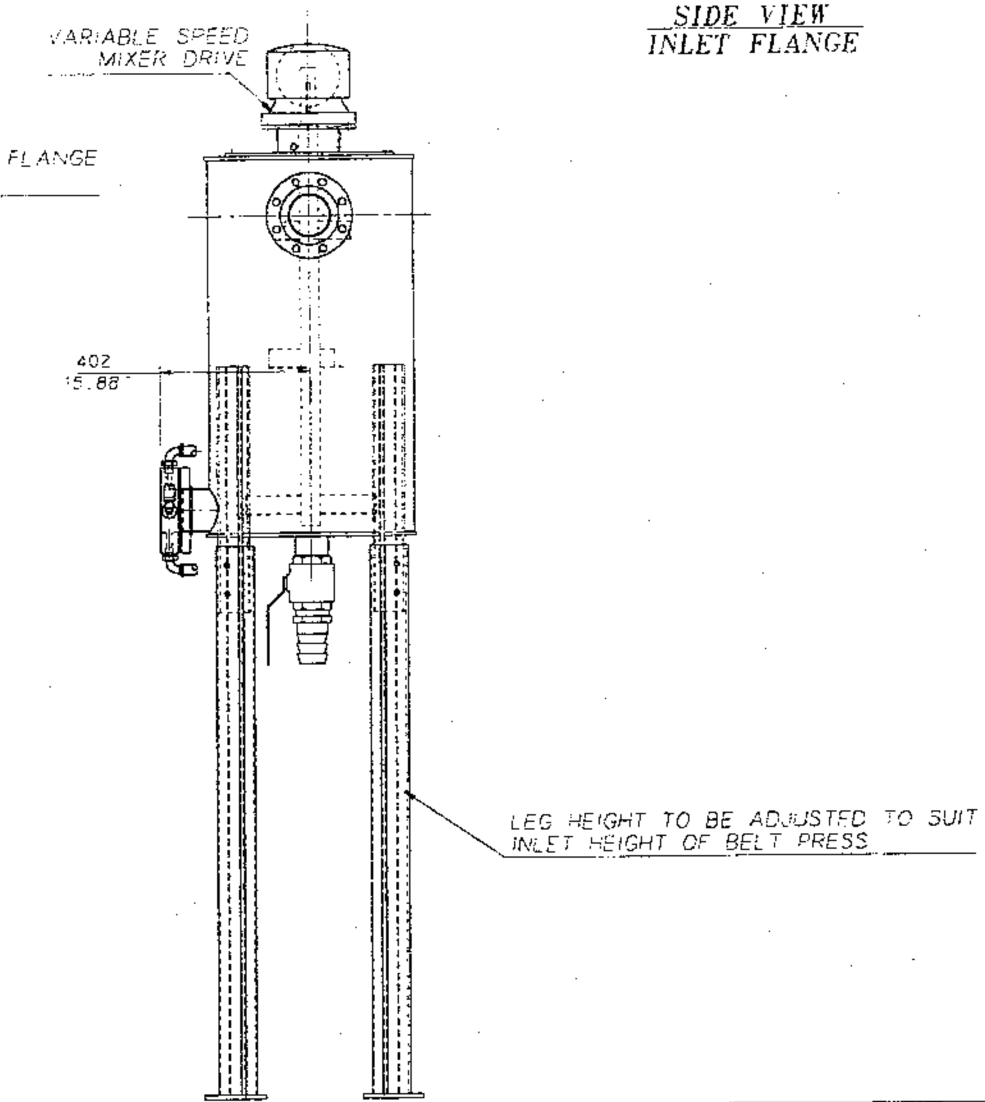
CAD

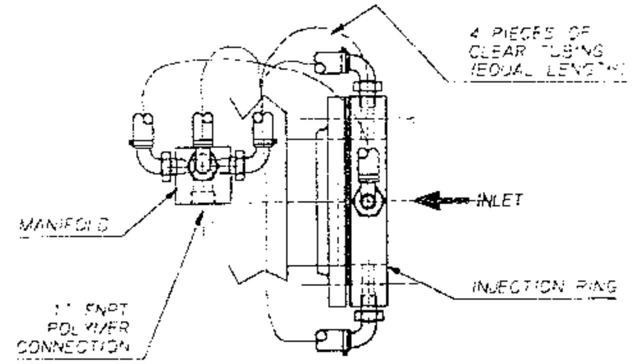
Customer: PONDEROSA FIBRES
File name: M690-4
Job No. 612-690
CPF 1.0m SMX-S8-LP
SIDE ELEVATION
Drawing No. M612690-4
Rev. 1





SIDE ELEVATION

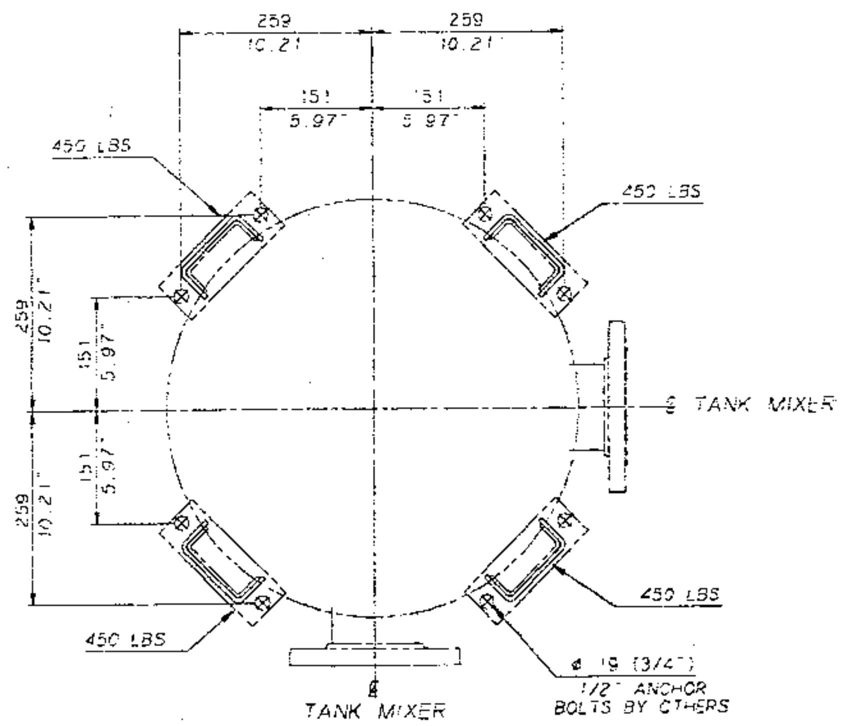




SIDE VIEW
INLET FLANGE

GENERAL NOTES & INFORMATION

1. THE LOADINGS INDICATED INCLUDE VIBRATION EFFECTS
2. THE FOUNDATION DESIGN SHOWN INDICATES MINIMUM REQUIREMENTS FOR CLEARANCE AND DRAINAGE. ACTUAL FOUNDATION DESIGN AND CONSTRUCTION TO BE FURNISHED BY OTHERS.
3. MINIMUM UTILITIES REQUIRED TO BE FURNISHED BY THE OPERATOR, FOR THE MACHINE ONLY. ANY ANCILLARY EQUIPMENT WILL REQUIRE ADDITIONAL UTILITIES.
4. DRY WEIGHT OF THE MIXER: 1350 LBS
   WET WEIGHT: 1800 LBS
5. RIGHT HAND AS SHOWN.
   LEFT HAND OPPOSITE AS SHOWN.
   ONE MIXER RIGHT HANDED AND
   ONE MIXER LEFT HANDED



FOUNDATION PLAN

SCALE 1 : 5

0607 00-A01-#14

ANDRITZ AUTOMATION, INC
1010 COMMERCIAL BLVD. SOUTH
ARLINGTON, TEXAS 76017
Phone (817)465-5611
Telefax (817)472-5589

CERTIFIED CORRECT FOR INSTALLATION

BY: [signature] DATE 6-30-95

PROJECT No. 612-690

THESE DWGS. REFLECT CUSTOMER'S CHANGES AND APPROVAL ON PREVIOUS DWG. SUBMITTALS

NO	REVISION	BY	DATE
1	REVISED PER CUSTOMER REQUEST	SEH	06-09-95

Drawn by: S.D.M. Date: 2/27/95

ANDRITZ AUTOMATION, INC — 1010 COMMERCIAL BLVD. SOUTH, ARLINGTON, TEXAS 76017, Phone (817)465-5611

Scale: 1 : 10

File name: DMA1657D

Title: 4"INLET / 50GAL. VERTICAL TANK MIXER ASSEMBLY

Drawing No.: DMA1657D Rev: 1

CAD DRAWING ORIGINAL - DO NOT ALTER HARDCOPY