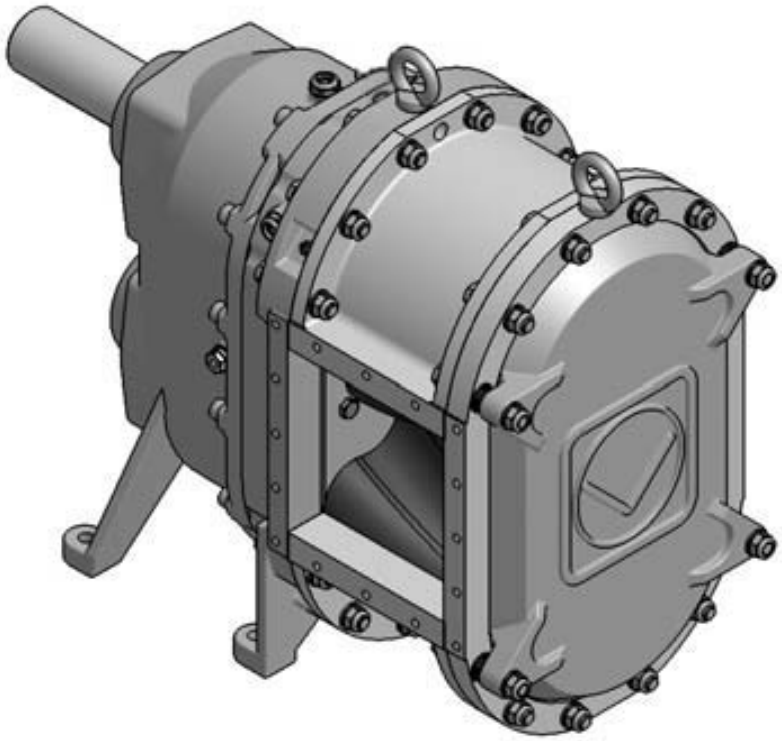
Level 1 Service Manual for all VX Q Series Pumps



Prior to starting any repair, make sure you understand the safety instructions provided with any piece of rotating equipment. There is a specific section in this manual that deals with safety concerns related to the Vogelsang Pump. Make sure you read and understand this section completely prior to starting any repair. If you have questions, please contact: **800.984.9400**

Section 1: General Information for Operation & Maintenance

General Instructions

Description of the Vogelsang Positive Displacement Rotary Lobe Pump and how it functions

The Vogelsang positive displacement rotary lobe pump employs right and left set lobes, top and bottom, rotating in opposite directions, driven by an external power source, to move fluid from the suction side of the pump to the discharge side.

During operation the lobes mesh together, forming cavities between the rotors and the casing. The lobes mesh tightly together in the center of the pump and have a very small clearance at the radial housing. As the lobes continue to turn, the fluid and objects are moved along the outer perimeter of the pump. As the pump completes a full cycle, the fluid is pumped through to the discharge side of the pump. The direction of flow is determined by the rotation of the lobes. Vogelsang positive displacement rotary lobe pumps can operate in both forward and reverse directions of flow.



If you are in doubt about the functionality of your Vogelsang product, please ask us. Any other use is contrary to the intended purpose. The manufacturer is not liable for damages or wear caused by incorrect use.

Identification

Each Vogelsang pump is tagged with an identification label on the gearbox end of the pump. This tag shows the full model designation, serial number, year of manufacture and maximum operating conditions, if applicable. Refer to the illustrations below.



Normal Operation Information

	Pre-startup checks	Startup	Normal Operation	Shutdown	Emergency Shutdown
Properly install and pressurize buffer chamber using the pressurized oil bottle. *Follow instructions outlined in this document.*	X	X	X		
For direct drive assemblies: Confirm the pump and drive unit are properly coupled and aligned. Coupler guard must be in place.	X	X	X		
For belt drive assemblies: Confirm sheaves are aligned and belt is properly tensioned. Belt guard must be in place.	X	X	X		
Confirm that ALL base plate mounting points are fastened and properly tightened.	X	X	X		
Confirm that there are no obstructions in the pipelines.	X	X	X		
Pressure relief system, valves, etc, must be in good working order and set to the appropriate relief pressure.	X	X	X		
Under no circumstances should the pump or its flanges, be used to support external loads. All piping must be supported.	X	X	X		
Pump should be filled with liquid before initial startup and any restart.		X	X		
Liquid should be drained from the wet-end of the pump, to insure it does not freeze, or set-up in the wet-end.				X	
Insure the surrounding piping matches or exceeds the port size of the pump, to reduce the chance of cavitation.	X	X	X		
Confirm the NPSHA in the system is suitable for the NPSHA of the pump, to ensure smooth operation of the pump, without cavitation	X	X	X		
Insure suction and discharge gauges are properly installed, and working.	X	X	X		
Insure all PM has been completed on the pump and drive system.		X	X		

	Pre-startup checks	Startup	Normal Operation	Shutdown	Emergency Shutdown
Rotate the pump one complete turn each month, to insure proper lubrication of mechanical seals.	X		X	X	X
Clean wet-end of unit to insure a smooth re-start.		X		X	X

Start-Up Report & Checklist

VOGELSANG

Scheduled Date: _____ S/N: _____

CUSTOMER INFORMATION

End-User Contact Name: _____ **VSO#:** _____

End User Company: _____ Phone: _____

End-User City: _____ State: _____ Fax: _____

Distributor Salesperson: _____ Phone: _____

Distributor Company: _____ Fax: _____

UNIT TYPE ☐ Pump ☐ Rota-Cut **CONSTRUCTION** ☐ Iron ☐ Stainless Steel ☐ Tungsten Carbide (Flamed on Coating)

LOBE MATERIAL ☐ NBR ☐ EPDM ☐ PUR ☐ FKM ☐ SBR

UNIT INFORMATION

Equipment Number: _____ Mounted on: ☐ Channel Base ☐ V-Belt Construction

Unit Serial Number: _____ Unit Model Number: _____

Flange Connections: Suction: ☐ Gooseneck ☐ 90° Elbow ☐ Straight ☐ Other: _____

Discharge: ☐ Gooseneck ☐ 90° Elbow ☐ Straight ☐ Other: _____

MOTOR INFORMATION

Motor Manufacturer: _____ Model: _____ Serial Number: _____

HP: _____ RPM: _____ Gear Ratio: _____ Voltage: _____ Ø: _____ S.F.: _____ Enclosure: _____

Nameplate Amps: _____ Actual Amps: _____ Is there a VFD installed for this unit? Yes No

If so what is the Make & Model: _____

_____

FLUID & DESIGN INFORMATION

Fluid Type: _____ Solids by weight (%): _____ Hours Running per day: _____

Capacity in (USGPM): Design: _____ Actual: _____ Flooded Suction: _____ ft

Pressure (PSI): Design: _____ Actual: _____ Suction Lift: _____ ft.

Other Information: _____

Pipe size: Suction Pipe _____ inches Discharge Pipe _____ inches

COMMENTS

_____

_____

Start-Up Report & Checklist

VOGELSANG

INSTALLATION INFORMATION

Is there a discharge pressure gauge installed? ☐ Yes ☐ No Suction pressure gauge? ☐ Yes ☐ No

Is there a high-pressure relief valve or control? ☐ Yes ☐ No Set MAX PSI at: _____

CHECKLIST

Please check the box if the item has been completed, or checked for proper installation. Add comments if necessary.

- ☐ Base Plate Secure & Level — Comments: _____
- ☐ Discharge & Suction Piping Secure — Comments: _____
- ☐ Pump Gear Box Oil Filled to Correct Level — Comments: _____
- ☐ Pump Gear Box Vent Plug Removed (If necessary) — Comments: _____
- ☐ Pump Buffer Chamber Filled to Correct Level — Comments: _____
- ☐ Buffer Chamber Oil Bottle Oil Level & Pressure Correct — Comments: _____
- ☐ Motor or Geared Motor Greased and Oil Checked — Comments: _____
- ☐ Proper Voltage supplied to Motor — Comments: _____
- ☐ Correct Rotation Checked — Comments: _____
- ☐ Discharge Valve Opened (During Unit Start-Up Operation) — Comments: _____
- ☐ Suction Valve Opened (During Unit Start-Up Operation) — Comments: _____
- ☐ Coupling, Motor, and Pump Aligned (Only on Channel Base) — Comments: _____
- ☐ V-Belt Tension Checked (Only on V-Belt Base) — Comments: _____
- ☐ Blade Tension Checked (Only for RotaCut) — Comments: _____
- ☐ Oil Level for ACC Checked (Only for RotaCut) — Comments: _____

COMPLETION INFORMATION

Factory Authorized Person: _____ Date: _____

Company: _____ Title: _____

End-User Witness Person: _____ Date: _____

Company: _____ Title: _____

THIS FORM MUST BE COMPLETED WITHIN 60 DAYS AND RETURNED TO VOGELSANG AT (330) 296-4113 FOR WARRANTY TO BE VALID!

Start-Up Report & Checklist

VOGELSANG

ADDITIONAL COMMENTS & NOTES

THIS FORM MUST BE COMPLETED WITHIN 60 DAYS AND RETURNED TO VOGELSANG AT (330) 296-4113 FOR WARRANTY TO BE VALID!

Sequence of Operations

1	Open all suction and discharge valves
2	Assure completion of all startup checks in table above
3	Assure compliance with any electrical checklist for this application
4	Engage pump
5	Assure normal operation parameters
6	Upon shutdown, observe shutdown advisories in chart above

Installation, Maintenance, Calibration & Repair

Installation

Vogelsang does not install equipment supplied as this is the responsibility of the contractor. See section 2.A.1 for installation advice. However, when designing your system, keep in mind the below guidelines.

When designing the pumping system:

DO - Confirm with the supplier the Net Positive Suction Head (NPSH) requirements for the pump, as this is crucial for ensuring the smooth operation and preventing cavitation.

DO - Avoid suction lifts and manifold/common suction lines for two pumps running in parallel, as this may cause vibration or cavitation.

DO - Protect the pump against blockage from incompressible solid objects e.g. nuts, bolts etc. Also protect the pump from accidental operation against a closed valve by using one or all of the following methods: relief valves, pressure switch, current monitoring device.

DO - Fit suction and discharge pressure gauges to monitor pressures for diagnostic purposes.

Depending on your requirements, the pump and drive (if supplied) may arrive mounted on a baseplate. Our standard baseplates have pre-drilled mounting holes to accept base retaining bolts. All mounting holes are required for best results against vibration and noise.

To provide a permanent, rigid support for securing the pump unit, a foundation is required. This will also absorb vibration, and reduce strain on the pumping unit.

DO - Set appropriate pressure to the pump's buffer chamber using the pressurized oil bottle that has been installed on your pump.

DO - Check alignments. Pump may become misaligned during shipping. For direct drive assemblies, make sure pump and motor are aligned and the coupling is making a straight connection. The coupling guard must be in place at all times during operation. For piggy-back belt driven assemblies, confirm that the sheaves are properly aligned and the belt is tensioned correctly. The belt guard must be in place at all times during operation.

DO - Make sure that all equipment and piping are properly supported. The pump assembly and flanges are only designed to support their own weight.

Equipment Alignment – Base plate

The base frame of motor driven units must not be out of alignment or under stress by the mounting bolts to prevent noise and wear of coupling. After mounting, the alignment of coupling must be checked and corrected prior to operation.

Retighten all motor and pump mounting screws on the frame **after 20 initial operating hours.**

For pumps with belt drive check the belt tension as described earlier:

- After the first 10 operating hours
- Then every 2000 operating hours



Use the eye bolts on the pumps **only** for lifting the pump without any additional mounting parts such as the motor.

Trade Levels for installation

Consult with General Contractor as Vogelsang does not install equipment.

Special Rigging

Pump/Motor assemblies may exceed 3090 lbs. and so require some lifting device with chain and hooks to engage lifting eyes on pump and motor. Assemblies should never be lifted by pump alone, or by motor alone.

Special Test Equipment

No special test equipment is required for the installation of the pump assembly.

Safety

Identify all safety and tag-out procedures

Before setting into operation read and observe the contents of the operating instructions and the safety advisories.

Warning and information stickers provide important information for safe operation. They may not be removed. Observation of these stickers provides for your safety.

Before start up of operations you should familiarise yourself with all facilities and operating options. Pump may only be set in operation if the suction and pressure pipes are connected so that access to the pumping chamber is not possible. Before pump is set in operation, ensure that access to the rotating parts (the drive shaft) is not possible.

The drive shaft must be completely covered by a coupling guard.

Before setting into operation, ensure that the discharge pipe is not completely closed off. Otherwise the pump shaft seals or even the pump housing or the pipelines may be damaged or destroyed by the resulting high pressure.

Before starting maintenance and repair work, turn off the drive and ensure that the pump cannot be switched on by mistake.

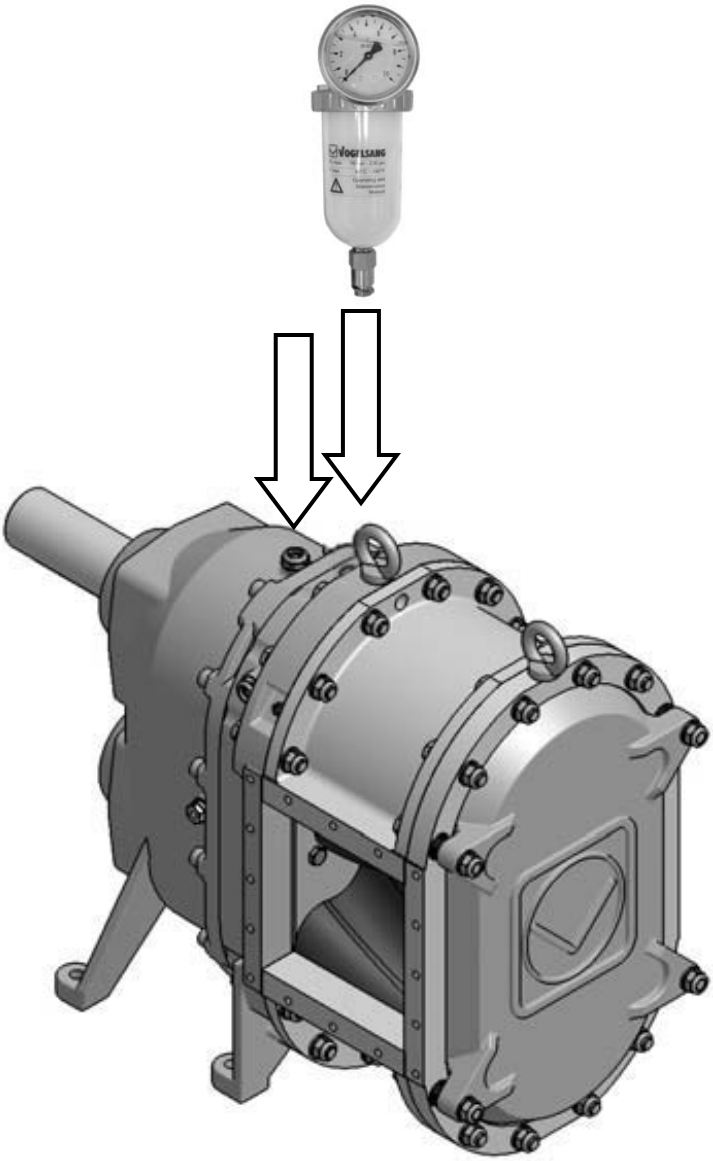
Use the **eye bolts** on the pumps only for lifting the pump without mounted parts (for example motor)!

Lubrication

Lubrication Points & Lubrication Reservoirs

There is a buffer chamber on the VX Q pump that is filled with oil and pressurized using a pressurized oil bottle.

The gearbox is filled halfway with oil to lubricate the drive gears.



2.C.3 Changing the Oil

Change the Gear Oil:

- For the first time after a period of 20 operating hours.
- Every 2000 operating hours.

Change the Buffer Chamber Oil:

- If Gear Oil has been changed.
- Every 2000 operating hours, however not more than 3 months between fill ups.
- See section 2.F.1 for information on using the pressurized oil bottle

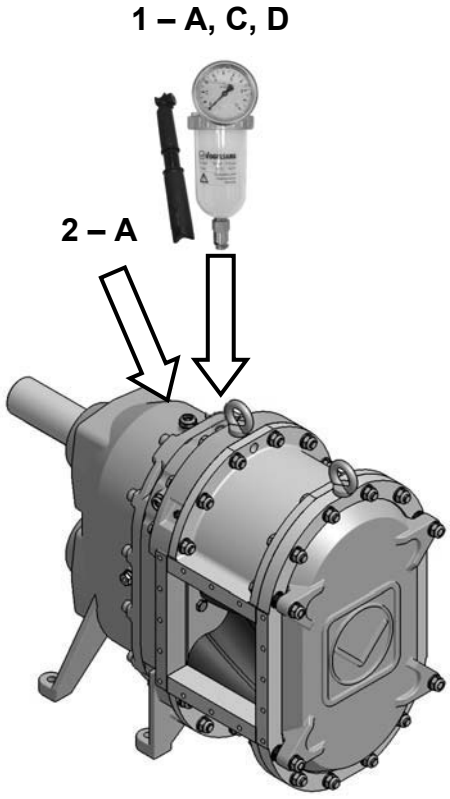
Lubricant: **Vogelsang Standard Oil**

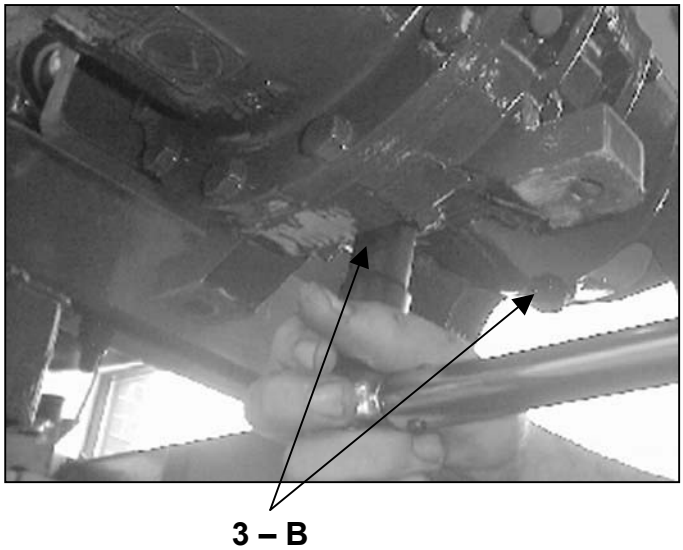
Mineral Oil Titan Gear MP90, SAE 90, Combustion point: 215°C, Art-No. BSS.006

See the table of alternative oils on the following page.

1: Pressurized Oil Bottle
2: Hex Head Screw Plug
3: Magnetic Hex Head Screw Plug

A: Fill
B: Empty
C: Check
D: Pressurize





Lubrication Chart

Lubrication Chart – VX Q Series Pumps

Location	Lubrication Specification	Supplier	Product
Gearbox	MP90 Mineral Oil SAE 90-GC-5	Fuchs	RENOLIN EP 220
		Valvoline	HP Gear Oil 80W-90
		Quaker State	FCIGL-5 MT-1 80W-90
		BP Oil	BP HYPO-U 80W-90
		Titan Gear	MP90 Gearplus
		Pennzoil	80W-90 GL-5
Buffer Chamber	MP90 Mineral Oil SAE 90-GC-5	Fuchs	RENOLIN EP 220
		Valvoline	HP Gear Oil 80W-90
		Quaker State	FCIGL-5 MT-1 80W-90
		BP Oil	BP HYPO-U 80W-90
		Titan Gear	MP90 Gearplus
		Pennzoil	80W-90 GL-5

Lubrication Quantity Chart – VX Q Series Pumps

Location	Model	Quantity
Buffer Chamber	VX 136 Q Series	1.5 quarts / 1.5 liter
Gearbox	VX 136 Q Series	2.1 quarts / 2 liter
Buffer Chamber	VX 186 Q Series	2.5 quarts / 2.4 liter
Gearbox	VX 186 Q Series	1 gallon / 4 liter

Operational Startup & Testing

Shown below is the standard we use to test each pump before it leaves the factory.

HI Rotary Pump Test

3.6 Test

This standard recognizes various performance test levels designated to permit a reasonable selection of tests, tolerances, and accuracy requirements appropriate for the application and the customer's needs.

Tests which conform to the requirements of this standard shall be designated as tests conducted in accordance with the Hydraulic Institute Test Standards.

These standards apply to tests of the pump only, unless stated otherwise. Recorded data and the final report may include information on drives and auxiliary equipment and must be identified as such.

The type of test performed and the auxiliary equipment to be used (purchaser's driver, gear box, etc.), should be agreed upon in writing by all interested parties prior to the test.

It is the intent of this standard to offer testing procedures to be used by all testing facilities. It is not the intent to limit or restrict tests to only those described herein. Variations in test procedures may exist without violating the intent of this standard. Exceptions may be taken to the provisions of this standard if properly agreed upon by the parties involved without sacrificing the validity of the applicable parts of the standard.

Since pumps are used to handle different liquids or liquid/solid mixtures, it is necessary to limit this standard to the testing of pumps with readily available test liquids. For other than normal test liquids, some methods and procedures not outlined herein may be required.

This test standard provides procedures for conducting and reporting various levels of tests of rotary pumps.

The objective of the standard is to establish a uniform demonstration of a pump's ability to perform satisfactorily both mechanically and hydraulically. This standard does not include vibration or acoustical testing.

The quantitative values observed and recorded will depend on the type of test specified. The quantitative indices are the same for a particular type of test no matter what type of pump is specified.

3.6.1 Type of performance test

I	II	III ↓	IV
Internal quality assurance test	RPM pressure	RPM pressure capacity	RPM pressure capacity power

Type III and IV have two levels of acceptance for the quantitative values. The level of test is to be level A unless otherwise specified by the user. Refer to Paragraphs 3.6.4 and 3.6.5.

Optional tests: Hydrostatic Test and Net Positive Inlet Pressure Required Test are separate tests and are described in Paragraphs 3.6.10 and 3.6.11.

3.6.2 NPIPR (net positive inlet pressure required)

NPIPR (net positive inlet pressure required) is the pressure required, above liquid vapor pressure (bubble point), to fill each pumping chamber or cavity while open to the inlet chamber. It is expressed in psi (kPa).

Many liquids handled by rotary pumps have an unpredictable or very low vapor pressure (bubble point). Most of these liquids also have entrained and dissolved gas (frequently air) as well. The practical effect of dissolved and entrained gas is to increase the NPIPR in order to suppress the symptoms of cavitation. While true cavitation occurs if the liquid reaches its vapor pressure (bubble point) during filling of the pumping cavities, most of the cavitation symptoms will be exhibited before reaching liquid vapor pressure (bubble point). This is largely due to the entrained and dissolved gas expanding when subjected to reduced pressure. Since the level of dissolved gas is a function of the liquid and its temperature and the level of entrained gas is a function of system design and operation, NPIPR for a rotary pump is difficult to establish with precision.

Normal NPIPR tests are conducted in a test environment that minimizes entrained gas. NPIPR is established at the first indication of any of the following:

1) A 5% reduction in capacity at constant differential pressure and speed;

2) A 5% reduction in power consumption at constant differential pressure and speed;

Operational Startup & Testing (continued)

HI Rotary Pump Test

3.6.3.30 Pump efficiency (η_p)

The pump efficiency, sometimes called pump mechanical efficiency, is the ratio of the pump output power (P_w) to the pump input power (P_p).

The formula for computing pump efficiency as a percent is:

$$\eta_p = \frac{P_w}{P_p} \times 100$$

3.6.3.31 Specific weight (γ)

The specific weight of a liquid is the weight per unit volume.

3.6.3.32 Specific gravity (s)

The specific gravity of a liquid is a dimensionless ratio of its specific weight to the specific weight of water at 68°F (20°C).

3.6.4 Performance test

3.6.4.1 Acceptance

Pumps must be closely checked for satisfactory mechanical operation during performance testing. The degree and extent of such checking is independent of the test type and acceptance level.

3.6.4.2 Witnessing of tests

The purchaser or designated representative may witness the test if specified in the purchase order.

3.6.4.3 Acceptance level

Level A is the normal level of acceptance for test with this standard and will apply unless otherwise specified.

Level B will apply when specified by the purchaser.

3.6.4.4 Acceptable deviation of independent test quantities from specified values

	Level A (Normal)	Level B (When specified)
Outlet gauge pressure	± 1%	± 1%
Inlet gauge pressure	± 5%	± 5%
Speed	± 2%	± 2%
Viscosity	± 7.5%	± 5%

3.6.4.5 Acceptable deviation of dependent test quantities from specified values for Type III and Type IV testing

	Level A (Normal)	Level B (When specified)
Rated capacity (Q = gpm)	$+\frac{100}{1+Q^{.33}}$ %	$+\frac{100}{1+Q^{.4}}$ %
	− 0	− 0
Pump input power[1] (p_p)	+ 0	+ 0
Total input power[1] (p_{mot})	+ 0	+ 0

1) When adjusted to rated pressure, speed and viscosity

3.6.4.6 Instrumentation

Test instrumentation should be sufficient to adequately measure relevant test conditions for the specified level of testing. Instrument accuracy requirements are defined in Paragraph 3.6.4.6.1. Level A instruments need not be calibrated specifically for each test but are to be periodically calibrated as noted by the manufacturer. Level B instruments are to be calibrated as specified in Paragraph 3.6.12. Description and setup of commonly used instruments, suggested maximum period between calibration, and computation of pressure are shown in Paragraphs 3.6.7 to 3.6.12.

3.6.4.6.1 Fluctuation and accuracy

		Acceptable fluctuations of average test readings as a ± percentage		Accuracy of the average test reading as a ± percentage	
Level		A	B	A	B
Capacity		4	1	2	1
Pressure or Head	Outlet	5	5	4	1
	Inlet	6	5	2	1
Pump Input Power		2	2	1.5	1.0
Total Input Power		2	2	1.5	1.5
Pump Speed		1	1	1	1
Temperature		3°F (1.7°C)	3°F (1.7°C)	1	1

Data from Startup & Testing Procedures

Actual certified field service reports will be inserted here, when conducted, and upon the final printing of this manual.

Test method, equipment, and procedure

Pump start-up is dependent on actual application. On start-up flow rates, pressures and speeds should be noted on the Start-Up checklist for comparison with design specifications. Differences should be noted.

Flow meters, pressure gauges and similar instruments may be used or installed in the system for observation of application conditions. Any request for technical assistance from Vogelsang will require this data.

Certified Factory tests will be conducted on all products per the specification, and approved by the engineer, prior to shipment.

Field tests will be conducted by the contractor per the specification. Vogelsang will witness these tests.

Preventative Maintenance

Inspection & Routine Adjustment

	Stocked Pumps: Once Every 30 days	Initial Startup	Before & After long out-of-service periods	10 operating hours after initial startup	20 operating hours after initial startup	Every 200 operating hours	Every 500 operating hours or 3 months	Every 2000 operating hours	After Exposure to strong contamination
New Pump w/Mechanical Seal combination of metals: SiC-Si/TC. One Rotation when not in service	X								
Remove plastic plug from breather on V100 QHD Pumps.		X							
Check belt tension for belt drive pumps according to specification for all pumps configured with V-Belt Drives				X				X	
Tighten all mounting bolts					X				
Check buffer chamber oil level					X	X			
Change buffer chamber oil								X	X
Change Gear Oil				X				X	
Check Gear Oil Level							X		

Man Hours Required for Preventative & Routine Maintenance

All Q Series Pumps – Time in Hours				
Title	Electrician	Mechanic	Operator	Laborer
Lobe Change	1.0	2.0		
Seal Change	1.0	2.5		
Wear Plate Change	1.0	1.5		
Housing Adjustment	1.0	2.5		
Complete Wet-End Rebuild (all of the above tasks)	1.0	4.0		
Check Oils		.25		
Change Oils		.75		

Number of Personnel Required for Preventative & Routine Maintenance

All Q Series Pumps – Time in Man Hours				
Title	Electrician	Mechanic	Operator	Laborer
Check Oils		.25		
Change Oils		.75		

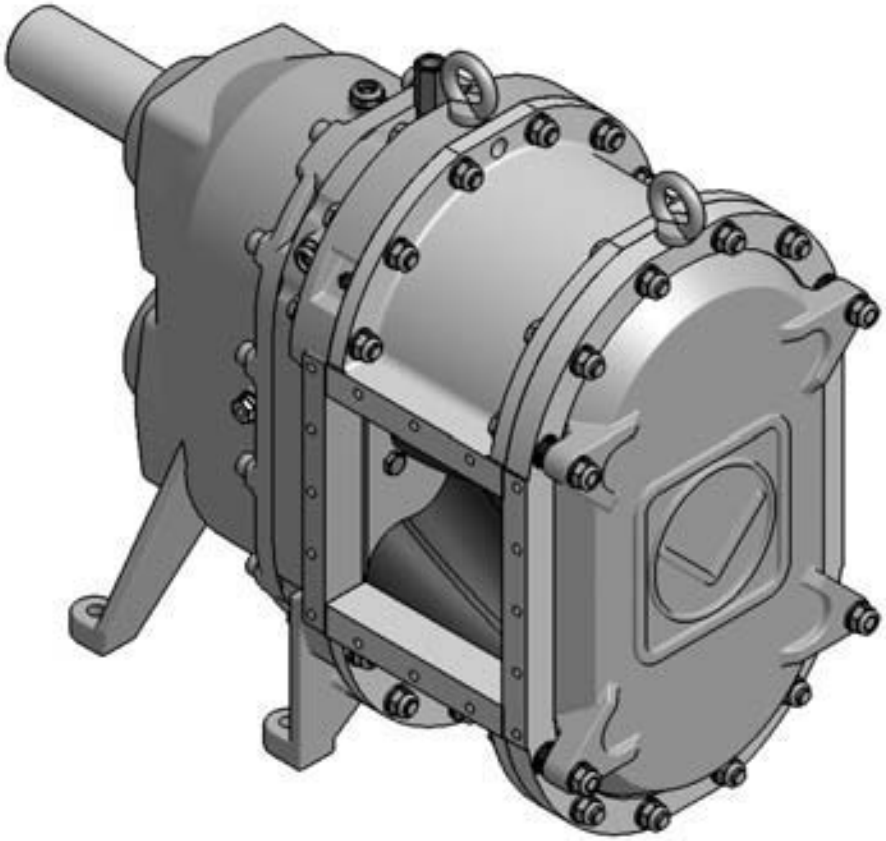
Frequency of Preventative & Routine Maintenance

	Stocked Pumps: Once Every 30 days	Initial Startup	Before & After long out-of-service periods	10 operating hours after initial startup	20 operating hours after initial startup	Every 200 operating hours	Every 500 operating hours or 3 months	Every 2000 operating hours	After Exposure to strong contamination
New Pump w/Mechanical Seal combination of metals: SiC-Si/TC. One Rotation when not in service	X								
Tighten all mounting bolts					X				
Check buffer chamber oil level					X	X			
Change buffer chamber oil								X	X
Change Gear Oil				X				X	
Check Gear Oil Level							X		

Corrective Maintenance

Details for equipment disassembly & assembly

Overhaul Manual for VX Q Series Pumps



Prior to starting any repair, make sure you understand the safety instructions provided with any piece of rotating equipment. There is a specific section in this manual that deals with safety concerns related to the Vogelsang Pump. Make sure you read and understand this section completely prior to starting any repair. If you have questions, please contact: **800.984.9400**

Depressurize Buffer Chamber

IMPORTANT:

Your pump is equipped with a pressurized oil canister. When you are working on the mechanical seals you must depressurize the buffer chamber before you remove the seals.

Whenever the mechanical seals are removed from the pump, a pressure test is highly recommended after re-installation of the mechanical seals and wet-end parts. This test will confirm that installation has been successful and no o-rings have been cut or pinched in the process. The pressurized oil bottle itself is ideal for this pressure test.

Pressure Testing:

1. **Test for proper seal installation:** Install a pressurized oil bottle at the empty buffer chamber port at the top of the pump. With the provided hand pump or other air source, pressurize the bottle (no oil in chamber) to approximately 21 psi (1.5 bar) and observe the gauge. Pressure should hold steady for at least 15 minutes. Then depressurize the bottle, remove it, re-fill the buffer chamber and re-install the pressurized oil bottle. A specific pressure is to be set on the oil bottle which is specific to your pump's operating pressure. Review the following page for instructions on determining and setting the pressure for your pump's buffer chamber.
2. If the buffer chamber does not hold pressure it will be necessary to disassemble and recheck all o-rings for damage, and the lobe core surfaces for proper preparation. Check also that the seal cartridge is seated fully into the pump body and the cartridge outer body is flush with pump body.
3. Re-install pump outer door (front pump cover) to complete assembly.



Use the included Hand Pump to add pressure inside the **empty** blocking chamber.

21psi equals about 1.5 bar on your pressure gauge.

Repressurizing Pump *after* completed maintenance

The pressurized buffer chamber canister (oil bottle) provides a constant pressure against the mechanical seal helping to prevent infiltration of material from a higher pressure in the pumping chamber. The semi-opaque container also allows easy monitoring of the oil level.

1. Fill the buffer chamber completely using the same oil as that used in the gearbox, ie. 80W90 hypoid gear oil.

2. If a non-pressurized oil bottle has been previously installed, remove and discard the bottle and the check valve installed under the bottle. Install the pressurized oil bottle, screwing it directly to the buffer chamber. On belt drive units, a hose kit is necessary to mount the bottle in a remote location.

3. Fill the pressurized oil bottle about 1/4 full with buffer chamber oil (see above). Using the supplied hand pump, pressurize the buffer chamber using the formula: 1/2 of normal pump operating pressure plus 7 psi. For example, if your pump normally has a pressure head on the suction side of 2 psi and a discharge pressure of 30 psi, the operating pressure is 32 psi. Pressurize the oil bottle to (1/2 x 32) + 7 = 23 psi.
   It's as easy as a b c. Just fill in the blanks:

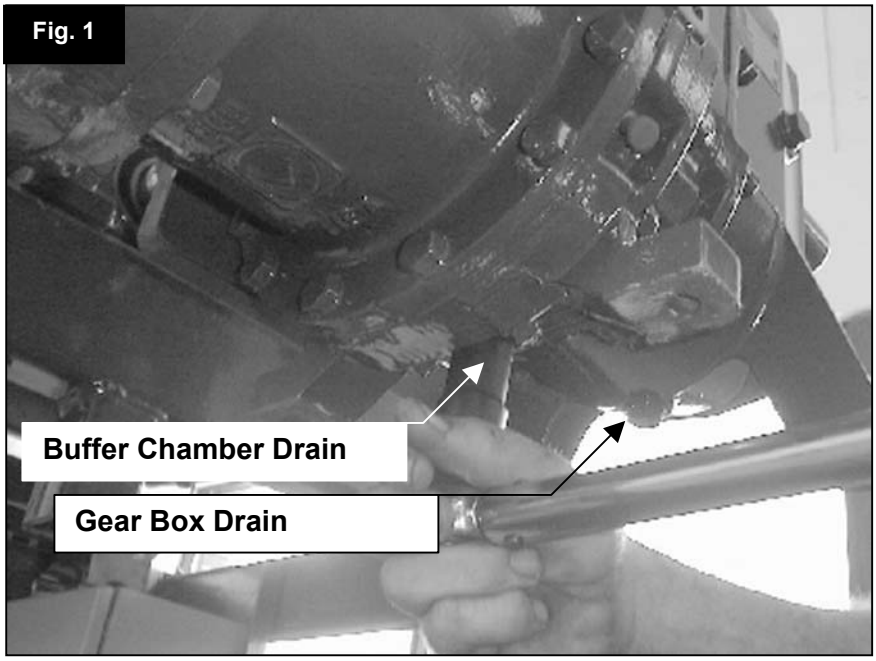
Step	Suction Pressure	*Plus*	Discharge Pressure	*Equals*	Operating Pressure
a		**+**		**=**	

	Operating Pressure	*Divided by*		*Equals*	½ Differential Pressure
b		**÷**	**2**	**=**	

	½ Differential Pressure	*Plus*	PSI	*Equals*	Gauge Pressure
c		**+**	**7psi**	**=**	

Drain Pump Oil Reservoirs

Fig. 1



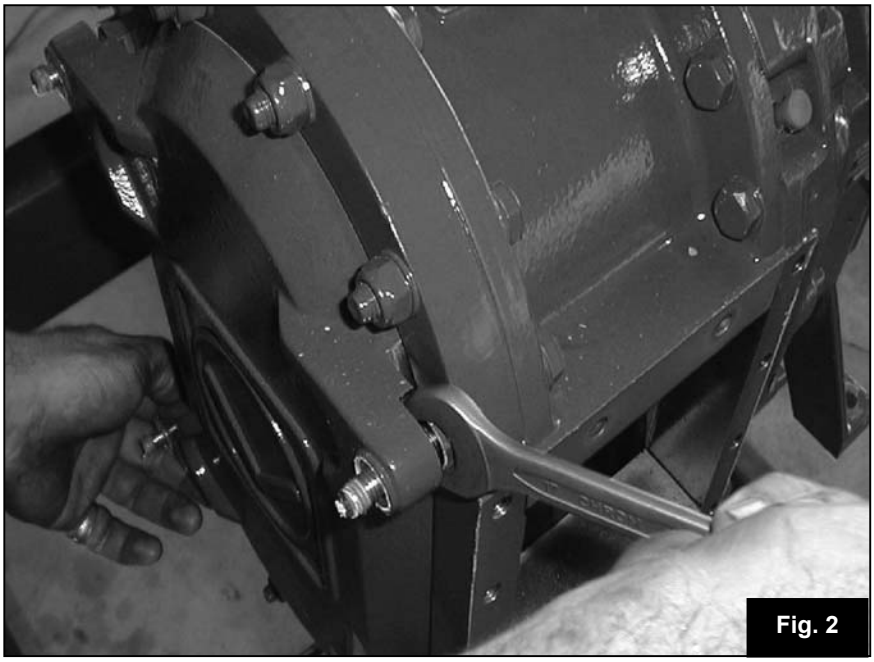
NOTE: *Your pump is supplied with a pressurized oil bottle. Release pressure and unscrew oil bottle from the pump.*

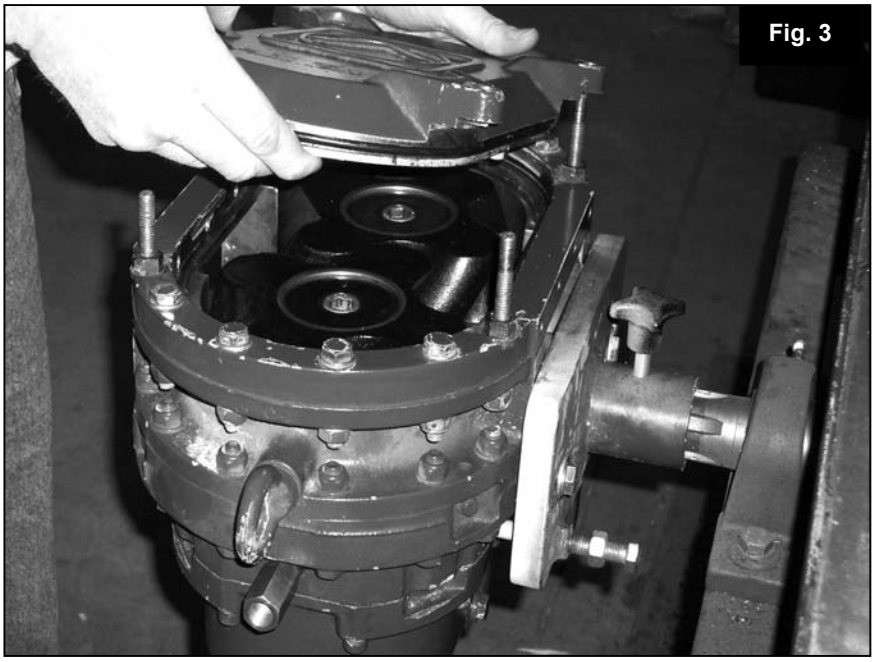
To begin service to the pump wet-end drain oil from the buffer chamber by loosening and removing the bottom drain plug. Remove the pressurized oil bottle from the top of the chamber at the same time. Place it in a safe place for reuse.
Place a drain pan under the pump to catch the quenching oil. Remove the buffer chamber drain bolt (**Fig. 1**) located on the bottom of the pump. This part will be reused.

Inspect the oil for foreign bodies or other evidence of contamination, as this may indicate mechanical seal failure.

Remove the top bolt on the gear case of the pump, and save for re-use. Place an oil collection pan under the pump, and loosen and remove the bottom drain plug from the gear case of the pump. Inspect the oil for foreign bodies and other contaminants. This may be an indicator of the lip seal performance, or gear/bearing damage.

Remove Rotary Lobes


Fig. 2


Fig. 3

Note: *Take care to insure the pump oil chambers have been drained prior to removing lobes.*

Remove the 4 door retention nuts and washers, and place in a safe place for re-use (**Fig. 2**).

Using an open-end wrench, carefully free the door from its groove in the housing, remove, and set aside.

The pump end plate, sometimes referred to as the door, can be heavy. Use care removing it from the fluid end of the pump. The pump end plate will also consist of the outer wear plate and may retain the sealing o-ring. Remove as a unit. Inspect the wear plate and replace if necessary (**Fig. 3**).

Note: *Some wear is expected on the outer wear plate. Excessive wear means pump flow is no longer satisfactory. Hardened plates are coated on just one side, thus turning the plate over only temporarily improves pump performance.*

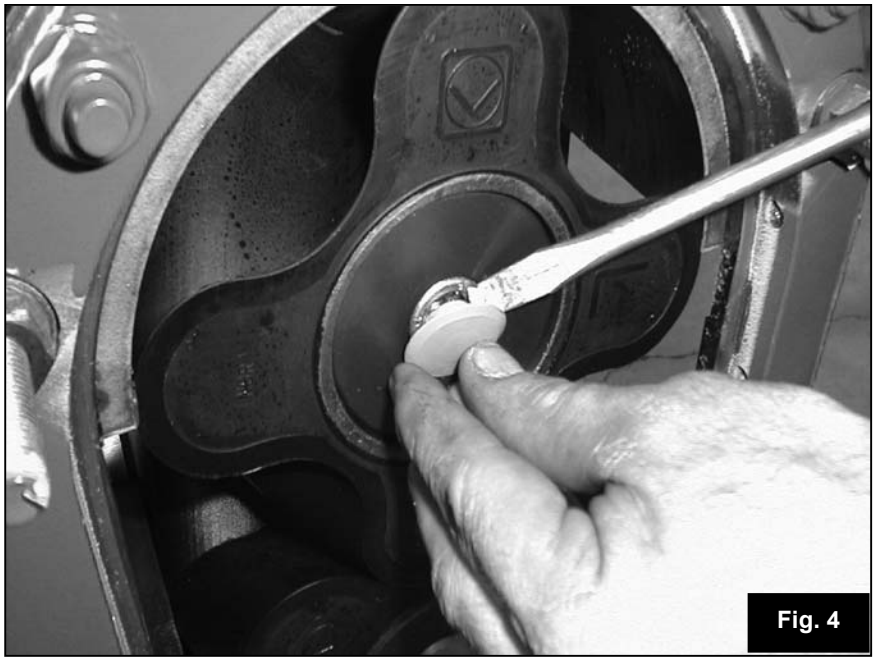


Fig. 4

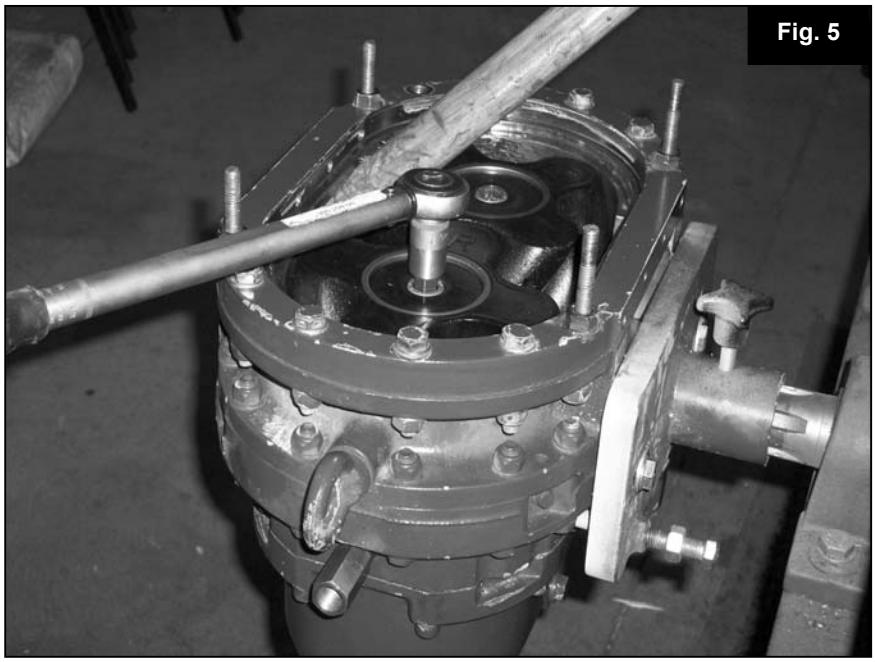


Fig. 5

Some pumps are equipped with plastic caps to protect the lobe retention bolts (strain screws). If your pump is equipped with these plastic covers, simply pry them loose with a flathead screwdriver, and discard (**Fig. 4**).

Note: *The caps are not required for proper pump operation.*

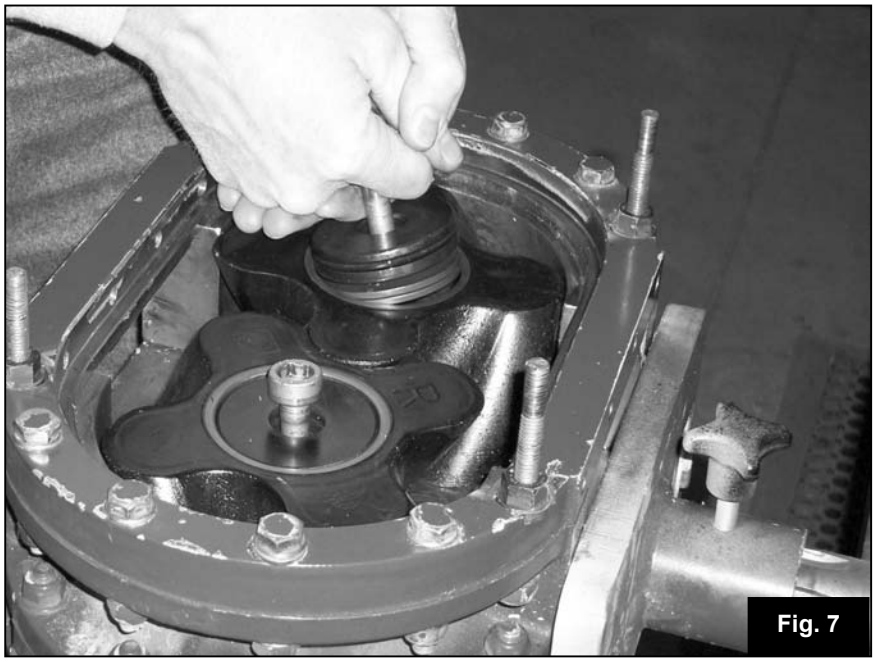
Insert the strain bolt socket provided with the optional lobe puller. With the lobes blocked so they will not rotate, loosen the lobe retention bolts. They will be very tight, so take care not to strip them. The bolt will loosen from the shaft, then seem to turn freely in the hole (**Fig. 5**).

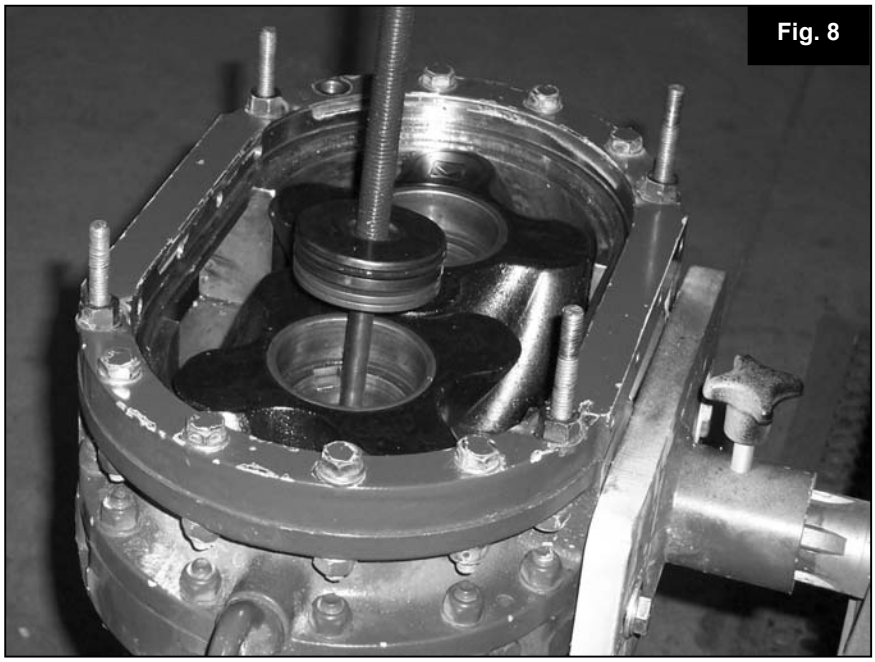
Note: *It is very easy to strip the strain bolt heads. Take care to use correct tools for this operation.*

Special Tool Required



Strain Bolt Wrench:
Part # WIN.002


Fig. 7


Fig. 8

Once you feel the bolt begin to move in the hole freely, pull the bolt toward you, until it stops, then continue to unscrew it through the locking (**Fig. 7**).

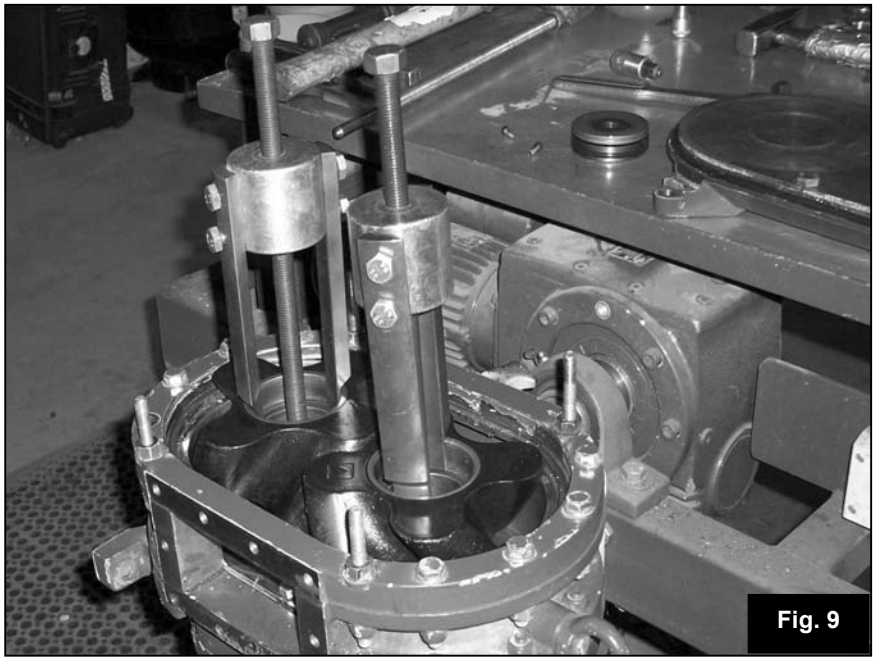
When several threads have been engaged, use the strain screw to pull the washer assembly out of the lobe end.

Carefully screw the lobe retention bolt into the locking disk, insuring that the threads are securely set into the disk only.

With the bolt secured in the locking disk, firmly grasp the bolt, and in a back and forth motion, wiggle the disk free. Save the disk for re-use. Remove and retain washers if loose for re-use.

Note: *the washers are generally fixed to the locking disk. Note also the o-ring on the outer edge of the locking disk, and the one on the inner edge of the locking disk. These should be replaced at each lobe change, but can be re-used if not severely compressed.*

In the event that the disk is too tight to pull out by hand, using the center bolt of the lobe puller tool in place of the strain screw, and turn the bolt down into the disk assembly (the thread is the same as the strain screw). The bolt will bottom out on the shaft and then push the disk assembly up out of the lobe end (**Fig. 8**).


Fig. 9

Using the lobe puller, loosen the arm bolts, and place the end of the arms into the groove provided in the lobe. Tighten the arm bolts on the lobe puller. Tighten the extraction bolt on the lobe puller to pull the lobes from the pump. Repeat as necessary (in the event of “stacked” lobes), removing lobes from both shafts (**Fig. 9**).

Note: *Lobes must be pulled together in pairs. Using two sets of pullers is recommended as it will save you a significant amount of time.*

Special Tool Required



Lobe Pullers: We recommend ordering two sets.

VX136 Short Lobe Puller: Part #PBA.B001.TK for models 70, 105
VX136 Long Lobe Puller: Part #PBA.B001.TL for models 140, 210

VX186 Short Lobe Puller: Part #PBA.A001.TK for models 92, 130,184, 260
VX186 Medium Lobe Puller: Part #PBA.A001.TL for models 184, 260
VX186 Long Lobe Puller: Part #PBA.A001.T1 for models 368, 390

Removing Cartridge Mechanical Seals

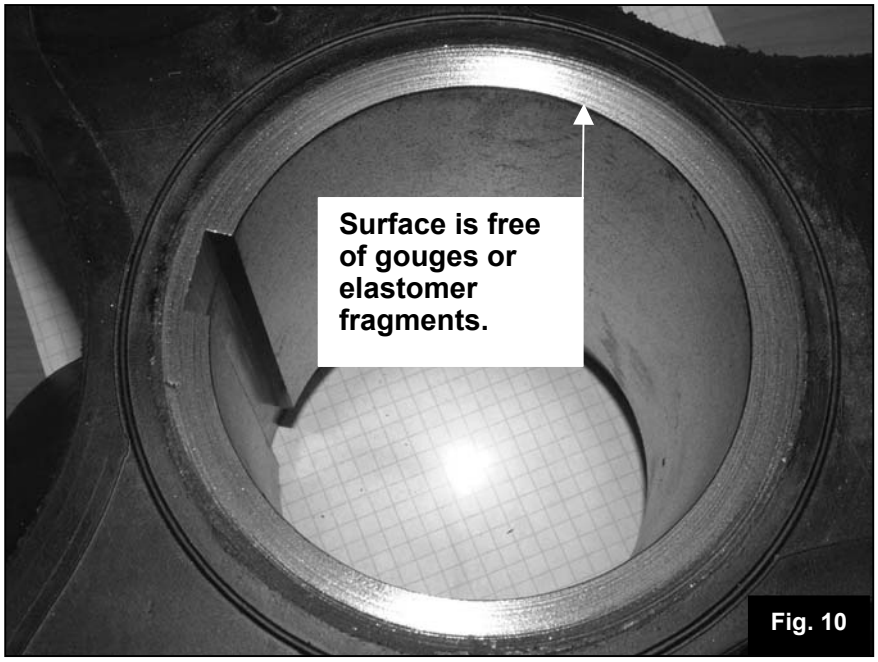


Fig. 10

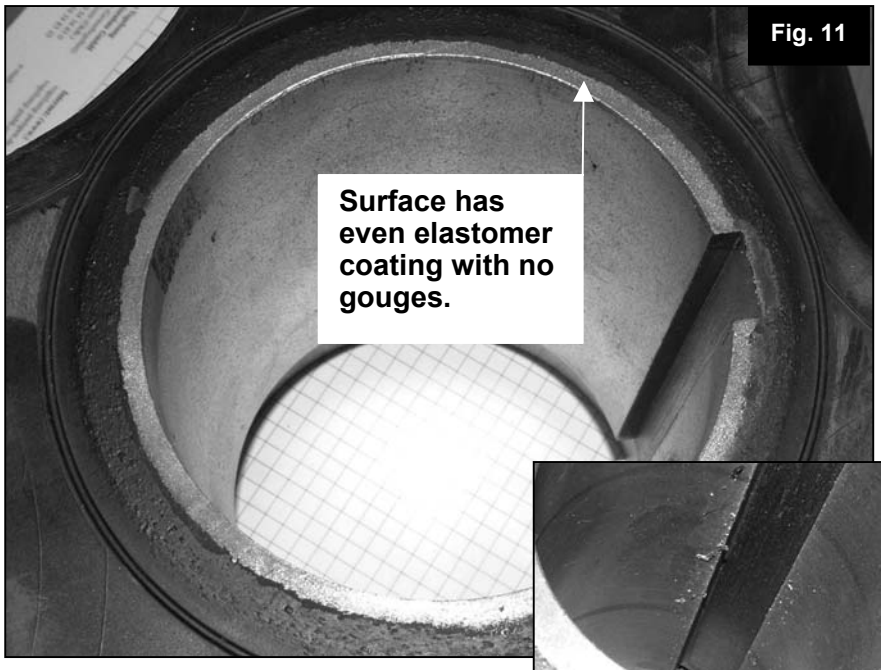


Fig. 11

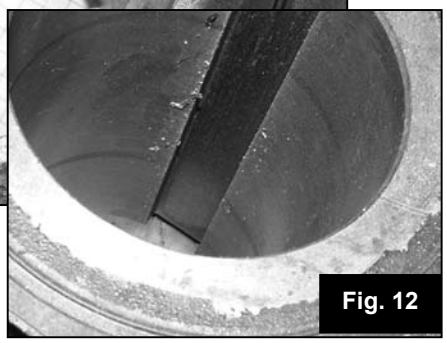


Fig. 12

Before continuing with cartridge seal replacement:

Important! Once you've removed the lobes, you must evaluate the condition of the lobe core that will contact the Block Ring. **Lobe condition is critical** to prevent premature seal failure (**Fig. 10 & 11**).

Lobes provided before the development of the Block Ring seal may have partial coating on the inner core which mates with the seal. These lobes may show small bits or pieces of the coating in a jagged appearance around the surface which is not acceptable when using Block Ring seals.

New lobes have a smooth, clean, machined appearance and show no jagged bits of coating. If lobes are being reused with the Block Ring seal, attention must be given to the condition of the lobe core, assuring that it has not been damaged.

Unacceptable: Jagged pieces of coating on inner core can lead to seal failure (**Fig. 12**).

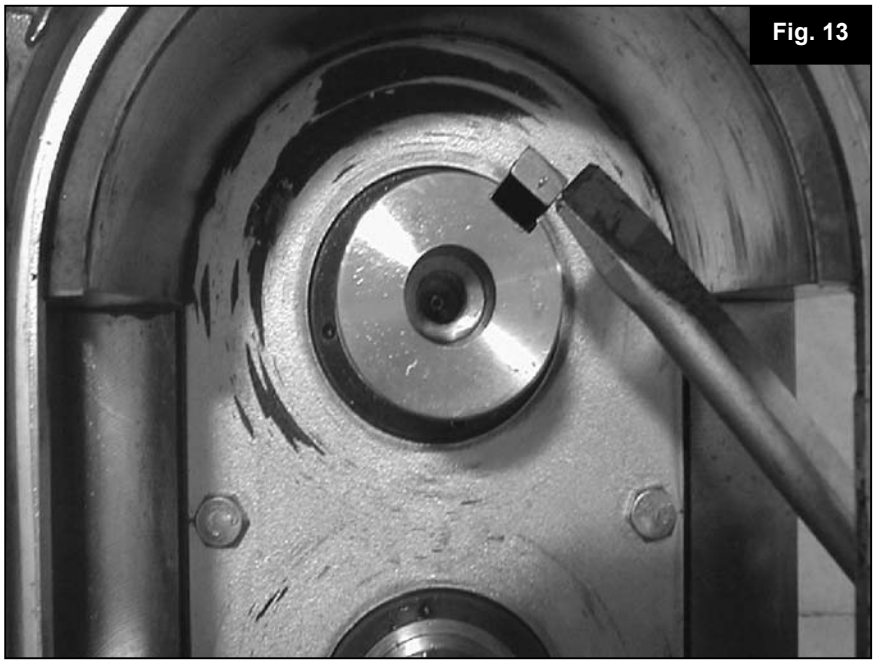


Fig. 13

With the aid of a hammer and chisel, carefully tap the keys (**Fig 13**) from their keyway, and remove from the pump.

Remove any burrs from the shaft with the aid of a file or emery cloth. Take care not to injure yourself on the sharp edges of the keyway.

Carefully reach into the pump, and remove the wave washers (**Fig 67**) from the shaft. If replacing the cartridge or block ring mechanical seal assembly, these parts will be included and should be replaced. If changing just the lobes they may be re-used, but replacement is recommended.

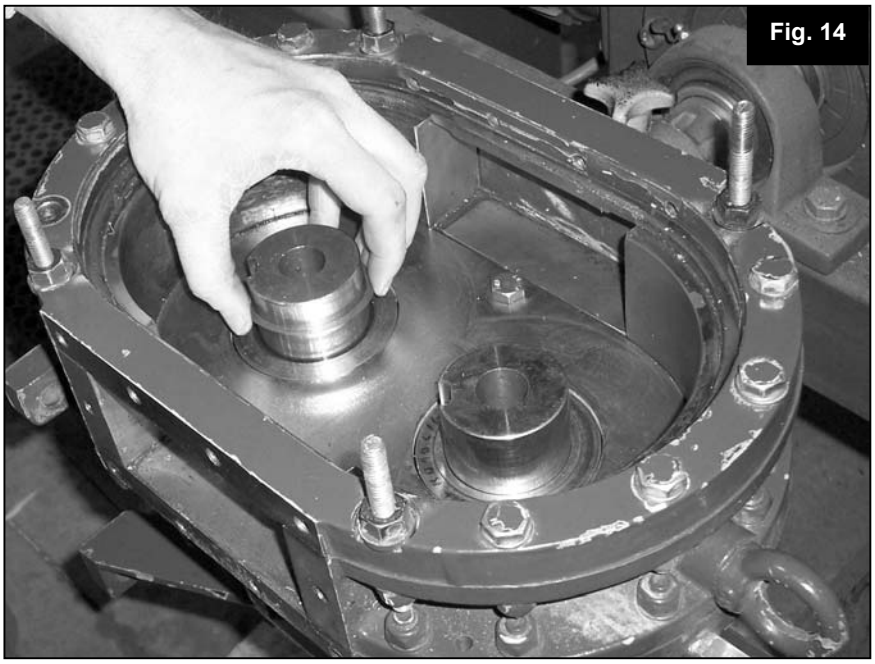


Fig. 14

Note: *Washers (**Fig 14**) go on top and bottom shaft. Re-install them in the same location from which they were removed.*

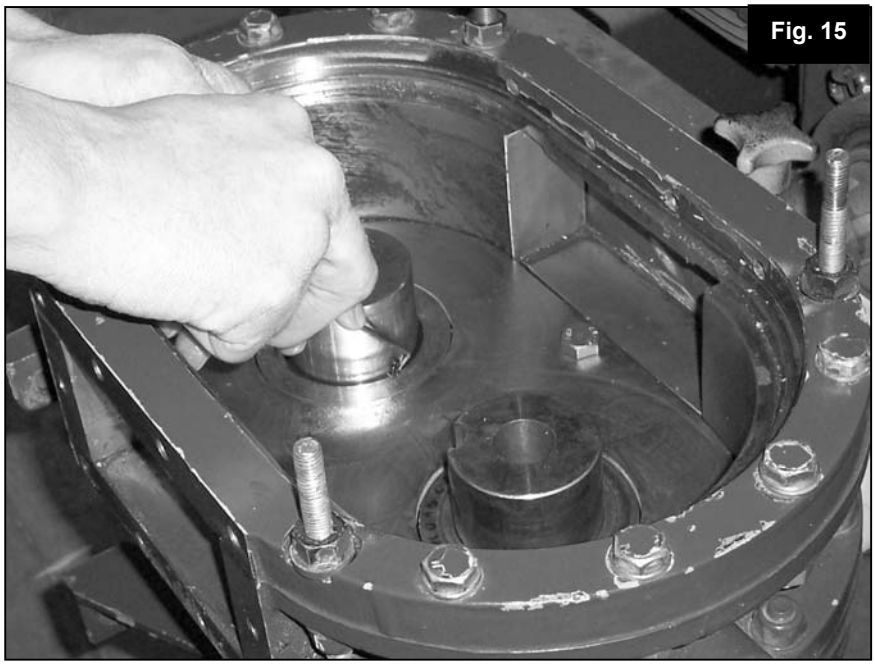


Fig. 15

Using a dental pick, o'ring puller or similar sharp instrument, remove and discard the o-ring (**Fig 15 & 16**) located around the pump shaft.

Note: *Never re-use this o-ring.*

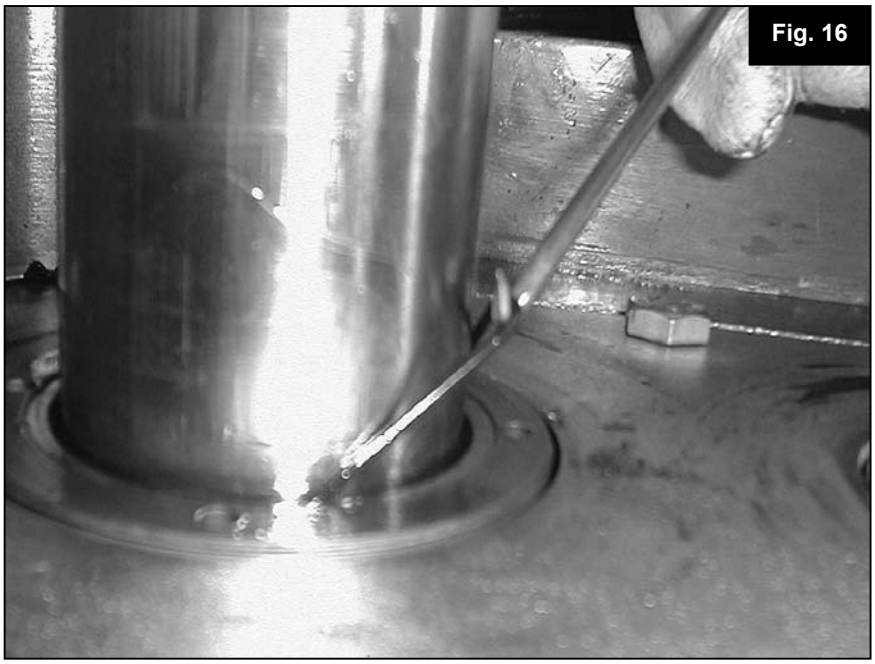


Fig. 16

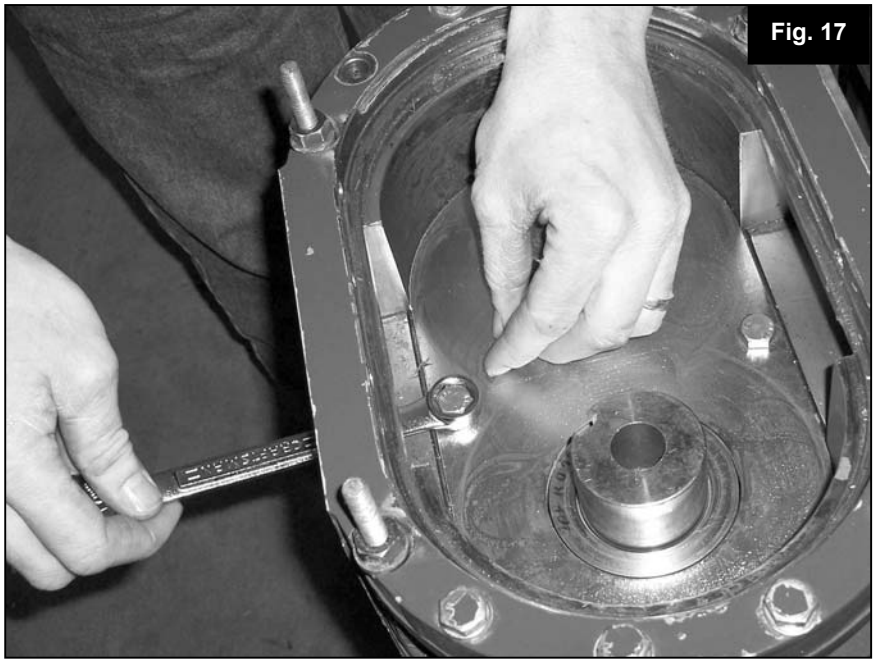


Fig. 17

Loosen and remove the two bolts (**Fig 17**) holding the rear wear plate. Inspect the bolts for wear. If in good condition, retain for re-use. If damaged, discard and replace during re-assembly.

Remove wear plate. Inspect for wear. If in good condition, re-use. If damaged, replace. As with the outer wear plate, some wear is expected. Excessive wear is determined by loss of flow performance. When pump flow is unsatisfactory the plate must be replaced. This plate can never be turned over for re-use.

Note: *The back wear plate has a slight convex bend to it (**Fig 18**). The plate is installed one-way only, with the ends of the plate pushing the center up slightly. The retaining screws bring the plate flush to the pump body and provide tension to the assembly.*

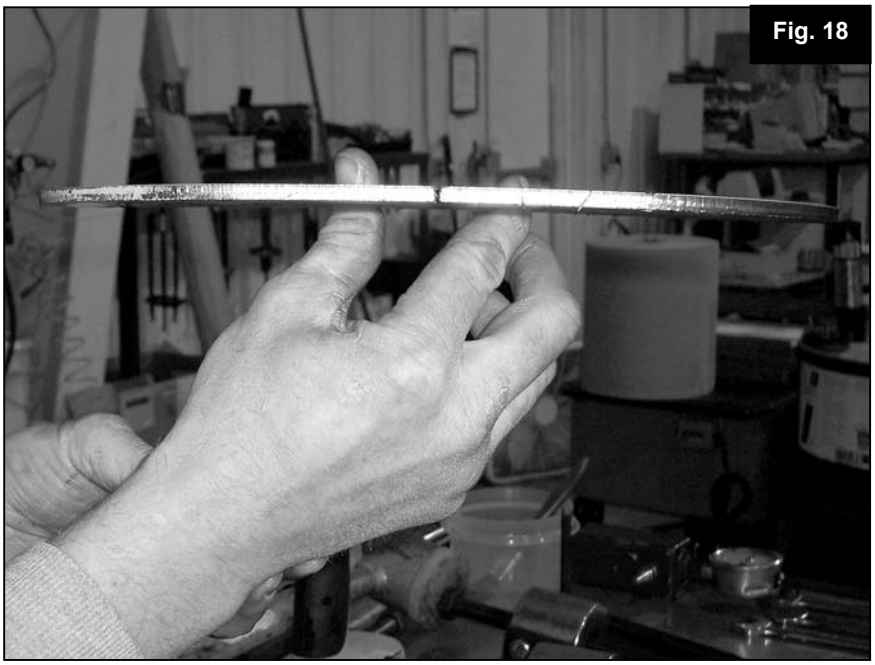


Fig. 18



Fig. 19

Remove the o-ring (**Fig 19**) at the top of the mechanical seal cartridge assembly. Discard the o-ring and replace. This o-ring is provided with the mechanical seal assembly if the cartridge is being replaced.

Cartridge and block-ring seal assemblies are supplied with 2 small set screws on opposite sides of the outer carrier of the assembly. Remove these small screws using a 2.5mm allen wrench (**Fig 20**).

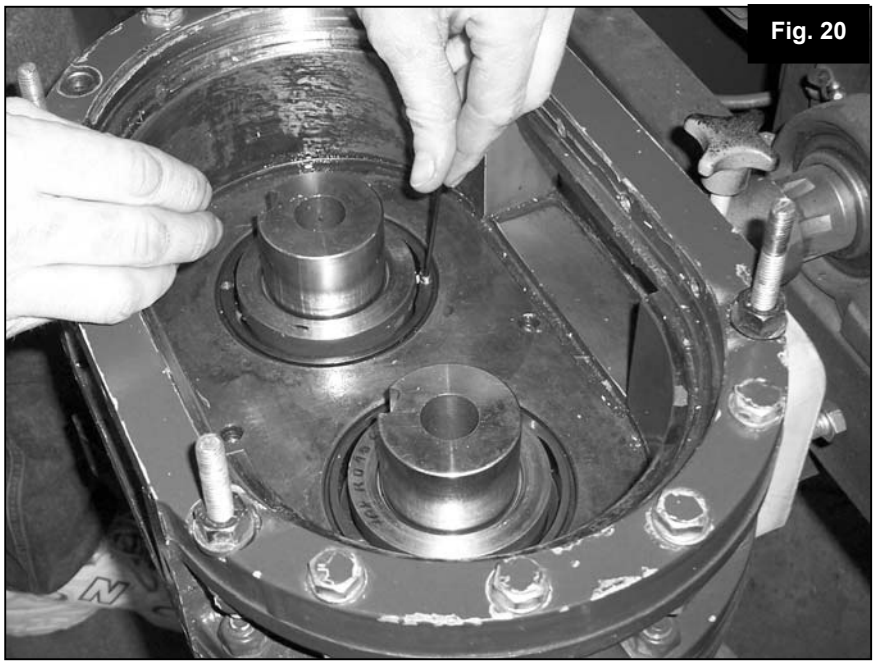
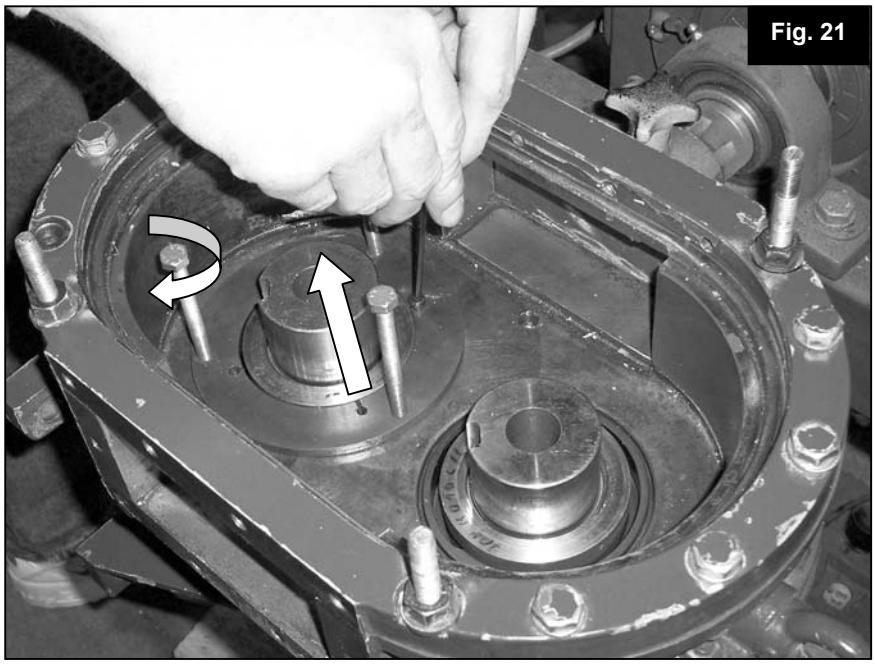


Fig. 20

These set screws are installed to help keep material out of the threaded holes in the carrier used by the cartridge removal tool (**Part # PBA.A014.N1: VX186Q PBA.B020.N1: VX 136Q**).

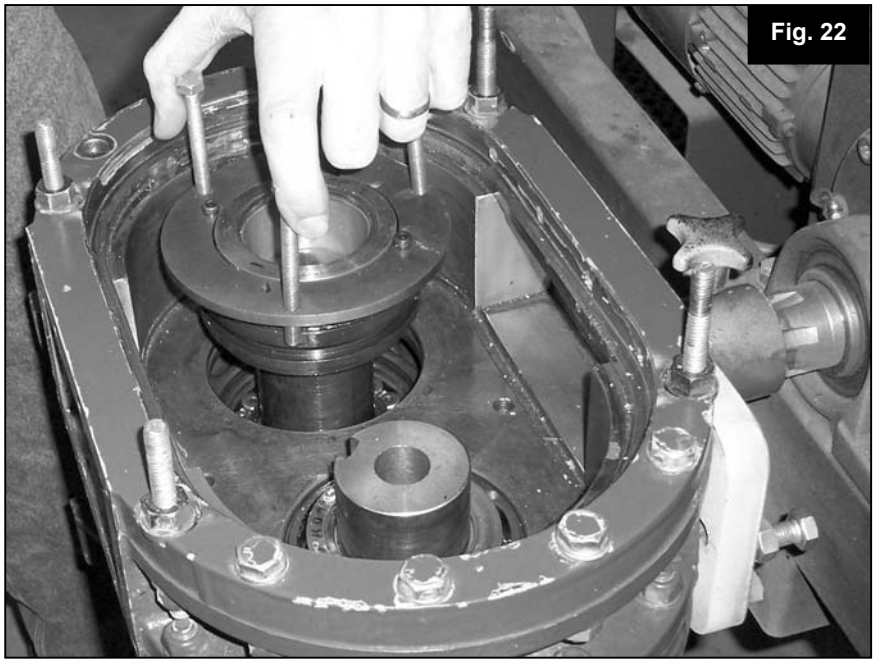
Special Tool Required




Fig. 21

Place the cartridge removal tool ring over the shaft of one cartridge assembly at a time. Install two retaining screws to attach the ring to the outer edge of the carrier on the seal assembly, and thread three jacking screws into the removal tool ring (**Fig 21**)**.** As the jacking screws are tightened into the ring and against the pump housing, the ring will pull the cartridge assembly out of the seal bore.

Pull entire seal assembly up off the lobe shaft. Repeat the procedure for the other mechanical seal assembly. Use an even, slow pressure with the jacking bolts to avoid bending the assembly tool ring. Turn each screw one or two turns at a time, and rotate around the ring increasing pressure with the jacking screws (**Fig 22**).


Fig. 22

Note*: If re-using a mechanical seal assembly, the o-ring around the outer circumference of the assembly must be replaced. These o-rings are part of the seal assembly kit when ordered new.*

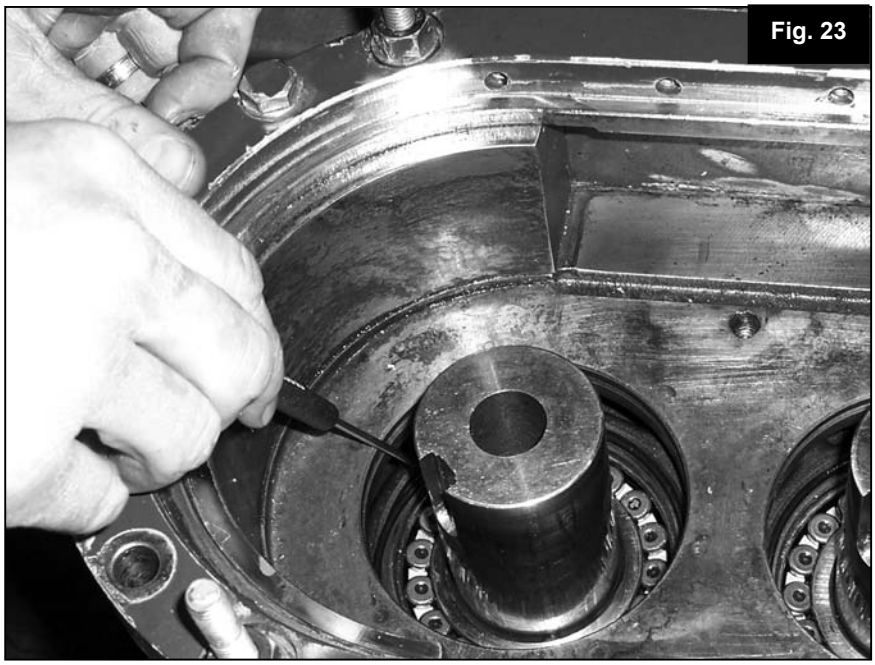


Fig. 23

Remove the o-ring (**Fig 23**) from the case. This is the same size o-ring as the one on the outer circumference of the seal assembly.

Caution: *The large o-rings used with the mechanical seal assembly are all the same size. However, the o-ring located directly behind the wear plate may be of different material depending on the elastomers used in the pump. All elastomers are standard as NBR, but optional elastomers may be provided, if specified, to combat reaction to specific chemicals being pumped.*

Note: *This completes the mechanical seal removal procedure. The entire wet-end is now disassembled. If you need to work on the pump's gearbox end, skip to that section at this point.*

Installing Block Ring Mechanical Seals



Each Block Ring Mechanical Seal Kit Includes:

Block Ring Mechanical Seal, 4 o-rings, & flat washer. **Do not reuse your old parts.**

Note: *If you are upgrading to our new Block Ring mechanical seal, you may have our old style non-pressurized oil bottle. All Block Ring seals require a pressurized oil bottle. The pressure setting will depend on your particular application. Follow the instructions in the Oil Bottle Instructions demonstrated earlier in this manual.*



Do not use Non-pressurized glass oil bottle with Block Ring Mechanical Seals.

Pressurized plastic oil bottle includes hand pump (included in kit)



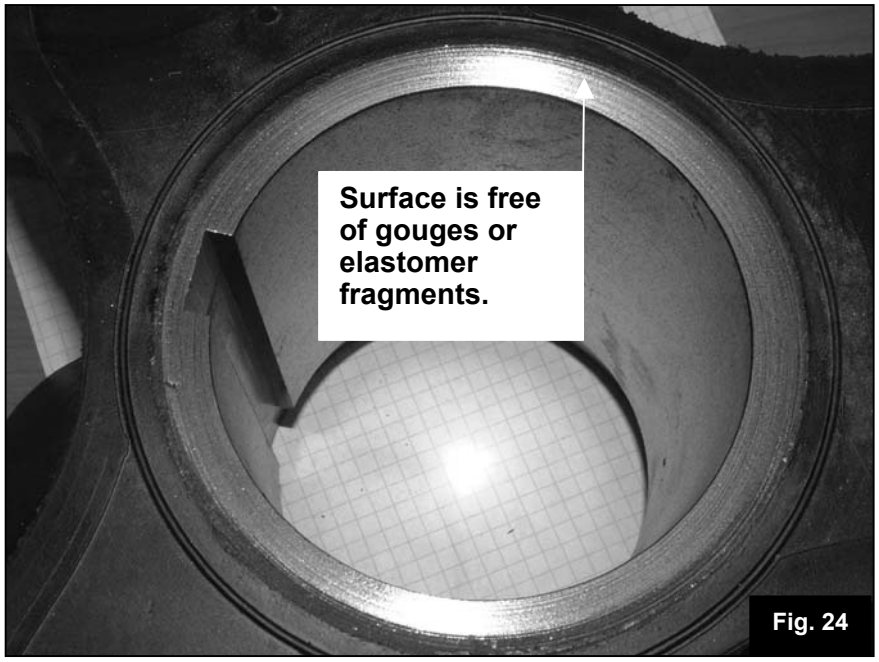


Fig. 24

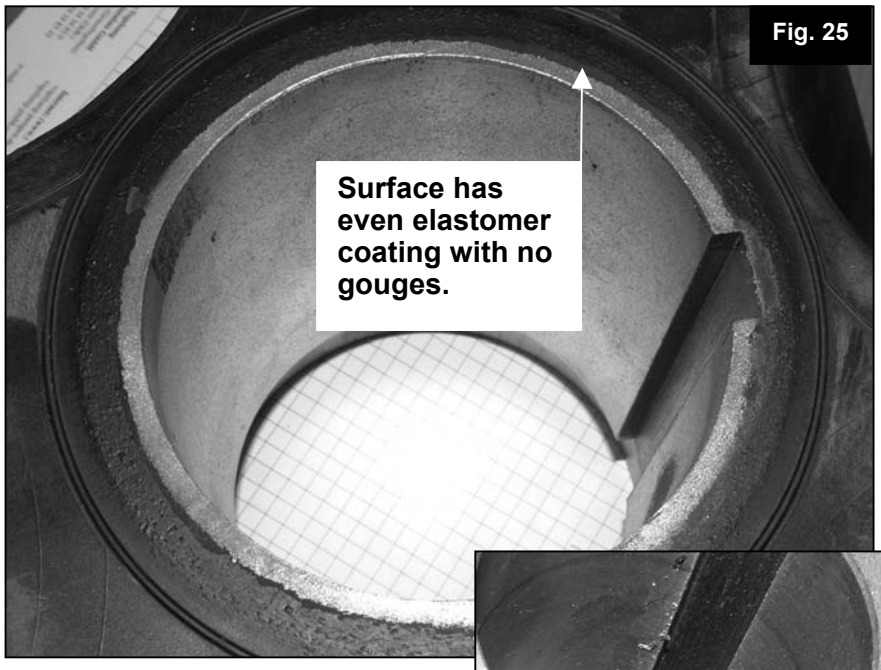


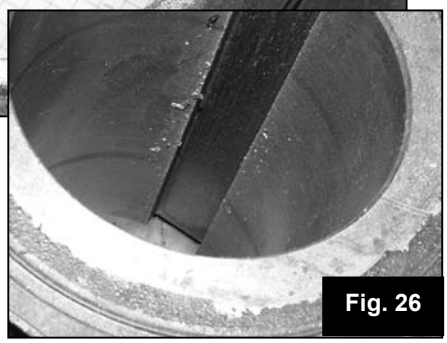
Fig. 25

Before continuing with cartridge seal replacement:

Important! Once you've removed the lobes, you must evaluate the condition of the lobe core that will contact the Block Ring. **Lobe condition is critical** to prevent premature seal failure. (**Fig. 24 & 25**)

Lobes provided before the development of the Block Ring seal may have partial coating on the inner core which mates with the seal. These lobes may show small bits or pieces of the coating in a jagged appearance around the surface which is not acceptable when using Block Ring seals.

New lobes have a smooth, clean, machined appearance and show no jagged bits of coating. If lobes are being reused with the Block Ring seal, attention must be given to the condition of the lobe core, assuring that it has not been damaged.


Fig. 26

Unacceptable: Jagged pieces of coating on inner core can lead to seal failure (**Fig.26**).

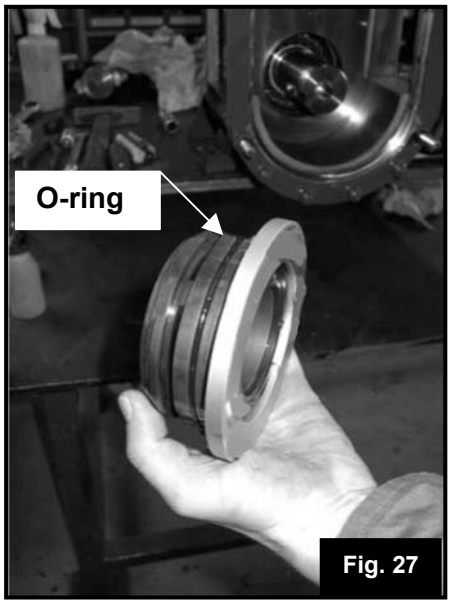
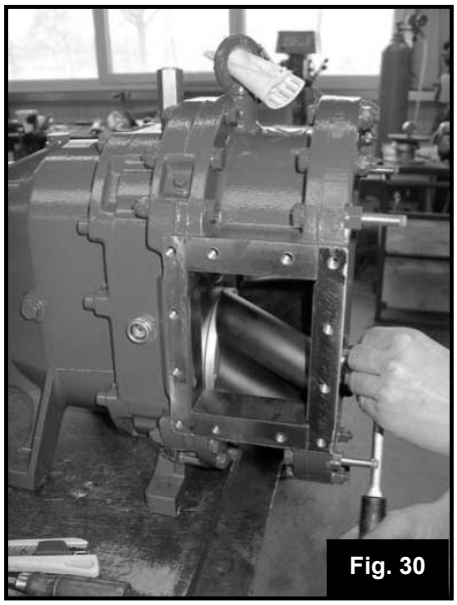


Fig. 27


Fig. 28


Fig. 29


Fig. 30

Installing Block Rings Seals:

Replace the o-ring inside the blocking chamber casing. Install a new o-ring around the outer body of the new mechanical seal cartridge, liberally coating the o-ring and the inside race of the seal assembly with buffer chamber oil (**Fig 27**), and slide the cartridge seal and seal removal tool (no bolts) onto shaft and push into the pump body as far as possible by hand (**Fig 28**).

Lubricate the shaft and slide in the lobe (without key in keyway) against the removal tool (**Fig 29**). Use the existing pressure disks and strain screw and draw the lobe against the pump body, thereby seating the mechanical seal (**Fig 30**).

Remove the screw, pressure disks, lobe and removal tool.

Repeat this procedure on the other shaft.

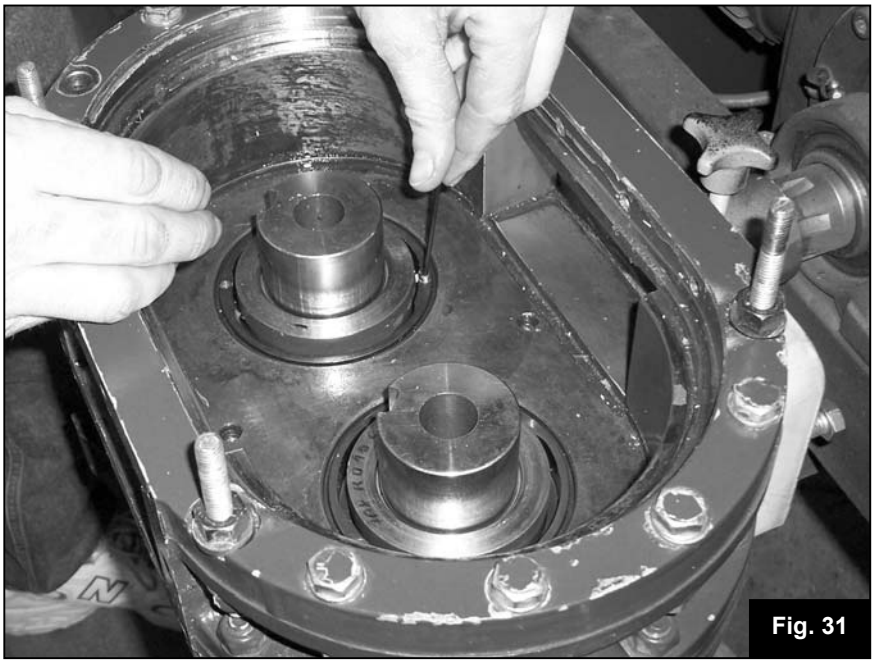


Fig. 31

Liberally coat seal outer o-ring with buffer chamber oil, and set o-ring in place. Do not attempt to seat the o-ring between the seal body and the pump body. This will occur upon final assembly and tightening of the wear plates (**Fig 31**).

Coat the smaller o-ring with oil, and slide over shaft and against the seal inner race. Take care that the o-ring is not cut by the sharp edges of the keyway, do not attempt to seat the o-ring (**Fig 32**).

Install the flat washer over the shaft and against the o-ring (**Fig. 33**).



Fig. 32

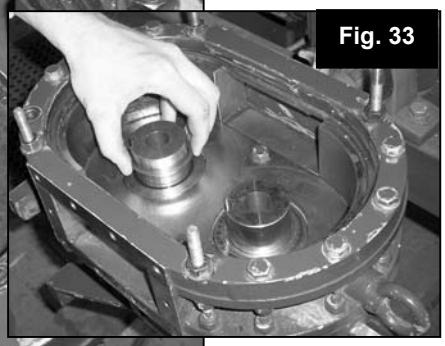
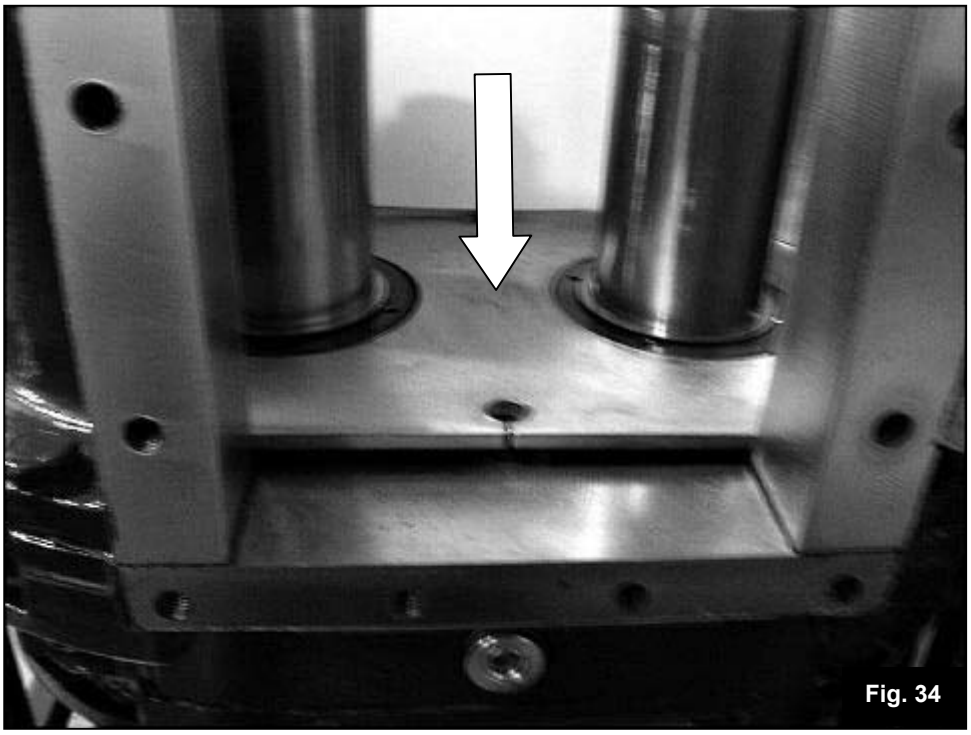


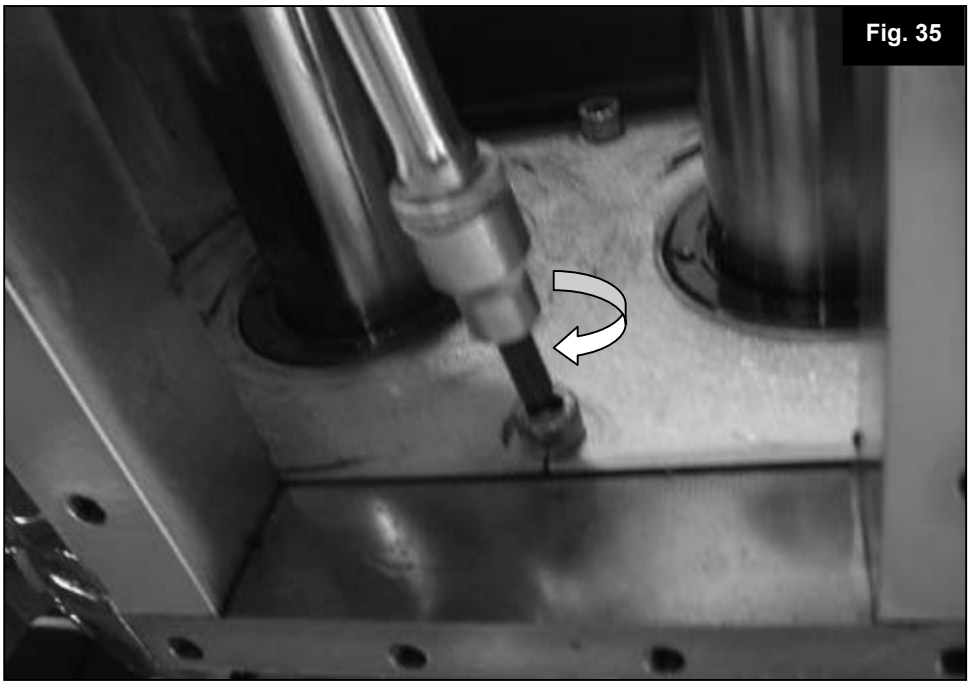
Fig. 33


Fig. 34

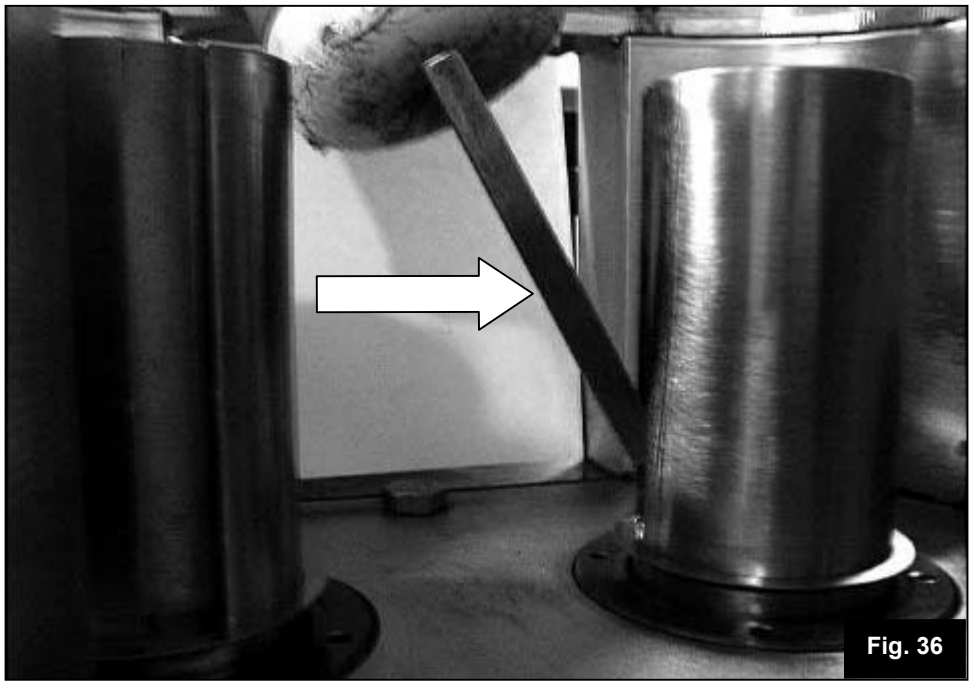
Place wear plate (**Fig 34**) into the pump, insuring that the chromed or ceramic side is facing both you and the wet-end of the pump.

Install the two screws (**Fig 35**) that hold the wear plate in place, and tighten securely.

Rotary Lobes are now ready to be installed.


Fig. 35

Rotary Lobe Installation


Fig. 36

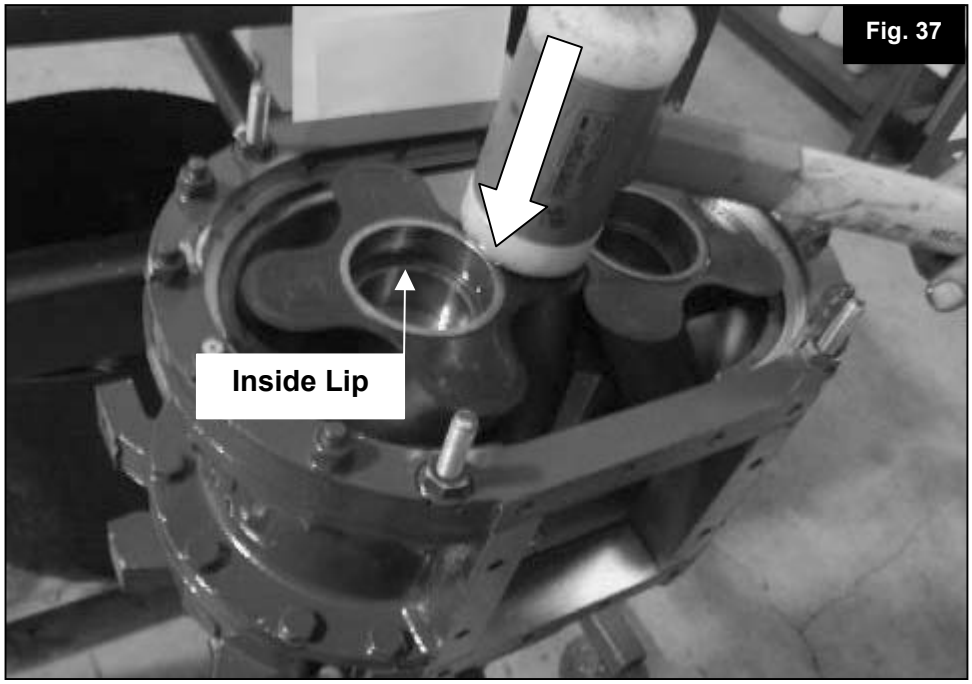
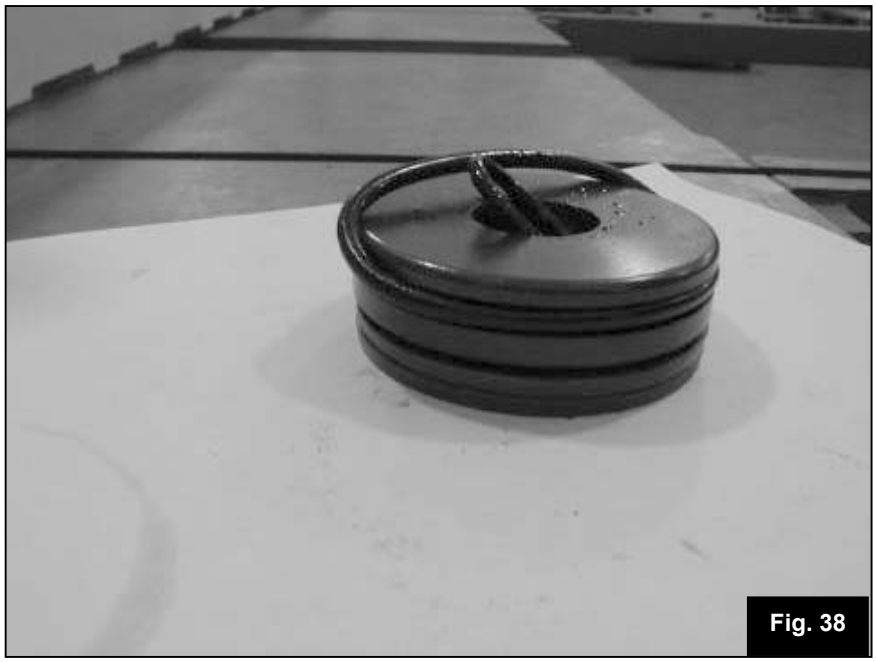


Fig. 37

Install a key or keys (**Fig 36**) into the shaft keyway. Take care to insure it is flush with the front end of the shaft.

With the aid of a brush, lubricate the shaft, key, and insides of the lobes with oil. Install the lobes (**Fig 37**) taking care that the inside lip is facing you. Pumps equipped with only two lobes should have a **right lobe on the top, and left lobe on the bottom shaft**.

For pumps with multiple sets of lobes mounted on each shaft, start with a right lobe on the top shaft and a left lobe on the bottom shaft. Install the next set using a left lobe on the top shaft and the right lobe on the bottom. Alternate this way until all lobes are installed. The sides of the lobes should form a “V” shape.


Fig. 38

Remove and replace the o-rings on the pressure disk (**Fig. 38**).

With the aid of a brush, lube the inside of the lobes, and the inside and outside o-ring of the pressure disk with hydraulic oil. Then carefully drive into place with a rubber or plastic mallet (**Fig. 39**).

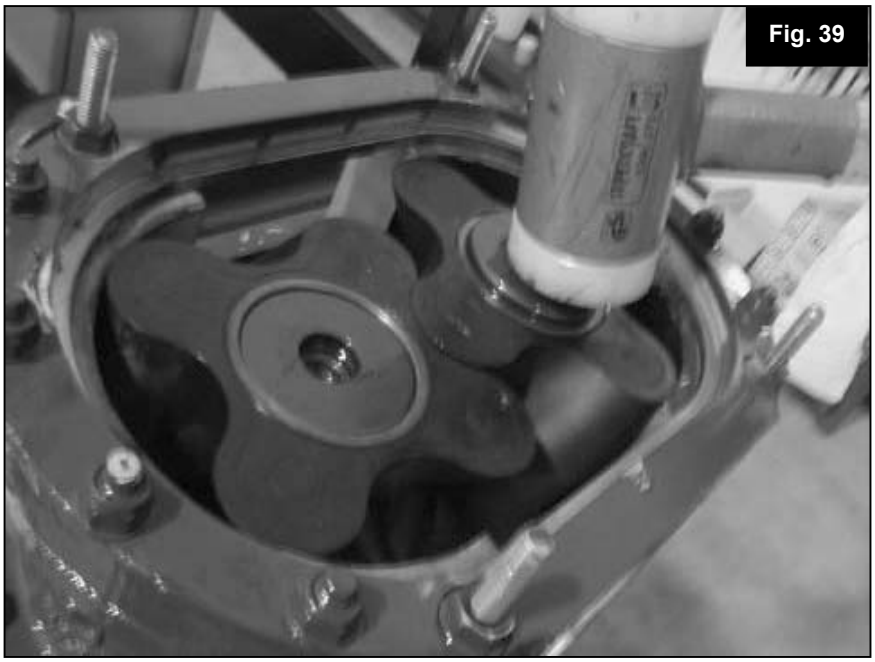

Fig. 39



Fig. 40

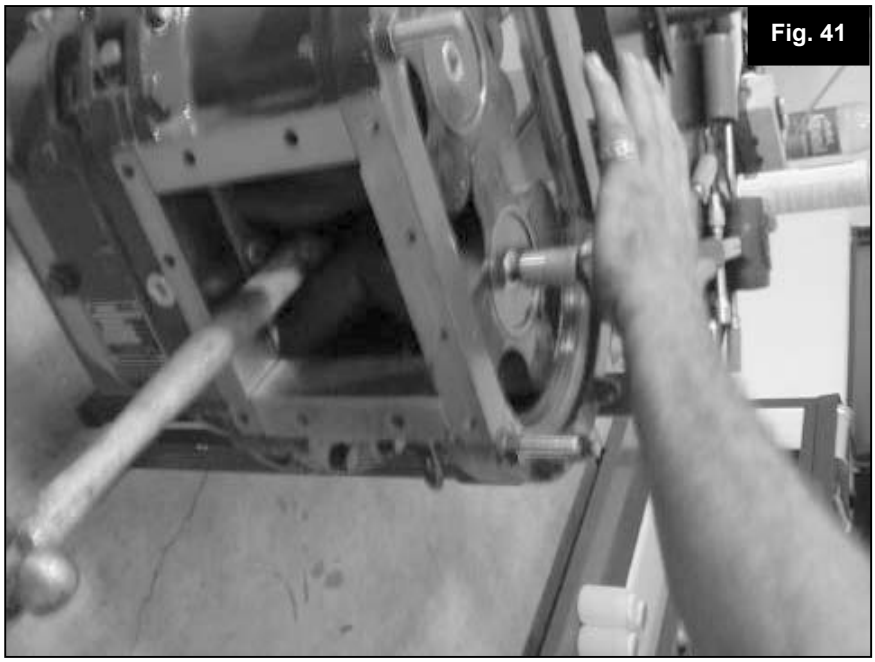


Fig. 41

Note: *Strain Screws CANNOT be re-used. Install only new Strain Screws.*

Lubricate the thread of the strain screw with oil, and install by hand only until it cannot be tightened any further by hand. Repeat on other shaft (**fig. 40**).

Fit lobe socket to torque wrench, and torque each of the strain screws to the following:

Torque Required

VX136 Series = 147 f/lbs.

VX186 Series = 147 f/lbs.

Then loosen each strain screw and re-torque each to 100 f/lbs (**Fig. 41**).

Front Cover Installation


Fig. 42

Replace the o-ring, and inspect the wear plate for signs of wear. If wear is present, replace the wear plate. Place the cover on the pump, insure it is seated into it's groove, and securely tighten the four locking nuts (**Fig. 42**).

Adding Lubricants

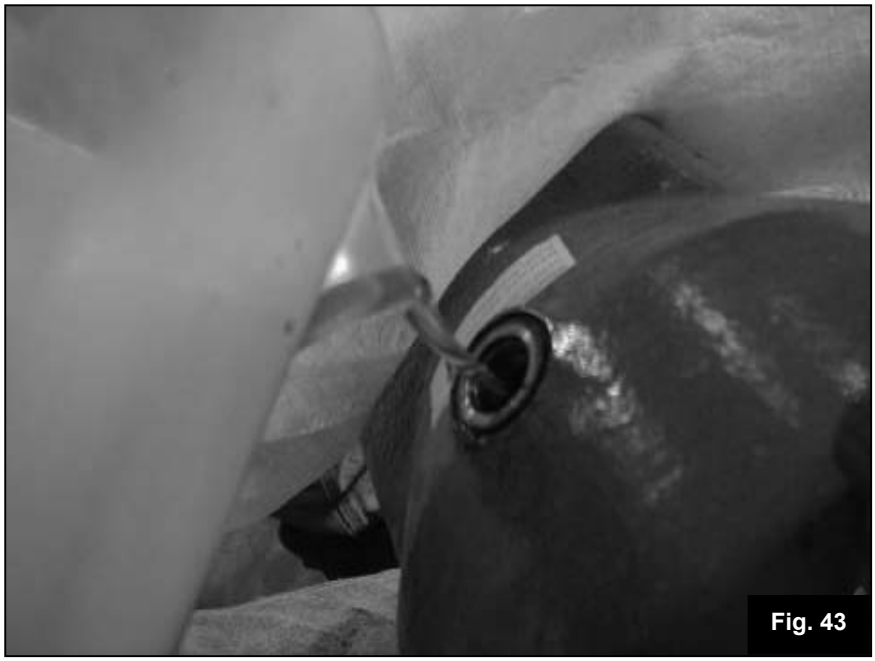

Fig. 43


Fig. 44

Double-check that all drain plugs are installed in the bottom of the pump.

Remove the side bolt from the pumps gear box. From the top, fill the gearbox with oil until begins to run out of the side hole, which translates to filling the gearbox up about halfway. Replace the side drain plug and tighten (**Fig 43**).

Fill the blocking chamber completely to the top with oil (**Fig 44**).

Note: *Refer back to the instructions regarding the use of the Pressurized Oil Bottle. The appropriate pressure must be set to your particular pump to help ensure maximum mechanical seal liftetime.*

Disassembly of Gearbox


Fig. 45

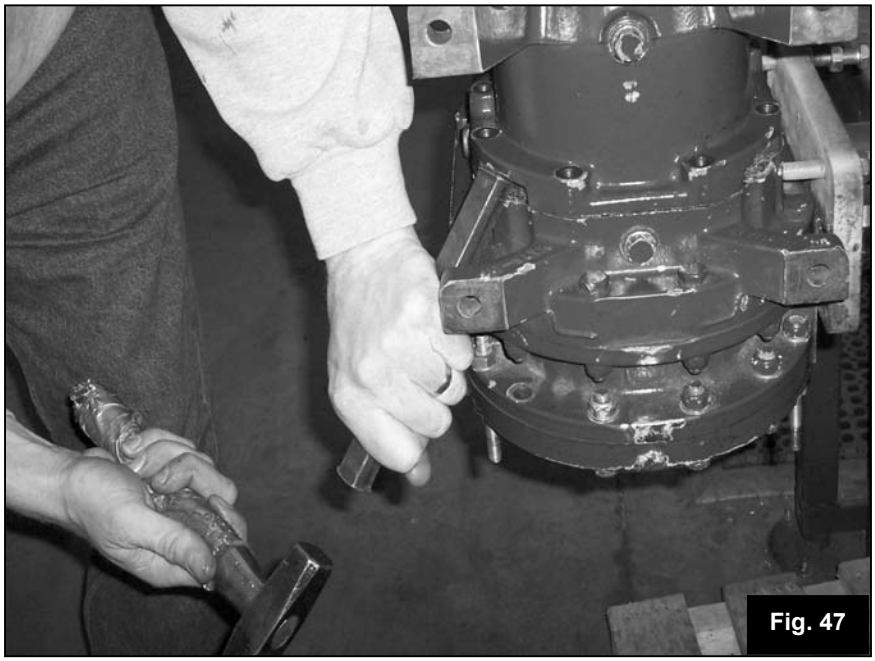
To service the gear end of the pump remove 10 M10x40 metric cap screws around the perimeter of the gear case. Use an 8mm allen wrench extended socket if available. Inspect the split lock washers and replace if necessary. The bolts may be re-used (**Fig 45**).

***Note**: If the shafts will be removed, it is necessary to remove the lobes and mechanical seal assemblies first. To service the bearings or gears, the shafts must be removed.*

With the aid of a hammer and chisel, carefully tap the key from its keyway, and remove from the pump (**Fig. 46**).

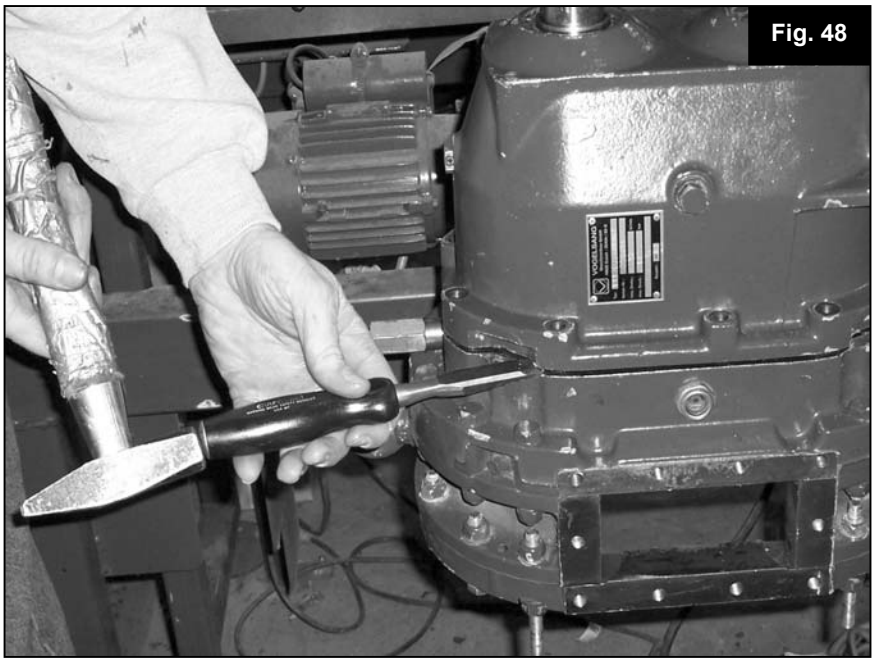

Fig. 46

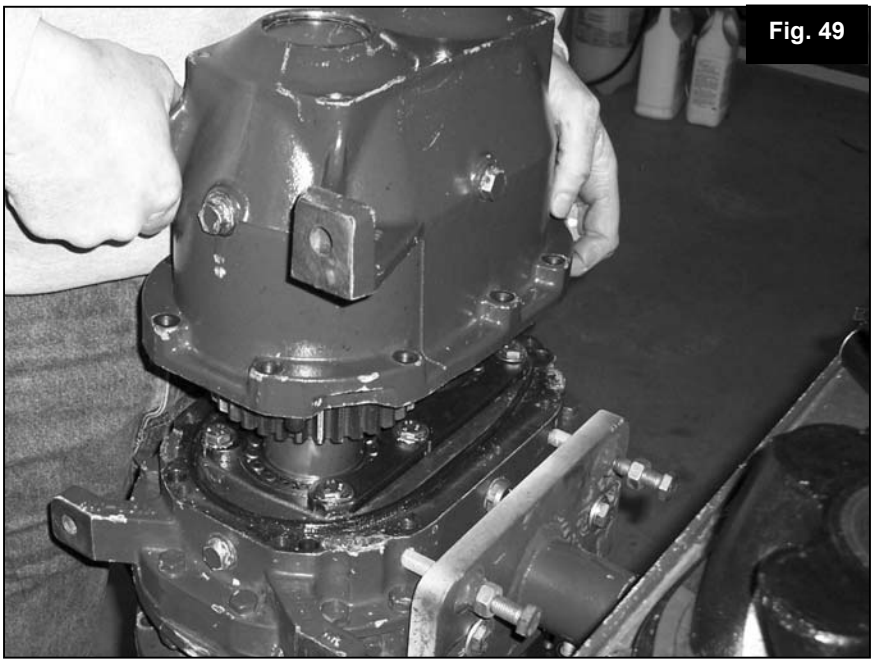
Remove any burrs from the shaft with the aid of a file or emery cloth. Take care not to injure yourself on the sharp keyway edges.


Fig. 47

Use a blunt drift in the recesses provided between the gear case (**Fig. 47**) and the pump body. **Never hammer against the feet of the pump**. The gear case uses four dowels to position and hold the case to the body. It may require several blows against the drift at various points around to loosen the case.

Once the cover has been loosened, the use of a chisel or similar tool can aid in further removing the case from the 4 dowels used to hold it in place. Use care to loosen the case evenly around the pump body (**Fig. 48**).


Fig. 48

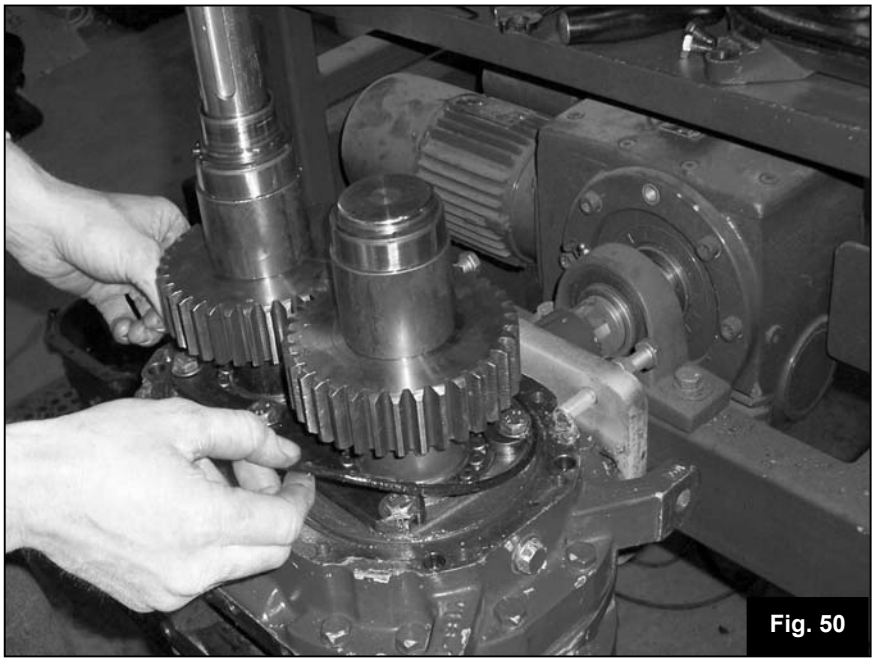

Fig. 49

Once loosened, the case can be lifted off the shafts and put aside. Two bearings reside in the case, as well as the lip seal for the outboard shaft end and the cap seal for the inboard shaft opening. These will be serviced later, if necessary (**Fig. 49**).

Special Tool Required



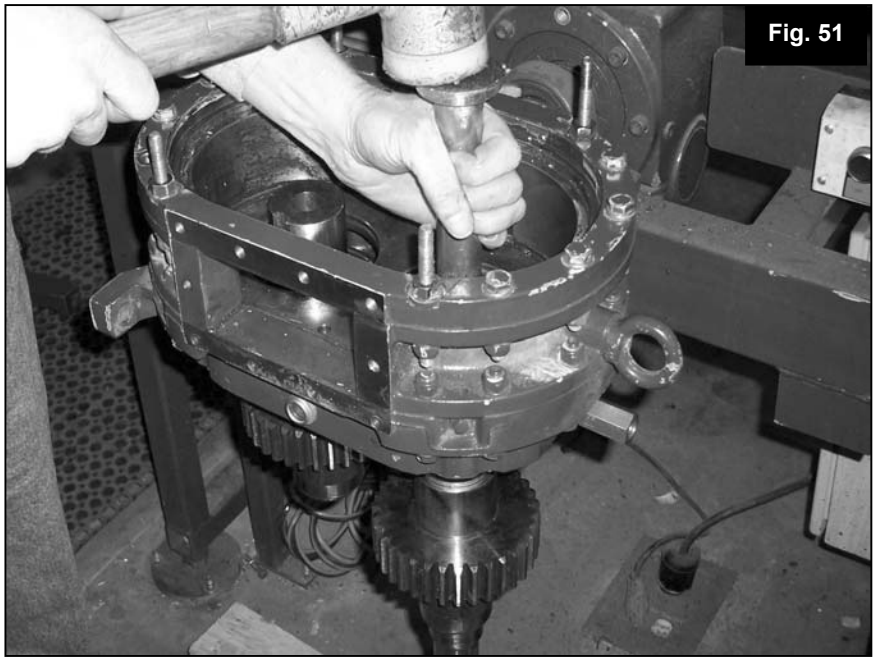
Assembly tool for floating bearing	PBA.A013
Assembly tool for bearing ring	PBA.A012
Assembly tool for seal	PBA.A007
Seal support puller	PBA.A017

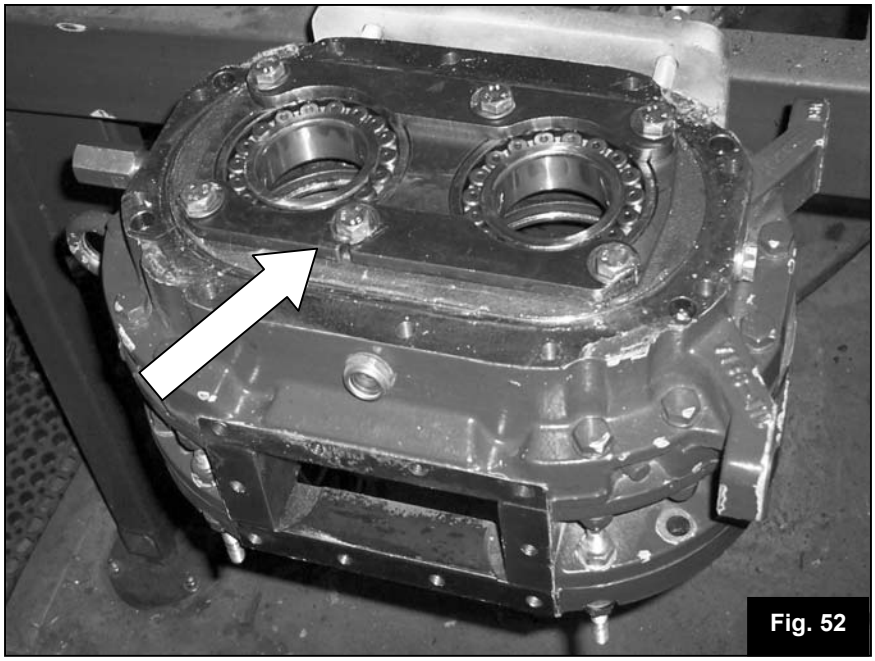

Fig. 50

Remove the case sealing o-ring (**Fig. 50**). Vogelsang recommends replacing this seal whenever the case is removed, but if it is undamaged and does not indicate excessive compression it may be re-used.

Drive the two shafts from the wet-end of pump through the gear end of pump. Use appropriate drift and heavy hammer as shaft is a tight fit through the double roller bearing (**Fig. 51**).

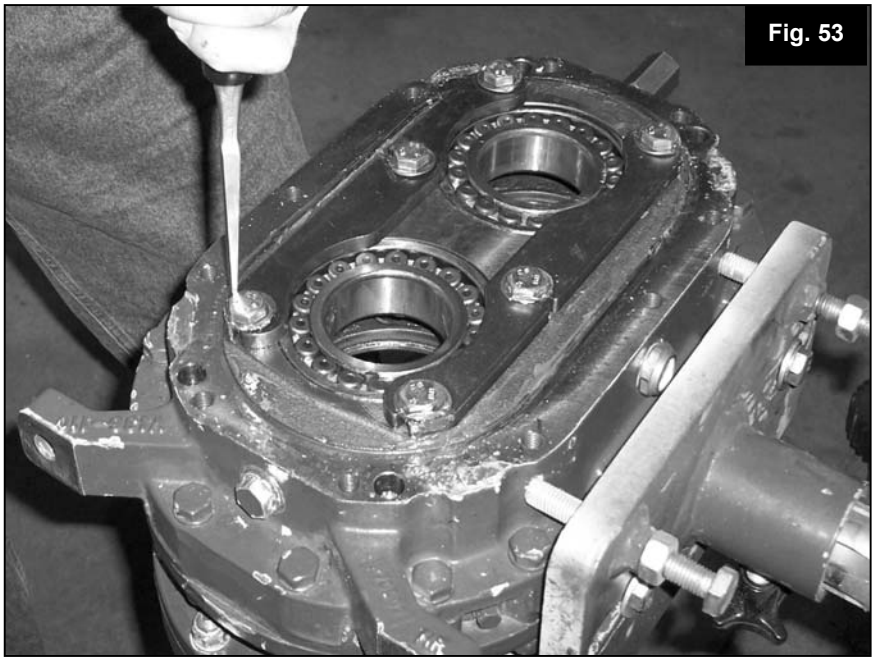
Note: *Provide soft landing for the shafts as they leave the pump body, or use a helper to hold shafts as they are driven out of the pump.*

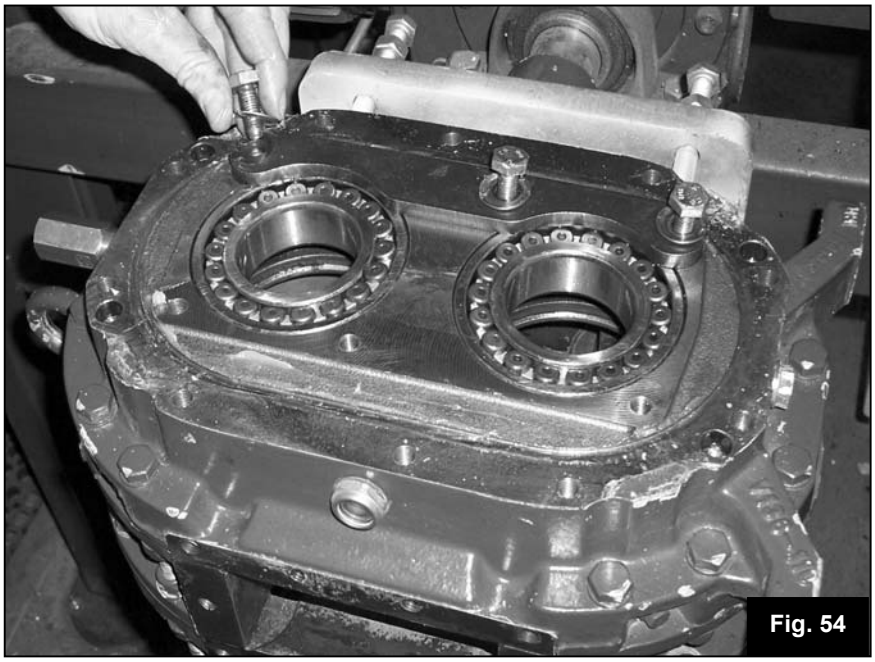

Fig. 51


Fig. 52

Pump body with shafts removed (**Fig. 52**).

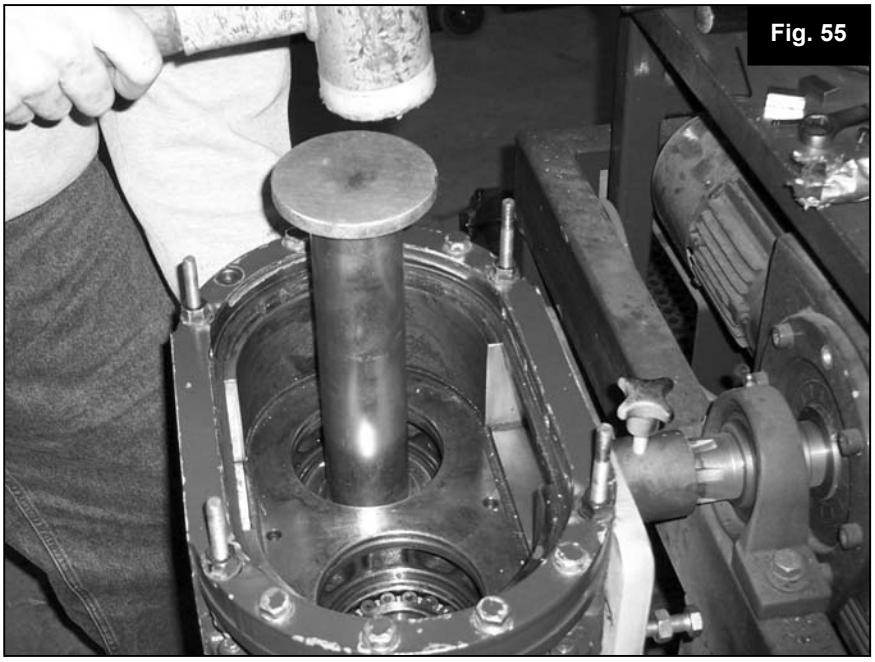
Use a hammer and chisel to bend the locking washers away from the retainer bolts (**Fig. 53**). The bolts may be re-used.

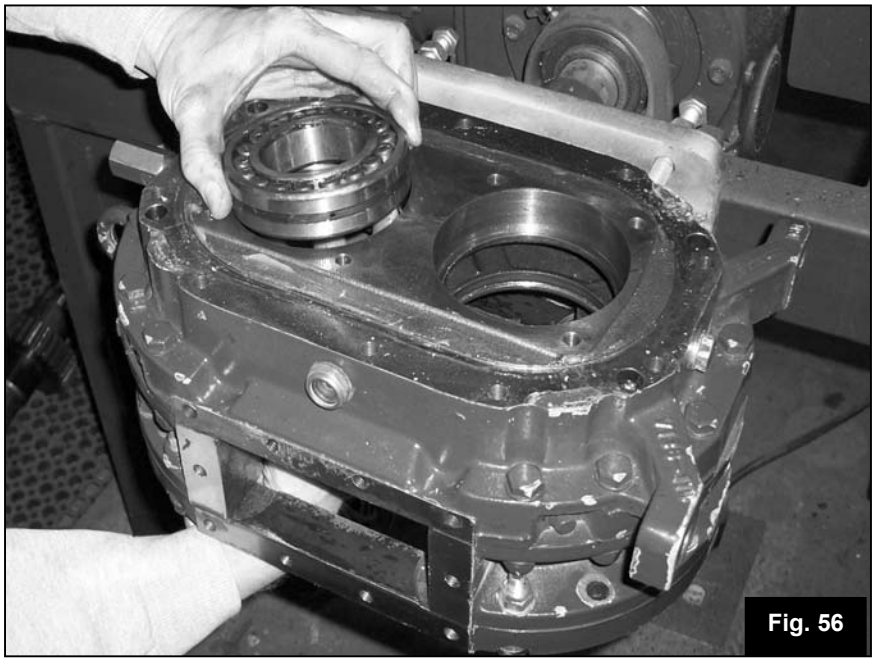

Fig. 53


Fig. 54

Use a 17mm wrench to remove the bolts around the bearing retainers (**Fig. 54**). Discard the locking washers and replace with new.

Drive the roller bearings from the pump body (**Fig. 55**). Note use of special tool to avoid damaging the bearing if it is to be re-used. (See tool list on previous page).


Fig. 55


Fig. 56

The bearing assembly should emerge from the pump body bore intact (**Fig. 56**).

Thoroughly clean the area with a fast-drying solvent. We typically use a good quality brake cleaning product to remove all traces of old oil and grease (**Fig. 57**).


Fig. 57

Reassembly of Gearbox

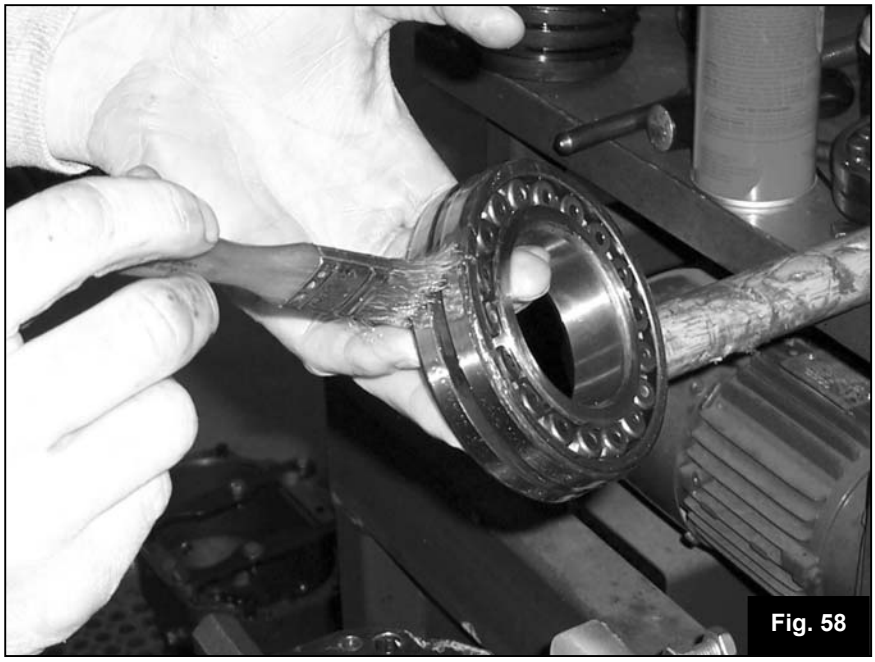


Fig. 58

Apply liberal coats of oil to all parts during re-assembly of pump (**Fig. 58**).

Drive bearing assembly fully into the pump body using an appropriate tool to avoid damage to bearing (**Fig. 59**).

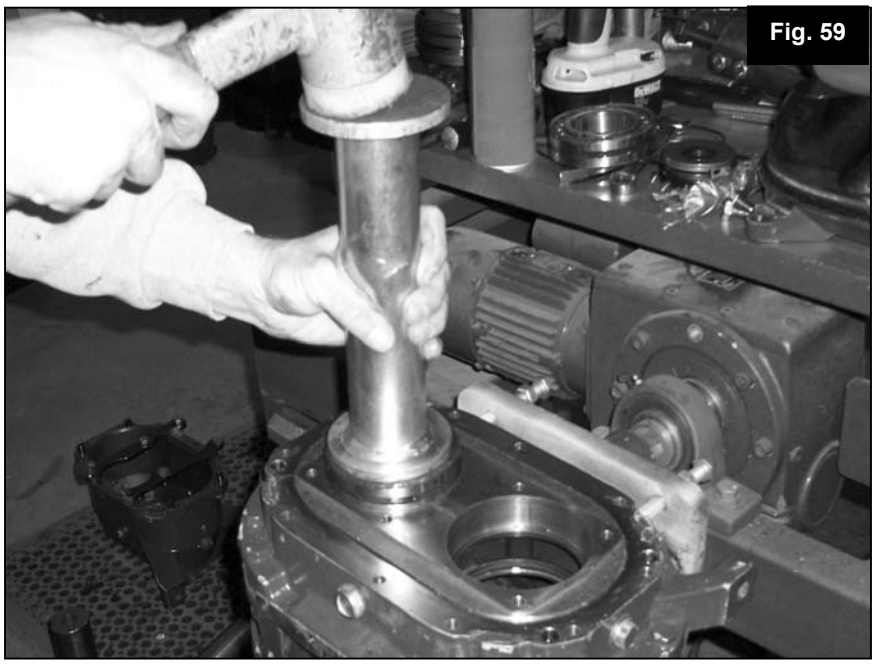
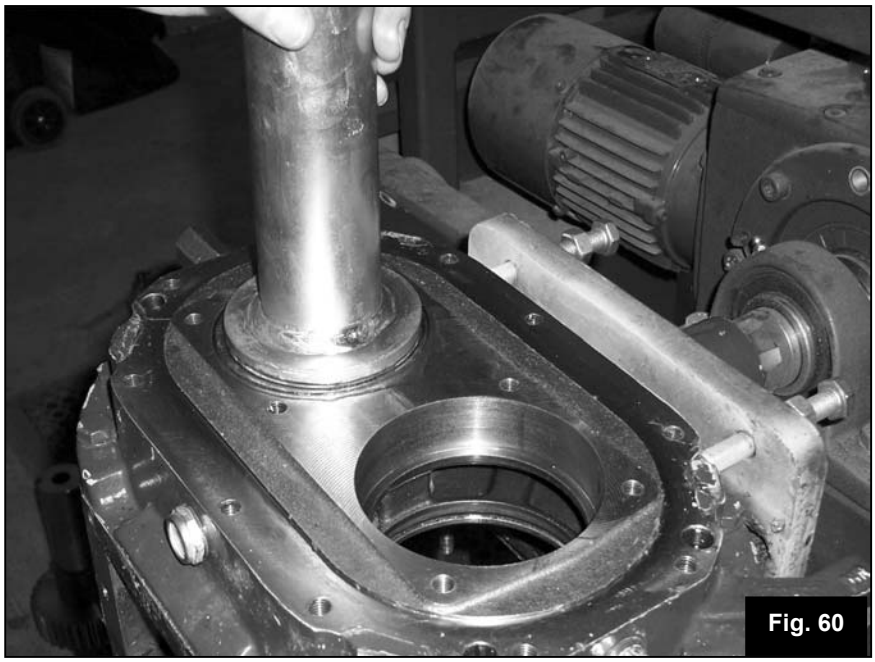
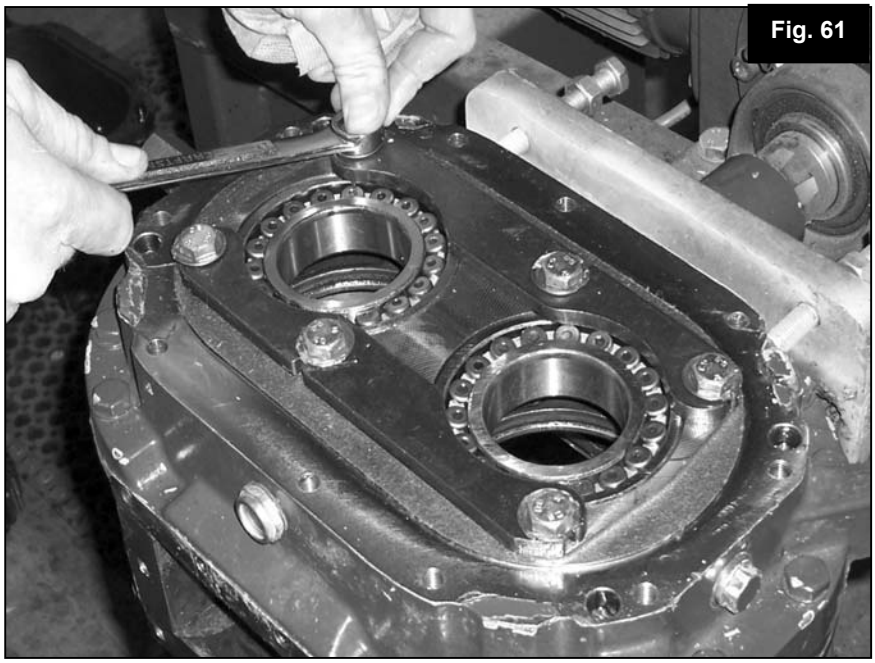


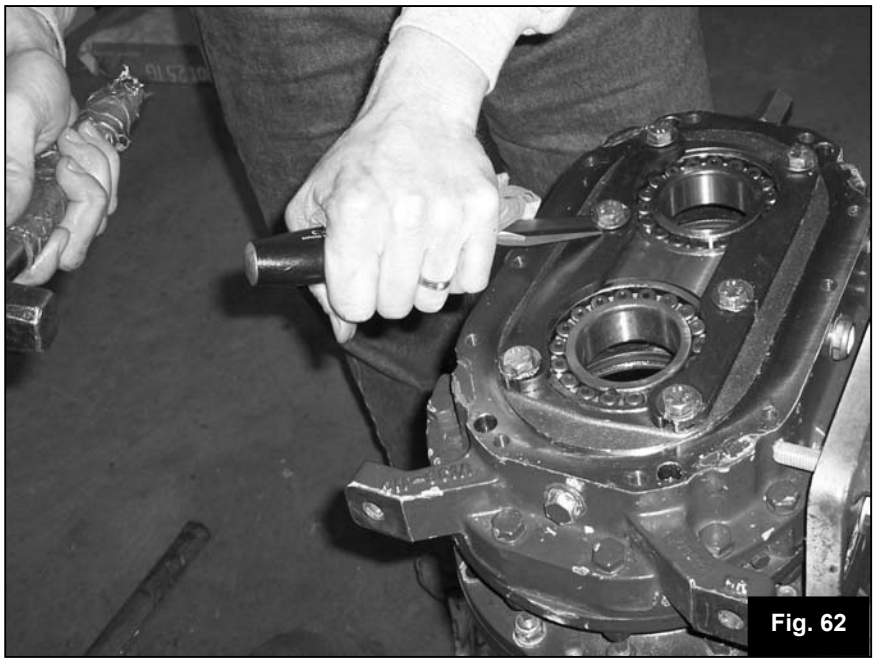
Fig. 59


Fig. 60

The bearing housing should be flush with the pump housing when fully seated (**Fig. 60**).

Install bearing retainers using new locking washers (**Fig. 61**). Bolts may be re-used if undamaged.

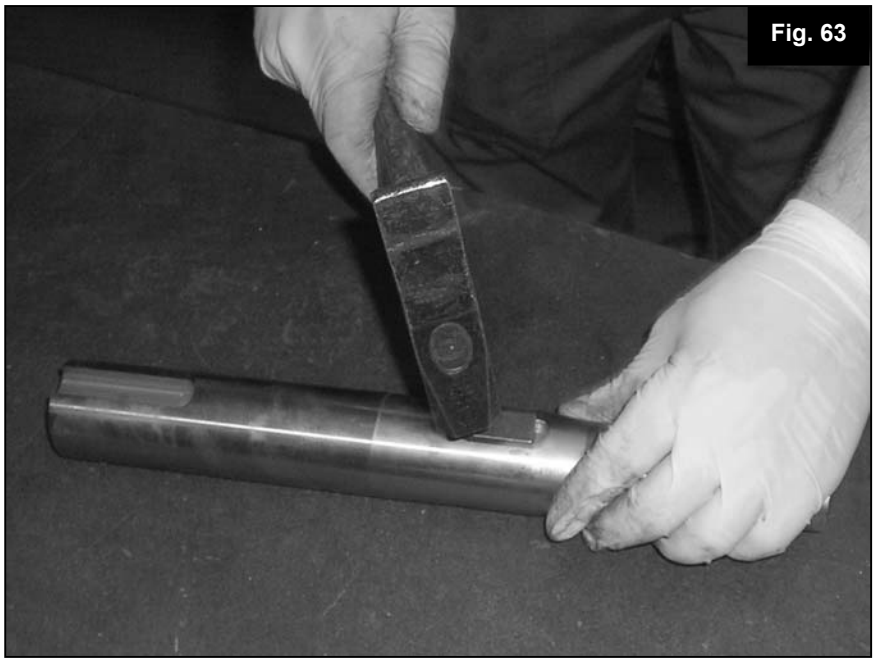

Fig. 61


Fig. 62

Use a hammer and chisel, or similar tool, to bend one edge of the locking washer up against the retainer bolt head (**Fig. 62**). Inspect assembly to assure that no locking washer edge extends over the o-ring seat on the corners, as this may impede the re-assembly of the gear case.

If it is necessary to replace the shaft or gear it will be necessary to build an entire new shaft assembly. Carefully inspect the parts list for correct parts for the shaft being rebuilt.

First install the key for the gear (**Fig. 63**).


Fig. 63

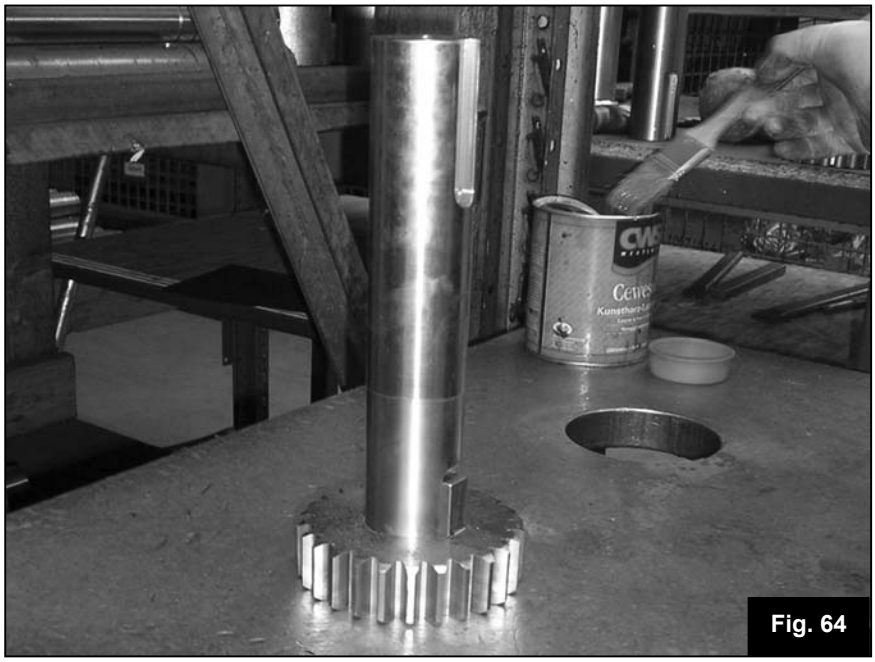


Fig. 64

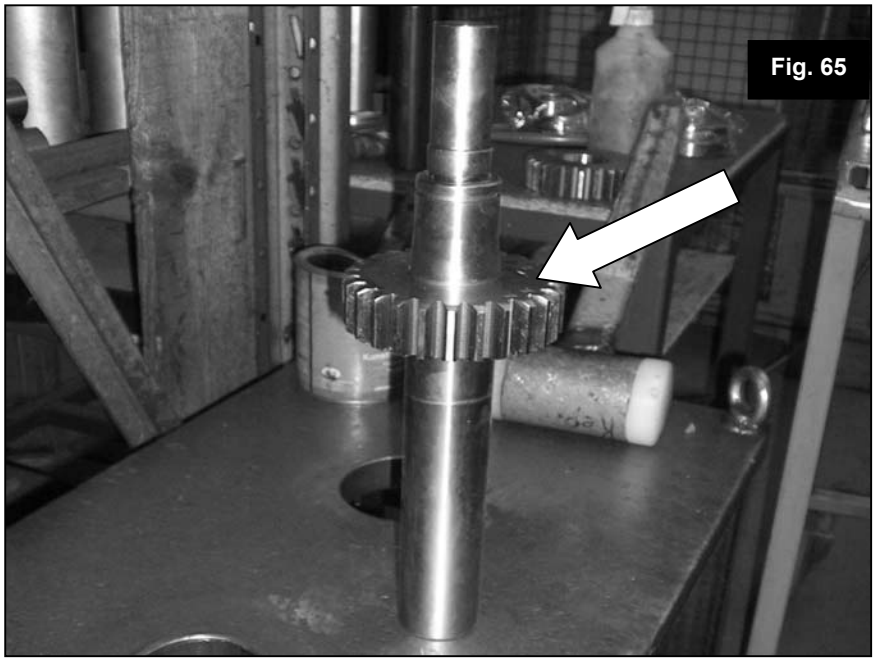
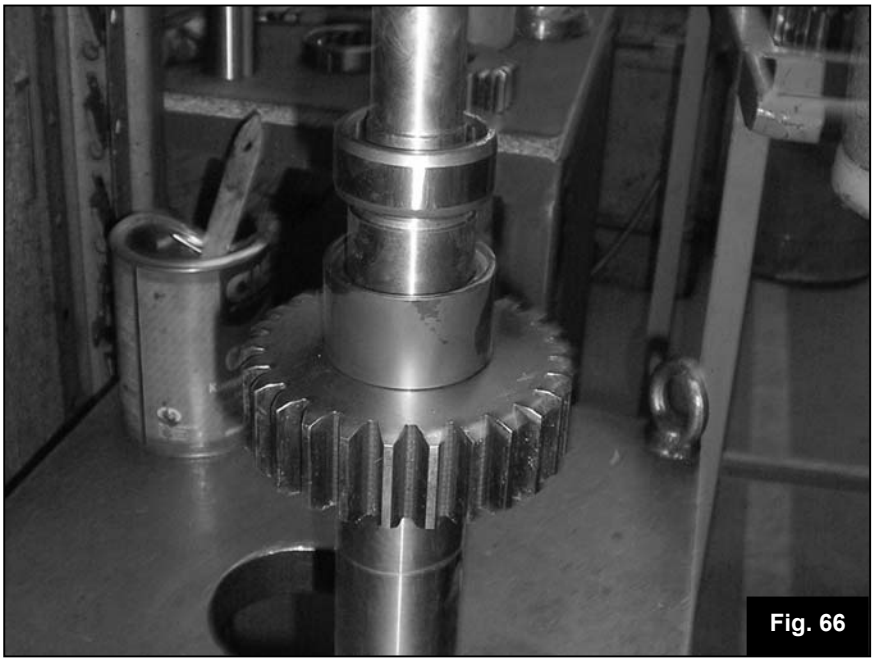


Fig. 65

Align the shaft key with the gear keyway and drive the shaft through the gear until the key aligns with the face of the gear (**Fig. 64**).

The shaft must be driven through the gear so that the keyways are aligned with the “X” or “XX” facing upwards. Final position of gear is created when spacers and bearing race have been installed (**Fig. 65**). Arrow points to either the “X” or “XX” depending on which shaft you’re working on.


Fig. 66

Install spacer on the gearbox end of the shaft, up against the gear face. Then drive the bearing race for the bearing over the shaft and past the cut groove in the shaft (**Fig. 66**)

Install the circlip into the groove to hold the bearing race in place (**Fig. 67**).

Install the bearing side spacer. If the drive shaft is being assembled, note that a race must be installed above the circlip to accommodate the lip seal installed later.


Fig. 67

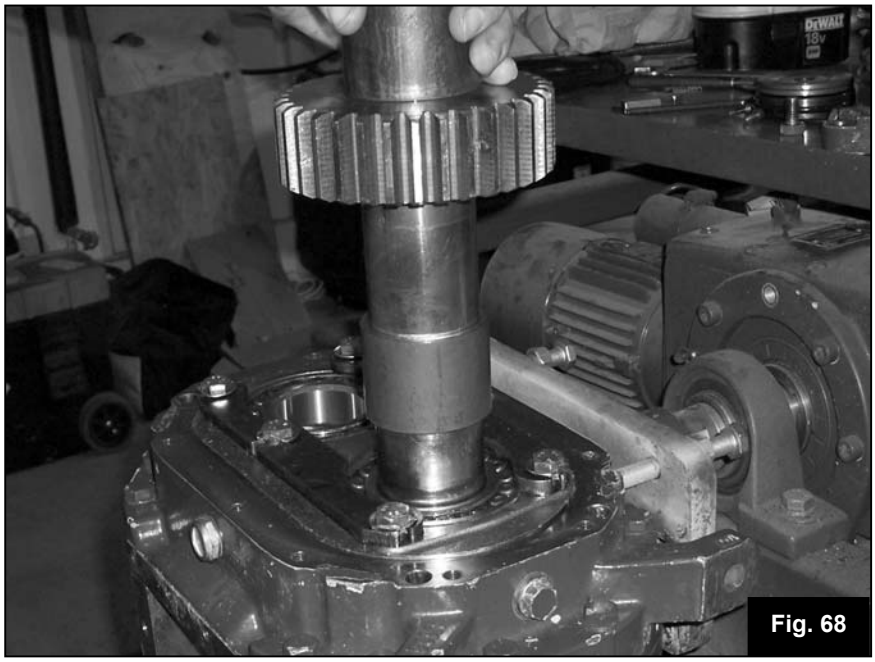
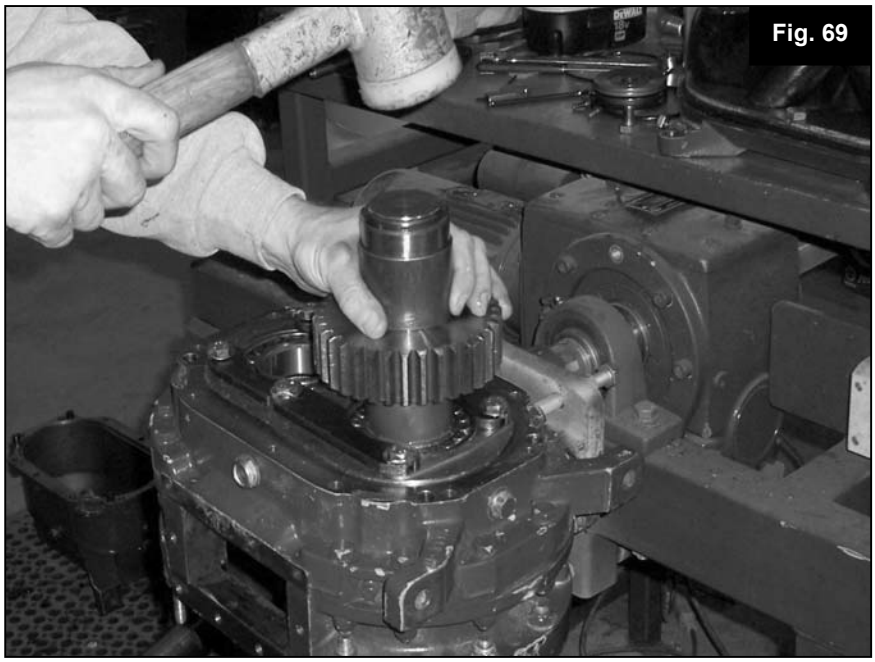


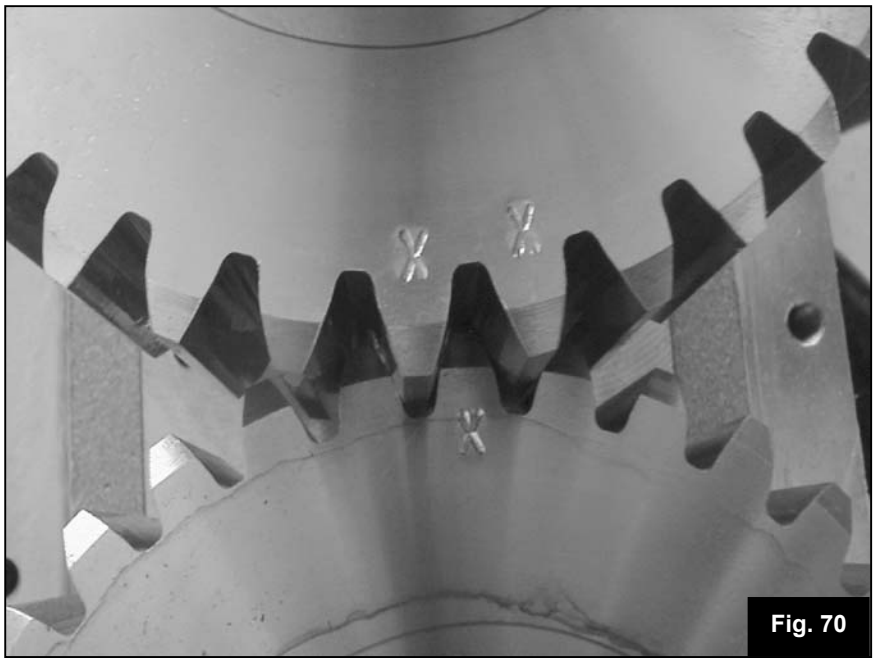
Fig. 68

When driving the shafts back into the pump, take care to properly orient each shaft top to bottom (**Fig. 68**). Generally speaking, most Vogelsang pumps are top shaft driven, which puts the idle shaft at the bottom, closest to the feet of the pump. Be sure to verify the position of the shafts when re-assembling the pump.

Drive shaft into pump until spacer is bottomed against the double roller bearing race and the gear face (**Fig. 69**).

Flip the shaft over and press the gear so that the spacers are fitted tightly.


Fig. 69


Fig. 70

When installing the second shaft, proper timing of the gears must be maintained by aligning the single tooth marked with an X on one gear between the two teeth marked with an X on the second gear (**Fig 70**). Failure to properly align the gear teeth will render the pump inoperable.

Second shaft installed with gear teeth properly aligned for correct timing (**Fig 71**).

Note: *Gears are always sold in sets as one part number.*

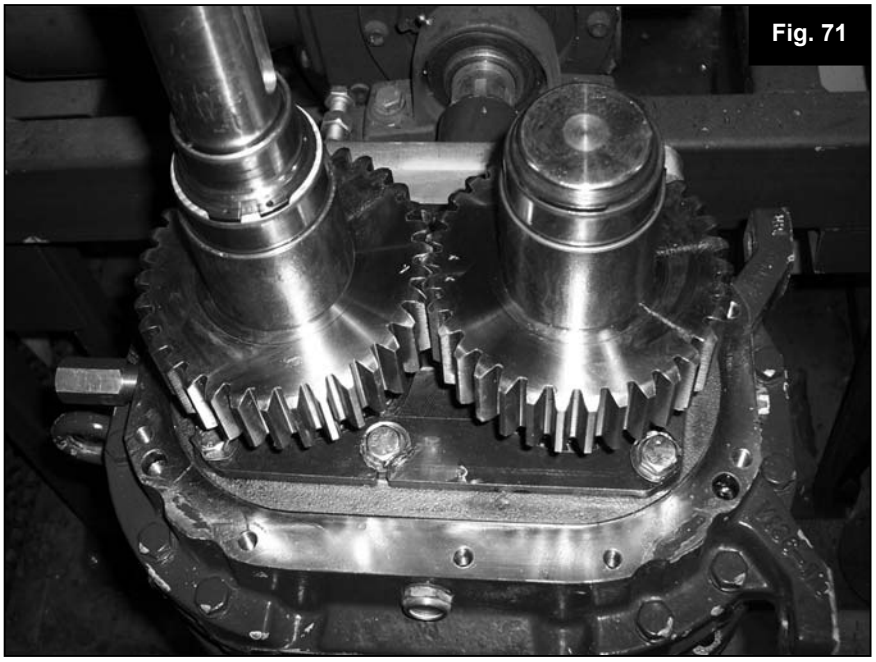

Fig. 71



Fig. 72

To prepare the gear box for re-assembly, remove the retainer clip (**Fig. 72**) on the lip seal for the outboard shaft.

This clip fits snugly in the machined groove just above the lip seal (**Fig. 73**).



Fig. 73


Fig. 74

Pry the lip seal out of the bore in the gear box. Discard the seal; it will be replaced in a later step (**Fig. 74**).

If the case bearing must be replaced, it will have to be removed with a blunt drift against the bearing housing. The bearing race must be replaced on the outboard shaft (**Fig. 75**). See previous instructions regarding the rebuild of the shafts.


Fig. 75

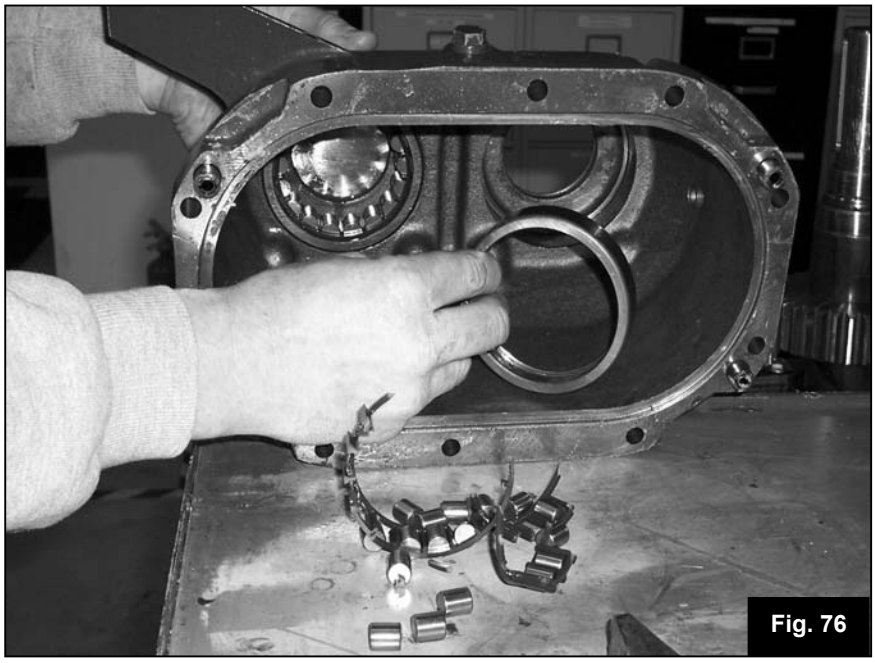


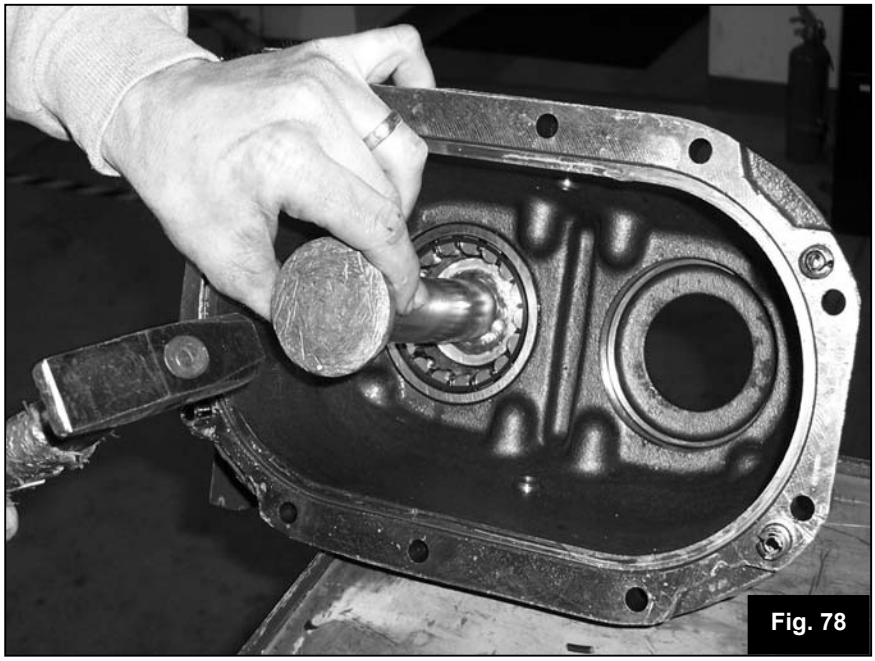
Fig. 76

The bearing is removed through the inside of the gearbox case. Note the broken roller cage (**Fig.76**). This is typical when attempting to remove the bearing, therefore remove this bearing only when it will be replaced with a new part.

Remove the retaining clip from the packing disk only if you are replacing the bearing, or if the packing disk is leaking oil. This part does not require routine service (**Fig. 77**).



Fig. 77


Fig. 78

If the packing disk is to be removed drive it out through the outside of the gearbox case using a suitable tool to avoid bending the disk (**Fig. 78**).

Replace the o-ring before re-installing the packing disk. Assure proper seating of the o-ring in the packing disk groove before inserting back into case (**Fig. 79**).


Fig. 79

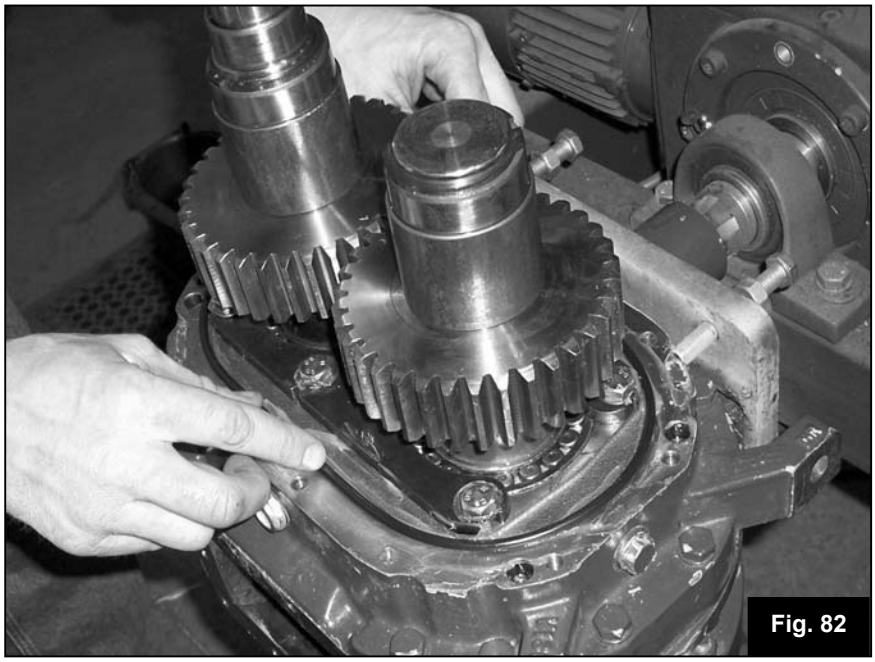

Fig. 80

Seat the packing disk fully into the bore until it bottoms against the casing. Use a suitable tool to avoid damaging the packing disk. Re-install the retaining clip (**Fig. 80**).

Place new lip seal in the appropriate bore and seat fully against the gearbox casing. Re-install retaining clip (**Fig. 81**).

The gearbox housing is now ready for reassembly.

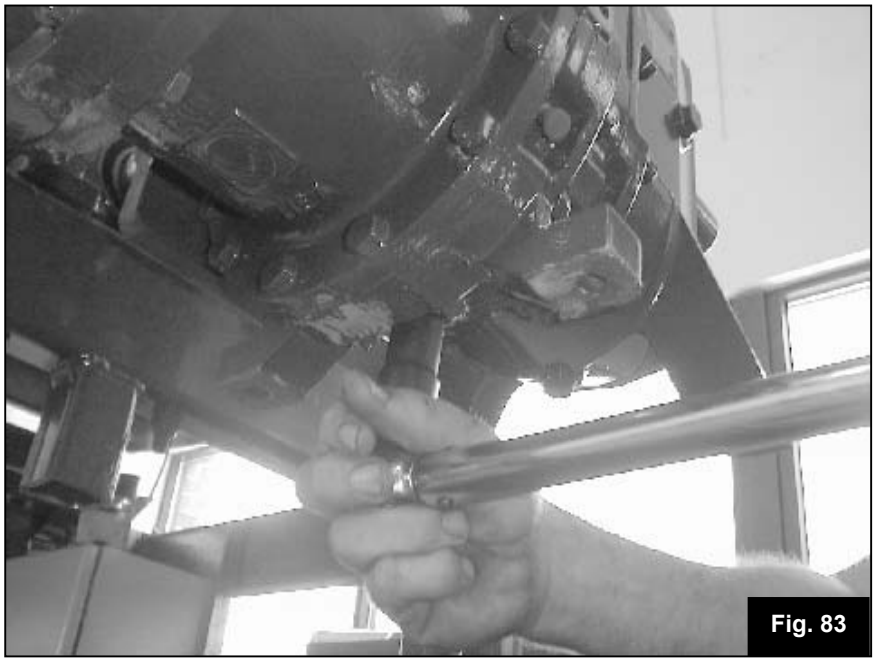

Fig. 81


Fig. 82

Apply a thin coating of lithium grease around the seat for the o-ring and set the o-ring in place. The grease will keep the o-ring in place during assembly. Be sure the o-ring is seated all the way around the pump body (**Fig. 82**).

Carefully replace the gear housing to the pump (**Fig. 83**). To properly seat the gear housing, place an allen bolt on opposite sides diagonally. Alternate tightening until the gear housing is seated and snug. Install the remaining bolts.

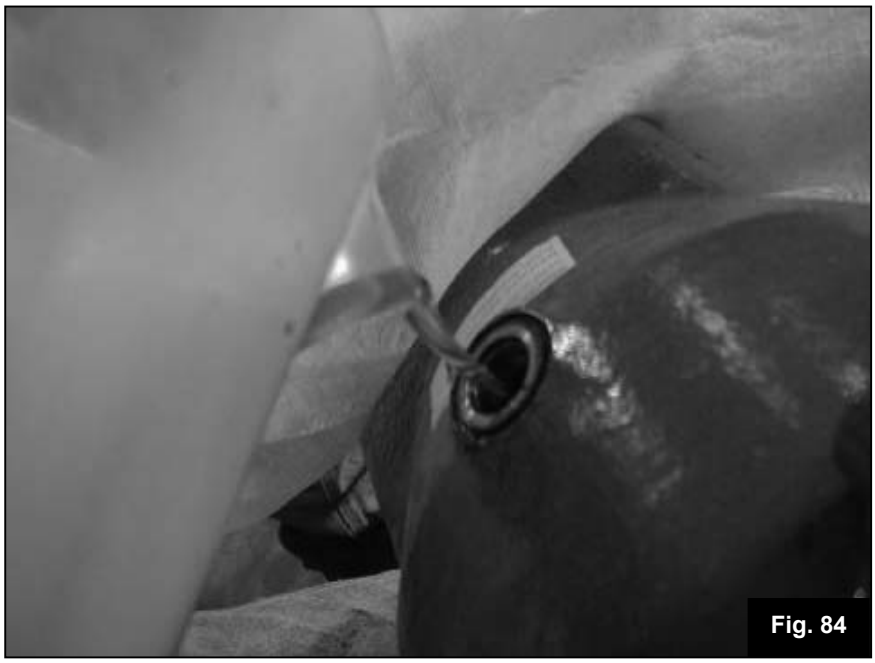

Fig. 83


Fig. 83

Re-install the drain plug on the gearbox taking care to also re-install the copper washer (**Fig. 83**).

Note: *Proceed to next section regarding the proper method to add lubricants.*

Adding Lubricants


Fig. 84

Double-check that all drain plugs are installed in the bottom of the pump.

Remove the side bolt from the pumps gear box. From the top, fill the gearbox with oil until its begins to run out of the side hole. Replace the side drain plug and tighten (**Fig. 84**).

Fill the blocking chamber completely to the top with oil (**Fig. 85**).

Note: *Refer back to the instructions regarding the use of the Pressurized Oil Bottle. The appropriate pressure must be set to your particular pump to help ensure maximum mechanical seal liftetime.*


Fig. 85

2.F.2 Normal Clearances

Because rotary lobes pumps begin to wear on start-up, there is no “normal” clearance between lobe and housing segment or wear plate. When new these clearances are less than 1mm. As the lobes and wear plates wear these clearances increase. As far as the pump itself is concerned this clearance does not matter.

2.F.3 Acceptable Limits for Wearing Parts

Rotary lobe pumps, by design, begin to show wear almost immediately upon start-up. The rate of wear on lobes and wet-end parts is dependent upon pump speed and the abrasion quality of material being pumped. Consequently, no “normal” wear characteristics can be identified.

Generally, pump lobes are “worn out” when the output flow no longer meets acceptable expectations. At this point lobes are replaced, or housing segments are adjusted to regain acceptable flow rates.

2.F.4 Critical Torque Specs

Only the lobe strain screw has a critical torque specification. All other fasteners, bolts and nuts are to be tightened to generally accepted standards.

Torque specification for lobe strain screws:

Tighten initially to 147 ft.lbs. (wet with oil torque)
Loosen to less than 100 ft. lbs.
Re-tighten to 100 ft lbs.

2.F.5 Troubleshooting

No Discharge	Below Capacity	Irregular Discharge	Lost Prime	Pump Stalls at Startup	Pump Overheats	Motor Overheats	Excessive Power Draw	Noise & Vibration	Pump Element Water	Seizure	Causes	Solution
X											Incorrect direction of rotation	Reverse Motor
X											Pump not primed	Expel gas from supply line and pumping chamber to introduce liquid.
X	X	X	X					X			Insufficient NPSH available	Increase supply line diameter. Increase suction head. Simplify piping and/or reduce length. Reduce pump speed. Decrease liquid temperature. Check effect of increased viscosity on available and permitted power inputs.
	X	X	X					X			Product vaporizing in supply line.	
X	X	X	X					X			Air entering supply line.	Remake pipe work
	X	X	X					X			Gas Supply	Expel gas from supply line and pumping chamber to introduce liquid.
X	X	X	X					X			Insufficient head above supply vessel outlet	False product level. Lower outlet position. Increase submergence of supply line.
		X	X					X			Foot valve strainer obstructed or blocked.	Service Fittings.
	X		X	X	X	X	X	X			Liquid viscosity above rated figure.	Decrease pump speed. Increase liquid temp.
	X										Liquid viscosity below rated figure.	Increase pump speed. Decrease liquid temp.

No Discharge	Below Capacity	Irregular Discharge	Lost Prime	Pump Stalls at Startup	Pump Overheats	Motor Overheats	Excessive Power Draw	Noise & Vibration	Pump Element Water	Seizure	Causes	Solution
					X			X	X	X	Liquid temp. above rated figure.	Cool the liquid prior to pumping
				X		X	X				Liquid temp. below rated figure.	Heat the liquid prior to pumping
								X	X	X	Unexpected solids in product.	Clean the system. Add strainer to supply line.
	X	X	X	X	X	X	X	X	X	X	Delivery pressure above rated figure.	Check for obstruction. Simplify supply line.
											Seal flushing inadequate	Check that fluid flows freely into seal. Increase flow rate.
	X					X	X	X			Pump speed above rated figure.	Decrease pump speed.
											Pump speed below rated figure.	Increase pump speed.
	X				X	X	X	X	X	X	Rotor case strained by pipe work.	Align pipes. Add flexible pipes or expansion fittings.
					X	X	X	X			Belt Drive Slipping	Tighten belt to specified tension.
								X			Flexible coupling misaligned.	Adjust flange alignment.
					X	X	X	X	X	X	Insecure pump drive mountings	Add lock washers and retighten.
				X	X	X	X	X	X	X	Shaft bearing wear or failure.	Call Vogelsang or distributor for advice.
					X	X	X	X		X	Worn unsynchronized timing gears	Call Vogelsang or distributor for advice.
				X	X	X	X	X	X	X	Gear case oil level incorrect.	Refer to oil level instructions.

No Discharge	Below Capacity	Irregular Discharge	Lost Prime	Pump Stalls at Startup	Pump Overheats	Motor Overheats	Excessive Power Draw	Noise & Vibration	Pump Element Water	Excessive Seal Wear	Seizure	Causes	Solution
X	X											Metal to metal contact of pumping element.	Check rated and duty pressures.
		X				X						Worn pumping element.	Install new components
		X					X					Relief valve leakage	Adjust pressure setting. Examine & clean seating surfaces. Install new components.
		X					X					Relief valve chatter	Check water sealing surfaces & guides. Install new components.

Warranties

4.A.1 Warranty Information

LIMITED WARRANTY

For the benefit of the original purchaser only. Vogelsang warrants all products of its manufacture to be free from defects in workmanship and materials, and failure from wear for a period of two years from the date of start-up, provided the purchaser gives prompt notice of any such defect to Vogelsang, and upon request, furnishes any defective parts or product to Vogelsang for its inspection, freight pre-paid, at its facility in Ravenna, Ohio. Provided such notice is received, and authorization is given by Vogelsang in writing, to commence work on its behalf, Vogelsang, at its option, will either repair or replace, without charge, **F.O.B. original shipping point**, any parts of products to have been found defective at shipment or during the warranty period, or credit to the account of purchaser the price paid for such product. No reimbursement shall be allowed for any expense incurred for repairs or alterations made by others without **prior** written authorization from Vogelsang.

The warranty does not cover any product failures arising from abnormal use, improper or other than approved applications or installations, neglect or accident. Our products are not designed nor intended for use with every known substance. Vogelsang does not warrant against chemical incompatibility.

The foregoing expressed limited warranty and remedy are exclusive of all other warranties and remedies, including, but not limited to, all implied warranties of merchantability or fitness for particular purpose, and all other remedies and damages for breach of such warranties are specifically excluded.

The warranties of Vogelsang do not cover and Vogelsang makes **NO Warranty** with respect to:

A. Materials of construction offered by Vogelsang are recommended based of previous Vogelsang experience. Verifications and acceptance of the materials of construction recommended are the sole responsibility of the buyer;
B. Failures not reported to Vogelsang within the warranty period specified above;
C. Failures or damage due to misapplication, abuse, improper installation;
D. Failures due to operation above the rated capacities or in an otherwise improper manner;
E. Products which have been in any way tampered with or altered by anyone other than an authorized representative of Vogelsang
F. Products damaged in shipment or storage or otherwise without fault of Vogelsang;
G. Loss associated with pumping medium
H. Labor and/or material expense incurred by buyer which relates in any manner to any alleged defective products, unless the Buyer incurs such expenses under expressed written authorization, from Vogelsang, **PRIOR TO THE COMMENCEMENT OF WORK.**
I. Unless a freight carrier is noted on the buyer's purchase order, Vogelsang will send all shipments at its own discretion, using fully insured commercial carriers.

Any equipment manufactured by others, included in the sale is sold only with such warranties as may be provided by the original manufacturer.

This information supersedes all previously published information.

Field Testing Records

5.A.1 Documents for Testing at Initial Startup

Start-Up Report & Checklist

VOGELSANG

Scheduled Date: _____ S/N: _____

CUSTOMER INFORMATION

End-User Contact Name: _____ **VSO#:** _____

End User Company: _____ Phone: _____

End-User City: _____ State: _____ Fax: _____

Distributor Salesperson: _____ Phone: _____

Distributor Company: _____ Fax: _____

UNIT TYPE ☐ Pump ☐ Rota-Cut **CONSTRUCTION** ☐ Iron ☐ Stainless Steel ☐ Tungsten Carbide (Flamed on Coating)

LOBE MATERIAL ☐ NBR ☐ EPDM ☐ PUR ☐ FKM ☐ SBR

UNIT INFORMATION

Equipment Number: _____ Mounted on: ☐ Channel Base ☐ V-Belt Construction

Unit Serial Number: _____ Unit Model Number: _____

Flange Connections: Suction: ☐ Gooseneck ☐ 90° Elbow ☐ Straight ☐ Other: _____

Discharge: ☐ Gooseneck ☐ 90° Elbow ☐ Straight ☐ Other: _____

MOTOR INFORMATION

Motor Manufacturer: _____ Model: _____ Serial Number: _____

HP: _____ RPM: _____ Gear Ratio: _____ Voltage: _____ Ø: _____ S.F.: _____ Enclosure: _____

Nameplate Amps: _____ Actual Amps: _____ Is there a VFD installed for this unit? Yes No

If so what is the Make & Model: _____

_____

FLUID & DESIGN INFORMATION

Fluid Type: _____ Solids by weight (%): _____ Hours Running per day: _____

Capacity in (USGPM): Design: _____ Actual: _____ Flooded Suction: _____ ft

Pressure (PSI): Design: _____ Actual: _____ Suction Lift: _____ ft.

Other Information: _____

Pipe size: Suction Pipe _____ inches Discharge Pipe _____ inches

COMMENTS

_____

_____

5.A.1 Documents for Testing at Initial Startup (continued)

Start-Up Report & Checklist

VOGELSANG

INSTALLATION INFORMATION

Is there a discharge pressure gauge installed? ☐ Yes ☐ No Suction pressure gauge? ☐ Yes ☐ No

Is there a high-pressure relief valve or control? ☐ Yes ☐ No Set MAX PSI at: _____

CHECKLIST

Please check the box if the item has been completed, or checked for proper installation. Add comments if necessary.

☐ Base Plate Secure & Level	Comments: _____
☐ Discharge & Suction Piping Secure	Comments: _____
☐ Pump Gear Box Oil Filled to Correct Level	Comments: _____
☐ Pump Gear Box Vent Plug Removed (If necessary)	Comments: _____
☐ Pump Buffer Chamber Filled to Correct Level	Comments: _____
☐ Buffer Chamber Oil Bottle Oil Level & Pressure Correct	Comments: _____
☐ Motor or Geared Motor Greased and Oil Checked	Comments: _____
☐ Proper Voltage supplied to Motor	Comments: _____
☐ Correct Rotation Checked	Comments: _____
☐ Discharge Valve Opened (During Unit Start-Up Operation)	Comments: _____
☐ Suction Valve Opened (During Unit Start-Up Operation)	Comments: _____
☐ Coupling, Motor, and Pump Aligned (Only on Channel Base)	Comments: _____
☐ V-Belt Tension Checked (Only on V-Belt Base)	Comments: _____
☐ Blade Tension Checked (Only for RotaCut)	Comments: _____
☐ Oil Level for ACC Checked (Only for RotaCut)	Comments: _____

COMPLETION INFORMATION

Factory Authorized Person: _____ Date: _____

Company: _____ Title: _____

End-User Witness Person: _____ Date: _____

Company: _____ Title: _____

THIS FORM MUST BE COMPLETED WITHIN 60 DAYS AND RETURNED TO VOGELSANG AT (330) 296-4113 FOR WARRANTY TO BE VALID!

5.A.1 Documents for Testing at Initial Startup (continued)

Start-Up Report & Checklist

VOGELSANG

ADDITIONAL COMMENTS & NOTES

THIS FORM MUST BE COMPLETED WITHIN 60 DAYS AND RETURNED TO VOGELSANG AT (330) 296-4113 FOR WARRANTY TO BE VALID!