TRAVAINI PUMPS

PREMIER FLUID SYSTEMS

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

DYNASEAL

VACUUM SYSTEMS

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"DYNASEAL"

LIQUID RING VACUUM PUMP SYSTEMS

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1.0 INTRODUCTION

The Travaini "Dynaseal" Liquid Ring Vacuum Pump system will give you years of trouble-free service provided some of the basic maintenance guidelines, as set out in this manual, are followed. Our systems have been designed to provide safe and reliable service. However, because a vacuum pump is a rotating piece of equipment, the operator must exercise good judgment and proper safety procedures to avoid damage to the equipment or personal injury. A system drawing is enclosed. Please review and follow instructions in this manual before attempting to install or start equipment.

1.1 General Instructions

This manual is intended to provide reference to:

- application and operating safety
- installation and maintenance for pump or system
- starting, operating and stopping procedures for pump or system

NOTE: All references made to pumps are also applicable to systems that employ these pumps, unless otherwise specified.

The manual should then be **read carefully** and kept in a safe file for future reference. It should always be available to the qualified operating and maintenance personnel responsible for the safe operation of the pump or system.

(Qualified personnel should be experienced and knowledgeable of Safety Standards, should be recognized by the safety department manager as being capable to effectively act on safety issues, should the need arise. A knowledge of first aid should also be required.)

⚠ The pump is to be used only for the applications specified on the confirming order for which **PREMIER FLUID SYSTEMS INC. or the authorized representative** has selected the design, materials of construction and tested the pump to meet the order specifications.

Therefore, the pump or system **CANNOT** be used for applications other than those specified on the order confirmation.

In the event the pump is to be used for different applications, please consult the sales office or representative of the manufacturer. Premier Fluid Systems declines to assume any responsibility if the pump is used for different applications without prior written consent.

The user is responsible for the verification of the ambient conditions where the pump will be stored or installed. Extreme low or high temperatures may severely damage the pump or system unless proper precautions are taken.

Premier Fluid Systems does not guarantee repairs or alterations done by user or other unauthorized personnel. Special designs and constructions may vary from the information given in this manual. Please contact Premier Fluid Systems **or the authorized representative** should you have any difficulty or doubt.

N.B.: Drawings appearing in this manual are only schematics. These drawings are not for construction. For construction drawings contact Premier Fluid Systems Inc. or the authorized local representative

1.2 Safety

It is assumed that your safety department has established a program based upon a thorough analysis of industrial hazards. It is important that due consideration be given to hazards which can arise from the presence of electrical power, hot liquids, toxic gases, and rotating equipment. Proper installation and care of protective devices is essential. Safety procedures are to be used in conjunction with the instructions contained in this manual.

1.3 Safety Instructions

⚠ **CAUTION: CAREFULLY READ FOLLOWING INSTRUCTIONS.**

Strictly adhere to the instructions listed below to prevent personal injuries and/or equipment damage.

ALWAYS apply the pump for the conditions outlined on the confirming order.

- Electrical connections on the motor or accessories must **ALWAYS** be carried out by authorized personnel and in accordance to the local codes.
- Any work on the pump should be carried out by at least 2 people.
- When approaching the pump **ALWAYS** be properly dressed (avoid use of clothes with wide sleeves, neckties, necklaces, etc.) and/or wear safety equipment (hard hat, safety glasses, safety shoes, etc.) adequate for the work to be done.
- **ALWAYS** stop the pump prior to touching it, for whatever the reason.
- **ALWAYS** disconnect the power to the motor prior to working or removing the pump from the installation.
- **NEVER** work on the pump when it is hot.
- After completion of the work **ALWAYS** re-install the safety guards previously removed.
- **ALWAYS** be careful when handling pumps that convey acids or hazardous fluids.
- **ALWAYS** have a fire extinguisher in the vicinity of the pump installation.
- **DO NOT** operate the pump in the wrong direction of rotation.
- **NEVER** put hands or fingers in the pump or system openings or cavities.
- **NEVER** step on pump and/or piping connected to the pump.
- Pump or piping (connected to the pump) must **NEVER** be under pressure or vacuum when maintenance or repair is carried out.

NOTE: There are materials in the pump that may be hazardous to people suffering from allergies. Maintenance and operating personnel should consult the tab. 1 for such materials.

Tab. 1

MATERIAL	USE	POSSIBLE DANGER
Oil and Grease	General lubrication, ball or roller bearings	Skin and eye irritation
Plastic and elastomer components	O-Ring, V-Ring, Splash ring, Oil seals	Release of fumes and vapours when overheated
Teflon & Kevlar fibers	Packing rings	Release of dangerous powders, release of fumes when overheated
Varnishes	Exterior pump surface	Release of powder and fumes in case of rework, flammable
Liquid compound	Gasket between flat surfaces	Skin, eye and breathing organs irritation

1.4 In case of Emergency

Should the pump break down leak gas and/or service liquid, immediately disconnect the electrical power following the instructions given elsewhere in this manual. Alert the maintenance personnel, at least two people should intervene using precautions as it is required for the specific installation: pump may be handling dangerous and/or hazardous fluids.

After correction of all the problems that created the emergency situation, it is necessary to carry out all the recommended starting procedures.

1.5 Basic First Aid

In the event dangerous substances have been inhaled and/or have come in contact with the human body, immediately contact the medical staff and follow the instructions given by the company's internal medical safety procedures.

2.0 INSTALLATION

The design of the foundation, piping system and the areas of plant systems design are the purchasers' responsibility. *Premier Fluid Systems Inc.* will offer advice but cannot assume responsibility for operation and installation design.

We recommend that the purchaser consult a specialist skilled in the design of foundation, piping and equipment location to supplement and interpret the information given in this manual to ensure a successful installation. Your representative can provide start up assistance in most instances at a reasonable cost.

> ***WARNING:*** **Install, ground and maintain equipment in accordance with the national electrical code and all applicable provincial, federal and local codes.**

2.1 Unpacking

Inspect the unit immediately upon arrival for any sign of damage. All *Premier Fluid Systems Inc.* products are shipped F.O.B. factory, which means that any damage is the responsibility of the carrier and should be reported to them.

2.2 Location

Install the unit in a well ventilated and dust free area. Cooling is an important aspect of the vacuum system operation, it is therefore important to install the system in a reasonably cool area where the temperature does not exceed 104°F (40°C), unless otherwise agreed upon.

For air cooled systems allow a minimum of 12 inches between the heat exchanger and the near wall. In addition, allow sufficient space around the unit for checking fluid level, temperature and for general servicing.

2.3 Foundation

The pump system must be installed in a horizontal position on a level surface. The foundation must be designed to support the total system weight and be rigid and substantial enough to absorb any system vibration and to permanently support the base plate at all points. We recommend the installation of standard neoprene mounting pads between the base frames and floor. Level the base frame using a machinists' level to determine the levelness. Although the base frame does allow for the use of foundation bolts if desired, *Premier Fluid Systems* "Dynaseal" systems are designed to operate without the need for foundation bolts.

2.4 Electrical

"Dynaseal" systems that include an electrical control panel have the main motor and control instruments wired to the panel at the factory. An electrical wiring diagram is included in this manual, if the panel is supplied. The system must be connected according to the local electrical codes. A disconnect switch should be installed between the system control panel and plant power. The full load current rating stamped on the motor nameplate should be used in selecting protective ratings.
After the electrical work is completed jog the motor to check direction of rotation. An arrow on the pump housing marks the direction of rotation. If the direction is wrong, switch any two of the three main leads at the power connection.

2.5 Pipe Connections and Sizing

Before installation, remove all protective inserts in the gas and liquid connections. Piping connected to the system must be installed without imposing any strain on the system components. Improperly installed piping

can result in misalignment, pump failure, and general operating problems. Use flexible connectors where necessary. Piping should be cleaned properly before installation.

Install a temporary screen at the pump inlet flange at first start up to protect the unit against carry over of pipe debris and welding slag. The screen must be removed after the initial run period.

Piping Sizing

Inlet and discharge piping should be at least the size of the pump inlet and separator discharge. It is recommended to install the system as close as possible to the process to minimize the length of the suction line. If the system has to be installed further away from the process, be sure that the inlet piping is oversized accordingly to minimize overall line pressure drop. If not sure, consult a specialist or call the factory. Pump systems operating in parallel on a common manifold must each have a manual or automatic shut-off valve or a suitable check valve installed in the suction line close to the pump suction flange.

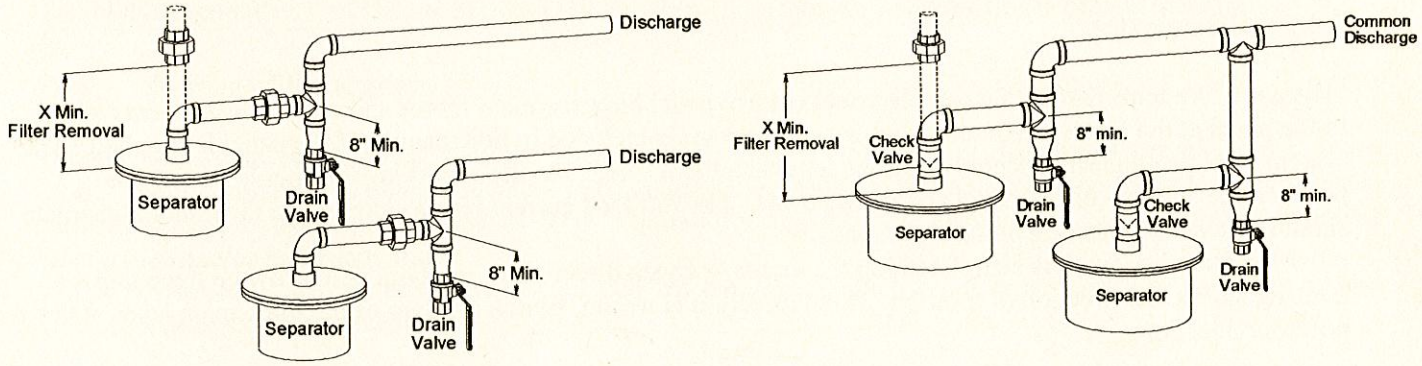
If the possibility exists that the pump inlet can become closed during operation it will be essential to install some type of vacuum relief so that air can enter the pump inlet.

NEVER RUN A PUMP WITH CLOSED SUCTION!

Always install a check valve suitable for vacuum service (providing a minimum of resistance) close to the pump suction flange to prevent backflow of process gas and seal fluid when the pump is stopped. "Dynaseal" systems are supplied standard with an inlet check valve.

Discharge Piping

It is not recommended to discharge the exhaust gas from the pump system into the room where the system is installed. Install an exhaust line of at least the same diameter as the discharge connection on top of the separator reservoir, leading outdoors. It is recommended to install the exhaust piping according to the sketch below. Install a drain valve at the lowest point to prevent condensation from draining back into the separator reservoir. Pump systems operating in parallel on a common discharge manifold must each have a suitable check valve installed close to the pump discharge flange. When discharging more that one pump in a common discharge line and/or over a long distance, oversize piping accordingly.



Pump Size	Filter removal clearance (optional)
5 – 40 HP	X = 24"
50 – 75HP	X = 38"

Existing discharge lines should be checked for pressure losses when replacing vacuum pumps on installations.

Cooling Water Piping

Water cooled systems require an adequate supply of cooling water at a maximum of 85°F and a minimum supply pressure of 40 psig. If cooling water temperature is higher or available pressure is lower, contact the factory.

The cooling water outlet connection of the heat exchanger is fitted with an automatic temperature control valve, which regulates the cooling water flow rate depending on pump operating temperature. If provided, the valve is preset at the factory. Normal system operating temperature is 150° - 180°F. The valve will only open when system operating temperature is reached.

Note: Ensure the cooling water line is connected to the heat exchanger.

3.0 OPERATION

3.1 General Description

At the heart of the "Dynaseal" system there is the reliable Travaini liquid ring vacuum pump. The pump design and principle of operation provides ample clearance between the impeller and casing elements. Grease lubricated bearings are mounted external from the pumping chamber, isolated by mechanical shaft seal. This means that the pump requires no internal lubrication. The function of the seal fluid in the system is to create a liquid piston action and to remove the heat of compression. The seal fluid in the system circulates in a closed loop. The heat exchanger, either air or water-cooled, removes the heat of compression. The discharge separator/reservoir holds the seal fluid and incorporates a highly efficient separator arrangement to separate the seal fluid from the air or gases discharged by the pump system.

3.2 Vacuum Pump Seal Fluid

The system is shipped with a factory recommended seal fluid although any light viscosity oil can be used. We recommend the use of our TR1001 fluid for obtaining ultimate performance from your "Dynaseal" system, providing low viscosity, excellent water separating qualities, anti-foaming and low oxidation. If the above recommended fluid is not on hand, contact the factory for recommended substitute. The air-cooled system includes a temperature control valve as a standard to maintain operating temperatures at all time, (150° - 180°F is normal).

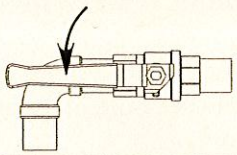
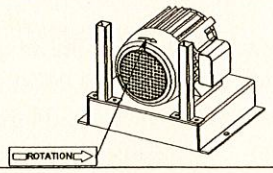
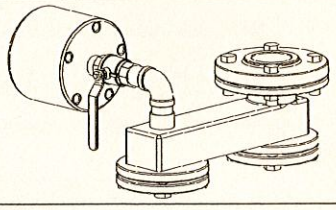
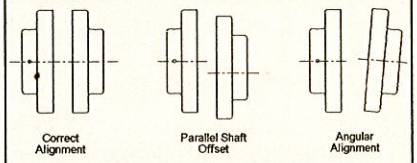
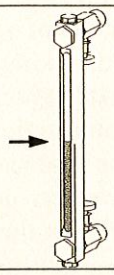
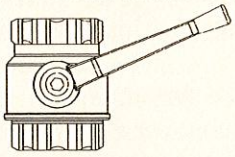
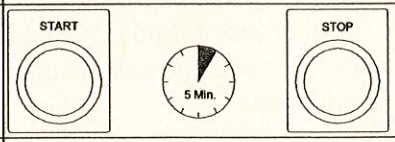
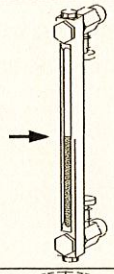
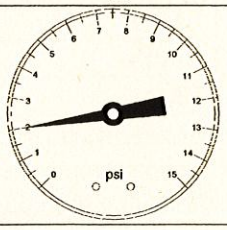
Note: Units up to 5 HP do not have a temperature control valve installed as a standard. This valve may also be omitted in some special systems, which operate for special applications. Check system drawing for verification.

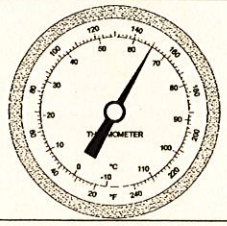
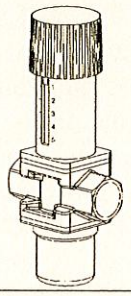
Mineral Oil Specifications for DYNASEAL Vacuum Systems
TR1001 Fluid

SUPPLIER	PRODUCT
Petro-Canada	Harmony 22
Mobil	Vacuum Pump Oil 22
Shell	Tellus 22
Esso	Nuto A22

Recommendations:
Our pump systems are shipped with Petro-Canada Harmony 22 oil. When choosing a different oil supplier, it is recommended to make a full oil change to prevent product mix.

3.3 Start Up Procedure

1	Ensure seal fluid isolation valve is open.	
2	Jog the motor briefly and check direction of rotation. An arrow on the pump housing marks the correct direction of rotation. If direction is backward switch any two of the three leads at the power connection. Usually the correct direction or rotation is clock-wise facing the pump from the motor skid.	
3	Ensure unloading valve (if installed) is closed.	
4	Check drive-coupling alignment, both angular and parallel alignment, adjust to manufacturer specifications. Mono-bloc units do not require any field adjustments (motors are C-face mounted). See Section 3.4	
5	Check fluid level in separator reservoir. The fluid level should be halfway in the sight glass.	
6	If installed set the inlet valve about 3/4 closed and start the pump.	
7	Run pump for a few minutes at vacuum levels above 10" Hg. (680 mbar) and then stop.	
8	With the pump shut off, check the fluid level again, the fluid level should be visible in the sight gauge between the ½ and ¾ mark. Add fluid if necessary.	
9	Start pump again and check that discharge pressure on the separator pressure gauge does not exceed 2 psig while the is operating under vacuum conditions. A pressure higher than 4 psig is a sign of high back pressure in the discharge pipe systems. Pressure gauge might show a higher pressure at start-up and/or when pump operates at low vacuum (0-10" Hg.)	

10	Check the voltage and motor current, they should be within the specifications for the motor. Standard motors have a 1.15 S.F. (Service Factor). **NOTE:** This test should be performed under normal operating conditions	**DANGER: High voltage and lethal shock hazards are present. Use extreme caution.**
11	After 10-15 minutes of operations check pump operating temperature, which should be in the 150° - 180°F range.	
12	Valve adjustment (for water cooled systems only) - To raise System operating termperature, turn valve adjusting screw counter clockwise. To lower operating temperature, turn clockwise.	

3.4 Alignment

3.4.1 Direct Drives

Pump and motor are factory connected and correctly aligned. However, due to shipping and handling, alignment may change. Fig. 13 and fig. 14 indicates a method of checking for correct alignment. **(Not required on Monoblock pumps)**

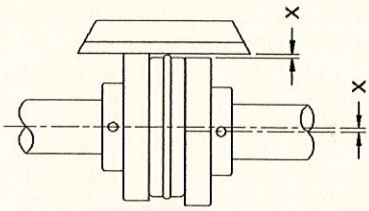


Fig. 13 - Parallel

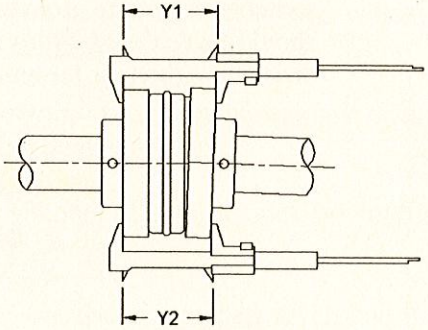


Fig. 14 - Angular

Check parallel alignment by placing a straight edge across the two coupling flanges and measure the offset at various points around the periphery of the coupling. DO NOT rotate the coupling. Maximum offset values are listed below and on the next page.

Motor HP	Maximum Offset 'X' Inch	mm
7 ½ - 10	0.015	0.4
15 - 30	0.020	0.5
40-50	0.025	0.64

Check angular alignment with a micrometer or caliper. Measure from the outside of one flange to the outside of the other at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions.

DO NOT rotate the coupling. The difference between the maximum and minimum must not exceed the value given below. If a correction is necessary, be sure to recheck the parallel alignment. NOTE: For maximum life, keep misalignment values as near to zero as possible.

Motor HP	Maximum Offset 'Y1 & Y2' Inch	mm
7 ½ - 10	0.070	1.8
15 – 30	0.094	2.4
40 - 50	0.128	3.3

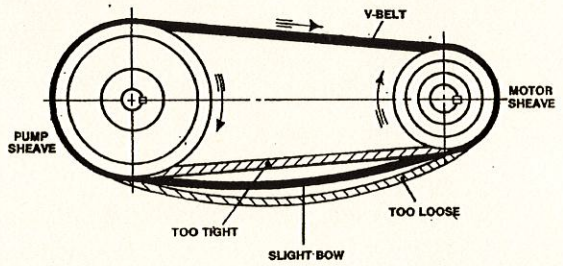
3.4.2 V-Belt Coupled Units

For pumps utilizing V-belt drives, make sure the sheaves are properly installed and aligned before attempting to tension the drive. The V-belts should be placed over the sheaves and in the grooves without stretching them over the grooves. The tensioning steps a, b, and c can be used for all types of V-belts, all cross sections and numbers of belts, and all types of construction.

a. With all belts in their grooves, adjust centers to take up the slack until they are fairly taut.

b. Start the drive and continue to adjust until the belts have only a slight bow on the slack side while operating with load conditions.

c. After several hours of operations, the belts will seat themselves in the sheave grooves. Further tensioning may be necessary, such that the drive shows a slight bow in the slack side. Insufficient tension is often evidenced by slipping (squealing) at start up. If the unit is idle for an extended period of time, the tension on belts should be removed. Excessive heat (140°F and higher) should be avoided, as belt life is shortened since the rubber is over cured. Belts should never be mixed or switched from one groove to another on the sheaves and belt dressing should never be used. Belts should be replaced with a matched set. Sheaves should remain free of oil and grease. Consult the drive manufacturer for more specific information.



CAUTION: Do not attempt to free a pump shaft from a binding or bound condition by applying power to the motor. Severe damage may result. To free up a pump, put an adjustable wrench on the shaft, using the key from the keyway as a stop for the wrench. Apply leverage to the wrench in the direction of normal rotation. If you are not able to free up the pump, contact your area representative or call the factory before trying any other method.

3.5 Oil Circulating Pump Option (where applicable)

The oil circulating pump is provided to guarantee a positive oil flow to the vacuum pump even when the operating vacuum is very low, or where a higher pressure drop in the oil piping due to deposit build-up, dirty and/or viscous oils is anticipated.

It is important to provide the vacuum pump with the correct oil flow to prevent flooding or starving the vacuum pump or high horsepower draw. To regulate the oil flow proceed as follows:

1. After the vacuum pump has been started and the working vacuum level has been set, adjust the oil flow-regulating valve while reading the pressure on the compound gauge.

2. The correct flow is achieved when the oil pressure on the compound gauge is approximately zero to plus 3 PSI for working vacuum level above 600 mbar (12" Hg vacuum or less) and zero to –5" Hg. for working vacuum level below 600 mbar (higher than 12" Hg vacuum).

Above instructions should be used for general guidelines. The setting may vary with pump sizes and ultimately the vacuum pump motor should not be overloading. The vacuum pump should run smoothly without vibration or abnormal noises and the oil temperature should be constant.

3.6 Shut Down Procedure

To stop the pump system, OPEN unloading valve (if installed), switch to off position, or push stop button. The inlet check valve will prevent fluid from the system being sucked back into the vacuum inlet manifold or piping.

4.0 MAINTENANCE

4.1 Seal Fluid

After the first 50 hours of operation, clean the filter/strainer in the seal fluid line to remove any debris carried over into the system.

Check seal fluid level in the reservoir. A high fluid level could mean a build up of water in the reservoir, which should be drained.

Repeat the above procedure every 1000 hours.

It is recommended that the seal fluid be changed every 6000 hours of operation or once a year, whichever is sooner. Extreme operating condition with contaminants may require more frequent changes.

To change the fluid, make sure the pump is off, and then drain the reservoir, vacuum pump and heat exchanger. We recommend that the fluid be changed when the system is at operating temperature.

Clean the seal fluid filter/strainer. If the strainer shows a considerable amount of deposit, consider flushing the system with Thermalsolve or similar cleaning fluid to remove varnish or sludge.

When changing the system with new fluid, make sure that the pump is filled up to shaft level, and that the reservoir is up to the level in the sight gauge. Open the air bleed valve on the heat exchanger to remove all air from the oil loop. Run the pump for a few minutes, stop and check fluid level again. If required, add fluid up to the correct level given by the sight glass gauge.

4.2 Bearing Lubrication

The smaller vacuum pump units through 7½ HP are installed with sealed bearings, which require no field lubrication.

The larger units of 10 HP and above require re-greasing every 3000 hours. Extreme operating conditions might require more frequent re-greasing. Grease fittings are located on each bearing housing.

WARNING: **DO NOT over grease bearings**

4.3 Shaft Seals

All Travaini vacuum pumps are fitted with mechanical shaft seals. Mechanical seals usually do not require maintenance unless there is visible leakage. Some leakage is normal or will accumulate over time.
Seal replacement is addressed in the assembly and disassembly instruction for the specific pump model used.

4.4 Exhaust Filter

The exhaust filter element is located in the separator/reservoir. Generally we recommend the replacement of the element every 6000 hours or once a year. Earlier replacement might be necessary when the backpressure is higher than 4 psig with operating vacuum level of 15" Hg or more. If excessive smoking or oil mist is present, check oil return line and orifice sight glass while the pump is running. A small amount of oil should be visible in the return line sight glass orifice, which has an adjustment knob for metering returned oil. If closed, turn knob until a flow of oil is visible.

4.5 Inlet Filter (if installed)

Check after first 50 hours of operation. Clean or replace element every 1000 to 3000 hours depending on application or if excessive pressure drop is noticed.

4.6 Maintenance Schedule

We recommend that you set up a basic maintenance schedule as follows to ensure trouble free operation.

***50 hours operation:** check oil level, clean strainers, remove temporary inlet screen if installed. Check for water in sight gauge. Drain off water, if necessary. Check piping for any signs of oil leakage, tighten, if necessary.

***Every 1000 hours of normal operation:** repeat above procedure.

***1000 – 3000 hours of operation (on pumps 10 HP and larger):** Grease bearings No.2 quality lithium grease. There are grease fittings located on each bearing housing. DO NOT OVERGREASE! 3–4 pumps with a normal grease gun is sufficient under normal conditions.

***6000 hours of operation (or once a year):** change seal fluid. Use TR1001 seal fluid. Change separator element if backpressure exceeds 4 psig. Check coupling element or belts for wear, replace if worn.

***Every 5 years or 30,000 hours:** it is recommended to have the mechanical seals and bearings replaced as preventative maintenance, if the pump operation is critical to your operation. Only an authorized distributor or properly trained individual should do this.

4.7 Troubleshooting

We recommend that you consult your local representative for service. This chart is intended as a basic troubleshooting guide. Each "Dynaseal" system is tested and checked at the factory. Always indicate system model and serial number when calling. A wiring diagram is supplied with each system if a control panel is supplied. Always isolate the machine before attempting any repairs.

WARNING: **Please observe caution, some machines can start automatically from a vacuum switch.**

4.7.1 Troubleshooting Chart

PROBLEMS	ITEMS TO CHECK*
1. Pump operates, but there is no vacuum	A-B-F-N-S
2. Pump shuts down while running	B-C-D-E-H-M-S
3. Pump overheats or operates above 200°F	B-F-G-P-T
4. Motor kicks out or stops after several starts	E-H-K-M
5. Pump will not start in hand or auto position	B-D-H
6. Abnormal noises or sound from pump	B-L-M-Q-R
7. Pump does not achieve desired vacuum level	A-C-Q-S-T
8. Excessive oil usage or misting	J-K
9. Excessive vibration	L-M-O
10. Pump will not rotate	I

Items to check for:

A. Open the inlet valve, check inlet filter for possible obstructions. Ensure that no lines are open to the atmosphere, causing loss of vacuum. Check suction line and system for leakage.

B. Ensure that the oil level is correct and that the pump is primed at start up.

C. Check the vacuum switch setting, if installed.

D. Check low oil level switch (if installed), add oil if needed. A 15 second time delay should be installed for oil level switch.

E. Check high temperature switch (if installed), which is set for 225°F

F. Check if the oil isolation valve is open and the solenoid, if installed, is working properly.

G. Check the oil cooler and fan. Clean cooler, ensure that 12" of space is available in front of the cooler and the ambient is below 110°F. Ensure that the fan motor is functional (if available).

H. Check the overload setting on the starter and fuses. Ensure the proper voltage is supplied and that the wire size is correct. Check if the disconnect is switched on. Push reset button.

I. Check if the pump has seized. If seized, consult the factory or dealer at once.

J. Check the oil return line from the separator and ensure that the oil flows through the sight glass. Check for a plugged line or closed metering valve. Oil return line at bottom of oil separator should have 45° cut.

K. Check the backpressure on the oil separator element. If above 4 psig, replace element.

L. Check the coupling and/or element. If worn or damaged, replace. Check belt drive, if available.

M. Check if bearings are greased. Rotate the pump by hand. If a rubbing noise or binding is observed, consult factory. Pump should rotate freely by hand.

N. Check if the pump rotation is correct!

O. Check the pump mounting bolts, coupling, fan and cooler are not loose. Tighten as required.

P. Check if the thermal valve (if installed) is working and if the oil is flowing through the cooler. ***Caution, hot oil!!***

Q. If a vacuum relief valve is supplied, check the setting and adjust as needed.

R. Check if the inlet is closed. The pump cavitates due to closed inlet or plugged filters.

S. Clean the strainer

T. Check that oil is clean and not viscous. Change oil if necessary.

4.8 MAINTENANCE SCHEDULE

		HOURS OF OPERATION																														
								1 yr						2 yr						3 yr						4 yr						5 yr
		50	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
1000 HRS	CHECK OIL LEVEL																															
	CLEAN STRAINERS																															
	REMOVE TEMPORARY INLET SCREEN																															
	CHECK FOR WATER IN SIGHT GLASS & DRAIN																															
	CHECK PIPING FOR OIL LEAKAGE																															
6000 HRS (once a year)	CHANGE SEAL FLUID																															
	CHANGE SEPARATOR ELEMENT IF NEEDED																															
	CHECK COUPLING ELEMENT FOR WEAR																															
	CHECK BELTS FOR WEAR																															
30,000 HRS/5 YRS	REPLACE MECHANICAL SEALS																															
	REPLACE BEARINGS																															
DATE																																

GREASING SCHEDULE (only applies to pumps 10 HP or larger)

DATE	every 1000 - 3000 hours																															

DO NOT OVERGREASE!! DO NOT OVERGREASE!!

DATE PURCHASED_____ MODEL_____ SERIAL NUMBER_____

Service Not Required At This Date

Service Required

√ (Check) and Date when Service Complete

5.0 *RECOMMENDED SPARE PARTS*

5.1	**System Parts:**	1 – Oil Demister Filter 1 – Pressure Gauge 1 – Vacuum Gauge 1 – Temperature Gauge 1 – 20 L Pail of Oil for top ups
5.1.2	**Vacuum Pump Parts:**	1 – Set of Mechanical Seals 1 – Set of Bearings 1 – Set of Radial Seal Rings 1 – Set of Gaskets
5.1.3	**Oil Pump:**	1 – Mechanical Seal

NOTES

TRAVAINI PUMPS

PREMIER FLUID SYSTEMS

OUR PRODUCT LINES:

- Liquid Ring Vacuum Pumps
- Rotary Vane Vacuum Pumps
- Compressors
- Fully Engineered Vacuum Pump Systems
- Fully Engineered Compressor Systems
- Mini / Compact Vacuum Pumps and Compressors
- Liquid Handling Multi-stage Centrifugal Pumps
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- Thermal fluid / Hot Oil Centrifugal Pumps
- Blowers and Blower Systems
- Complete Inventory of Pump and Compressor Spare Parts
- Ancillary items including tanks, bases, motors, couplings, gauges, filters, valves, heat exchanges and much more

TOTAL TECHNICAL ASSISTANCE AND SERVICE

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