



**INSTALLATION,
OPERATION AND
MAINTENANCE
INSTRUCTIONS**

THIS MANUAL APPLIES TO:

**DRY PIT VORTEX PUMPS
VERTICAL VDPS, VDPM, VDPL, XLVDP
HORIZONTAL HDPS, HDPM, HDPL, XLHDP
CLOSE COUPLED VDPCC, HDPC**

CAUTION

**CAREFULLY READ ALL SECTIONS IN THIS
MANUAL AND ALL OTHER INSTRUCTION
MANUALS PROVIDED BY MANUFACTURERS OF
OTHER EQUIPMENT SUPPLIED WITH THIS PUMP**

CAUTION

**PRIOR TO WORKING ON ANY ELECTRICAL OR PUMP EQUIP-
MENT, SAFETY ELECTRICAL LOCKOUT CIRCUITS SHOULD BE IN-
STALLED AND LOCKED OUT TO PREVENT SERIOUS INJURY OR
DEATH. REVIEW ALL LOCAL, STATE, FEDERAL CODES AND
OSHA REQUIREMENTS BEFORE WORKING ON ANY PUMPING
EQUIPMENT.
SAFETY IS YOUR RESPONSIBILITY**

**ESSCO PUMP DIVISION
ENGINEERS SALES-SERVICE CO., INC.
4935 TELEGRAPH RD.
LOS ANGELES, CA. 90022
Tel. (323) 261-2181 Fax. (323) 261-1523**

www.esscopumps.com



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PUMP IDENTIFICATION

Congratulations! You are the owner of the very best vortex dry pit pump commercially available. With proper care and maintenance it will provide you with reliable service for many years.

ESSCO pumps are of the heavy duty design with 100% recessed vortex impellers. **ESSCO** offers a wide variety of impeller designs to allow for equipment flexibility. **ESSCO** pumps are ideally suited for applications such as sewage, grit (heavy and/or fine), slurry, food waste handling, food handling and a variety of other services. Standard construction is cast iron with a packed stuffing box. Standard optional materials are available such as 316 S.S. (CF8M), High Chromium Iron, Nihard, CD4MCu, Bronze, and many others. Not all pump models are available in all materials. **ESSCO** pumps are engineered to accept a wide variety of mechanical seal materials.

This manual applies to:

All sizes of 100% Recessed Vortex Dry Pit pumps.

4x12* VDPM	
4x12	Pump size- 4" suction and discharge, 12" max. diameter impeller passing 4" solids.
6x4x12	Pump size- 6" suction, 4" discharge, 12" max. diameter impeller passing 4" solids
_*	ESSCO vortex pumps will pass solids equal to the discharge diameter.
V or H	Vertical or Horizontal
DP	Dry Pit
S,M, L or XL	Power Frame Size- Small, Medium, Large or Extra Large

In some cases a vortex pump model will be preceded by the suction size such as 8x6x17-100-6.

(1) **ESSCO** vortex pumps will pass solids equal to the discharge diameter.

CAUTION NOTES

These instructions apply to the pump only and are intended to be general and not specific. If the operating conditions change, refer to the factory or local factory representative or distributor for reapplication. Always refer to the manuals provided by manufacturers of the other equipment for their separate instructions and maintenance schedules.

CAUTION IMPORTANT SAFETY NOTICE

The installation, use and operation of this type of equipment is affected by various federal, state and local laws and the regulations concerning OSHA. Compliance with such laws relating to the proper installation, safe operation and maintenance of this type of equipment is the responsibility of the equipment owner and all necessary steps should be taken by the owner to assure compliance with such laws prior to operation and after performing equipment maintenance.

STORAGE OF PUMPS

If the equipment is not to be immediately installed and operated, store it in a clean, dry, well ventilated place, free from vibrations, moisture, rapid and wide variations in temperature.

A UNIT IS IN STORAGE WHEN:

1. It has been delivered to the jobsite and is awaiting installation.
2. It has been installed but operation is delayed pending completion of construction.
3. There are long periods (30 days or more) between operation cycles.
4. The pump is shut down for periods of longer than 30 days.

NOTE: Storage requirements vary depending on the length of storage, the climatic environment and the equipment. For storage periods of three months or longer, contact the manufacturer for specific instructions. Improper storage could damage the equipment

which would result in non-warranty covered restoration or non-warranty covered product failures.

DOUBLE MECHANICAL SEAL PUMPS

Pour at least 4 ounces of mineral oil into the seal housing and drain the oil just prior to start up of pump. **BE SURE TO CHECK FOR COMPATIBILITY OF THE MINERAL OIL AND THE MECHANICAL SEAL ELASTOMERS.**

SPECIAL INSTRUCTIONS WHILE PUMPS ARE IN STORAGE

Rotate the shaft for several revolutions at least once every week to:

1. Coat the bearing with lubricant
2. Retard oxidation or corrosion and
3. Prevent possible false brinelling

INTRODUCTION

This manual contains information which is the result of engineering research and experience. It is designed to supply instructions for the installation, operation and maintenance of your pump. Failure or neglect to properly install, operate or maintain your pump may result in personal injury, property damage or unnecessary damage to the equipment.

Variations exist in both the equipment used with these pumps and in the particular installation of the pump and motor. Specific operating instructions are not within the scope of this manual. The manual contains general rules for installation, operation and maintenance of the pump. **Observe and heed all caution or danger tags attached to the equipment or included in this booklet.**

INSTALLATION DRY PIT PUMPS

UNPACKING AND INSPECTION

Upon receipt, carefully unpack and inspect the pump and driver assemblies and individual parts to insure none are missing or damaged. Inspect all boxes and packing material for loose parts before discarding and report immediately to the factory involved, any missing parts or damage incurred during shipment. **You** must file a "damaged or lost in shipment" claim with the carrier immediately.

Horizontal pump and assemblies mounted on a structural steel base are aligned at the factory. However, alignment may change in transit or during installation. It must be checked after the unit is leveled on the foundation, after the grouting has set and the foundation bolts are tightened, and after piping is completed.

Tapped mounting blocks are furnished with horizontal pumps when the motor is to be field mounted. After the alignment of the motor is completed, the mounting blocks must be welded to the base and the alignment rechecked.

The installation of a vertical pump is essentially the same as for the horizontal configuration. Foundation, piping and alignment adjustments are accomplished using the same technique.

DRY PIT PUMP VENT

ESSCO Dry Pit pumps are shipped with a vent elbow, short nipple and pipe plug. Remove the pipe plug and the pump vent is ready for field installation. **It is recommended that the pump-
age from the vent valve be piped back to the
wet well above the high water level.**

MINIMUM SUBMERGENCE OF PUMP SUCTION AND PIT DESIGN

Generally it is required that an evenly distributed flow of non-aerated water be supplied to the pump suction. Improper pit design or insufficient suction submergence can result in intake vortexing which reduces the pump's performance and can result in severe damage to the pump.

We recommend that you secure the advice of a qualified Consulting Engineer for the analysis and design of the suction pit. Significant engineering data on pit design is provided in the Hydraulic Institute Standards.

Upon request, **ESSCO** will review plans and give general comments on the installation, but will not approve such plans for a specific installation and will accept no responsibility or liability for the performance of the pump intake structure.

LOCATION AND HANDLING

The pump should be installed as near the fluid as possible. A short direct suction pipe must be used to keep suction losses at a minimum. Locate the pump so the fluid will flow to the suction opening by gravity. The discharge piping should be direct and with as few elbows and fittings as possible.

The pump and motor should be located in an area that will permit periodic inspection and maintenance. Head room and access should be provided and all units should be installed in a dry location with adequate drainage.

WARNING

DO NOT PICK UP THE COMPLETE UNIT BY THE DRIVER, PUMP SHAFTS OR EYE BOLTS.

To lift a horizontal mounted unit, a chain or suitable lifting device should be attached to each corner of the base structure. Vertical mounted units may be lifted by using a sling through the motor high ring base, or by the eye bolts when provided in the pump casing. The individual

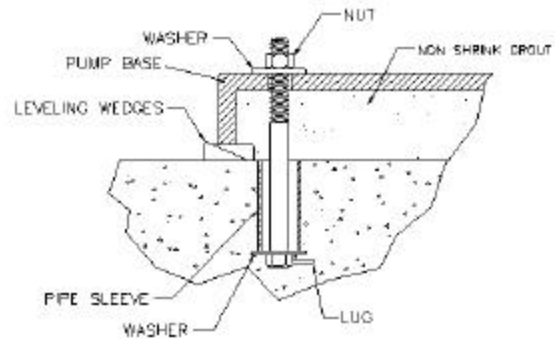
driver may be lifted using the proper eye bolts provided by the manufacturer, but these should not be used to lift the assembled unit.

INSTALLATION WHEN PUMPS ARE FURNISHED WITH A BOLT DOWN STAND OR VERTICAL PUMP STAND

FOUNDATION FOR PUMP STANDS

The foundation should have a level surface and be of sufficient mass to prevent vibration and form a permanent rigid support for the unit. The most satisfactory foundations are concrete with anchor bolts of adequate size embedded in the foundation in pipe sleeves with an inside diameter 2-1/2 times larger than the bolt diameter. This will allow for final accurate positioning of the unit.

Recommended anchor bolt design is shown below.



LEVELING OF THE PUMP UNIT

Lower the pump onto the foundation, positioning the pump so the anchor bolts are aligned in the middle of the holes.

Set the pump on metal shims or metal wedges placed directly under the part of the stand carrying the greatest weight, and spaced close enough to give uniform support and stability.

Adjust the metal shims or wedges until the discharge flange of the submersible pump is **level and plumb**. Make sure that all shims or wedges fit firmly between the foundation and the stand.

If leveling nuts are installed on the anchor bolts and are used for alignment, follow the same procedure as with shims or wedges. Support the pump with additional shims or wedges if necessary. Make sure that all nuts and shims are in firm contact with the stand. Tighten the foundation bolts snugly, but not too firmly, and recheck for alignment before grouting.

CAUTION

THE PUMP AND THE MOTOR MOUNTING SURFACES ARE PARALLEL WHEN MANUFACTURED, AND THE PUMPS AND MOTORS ARE ALIGNED AT THE FACTORY BEFORE SHIPMENT. DO NOT DISTORT THE BASE BY APPLYING UNDUE FORCE DURING THE ALIGNMENT PROCESS.

CAUTION

DO NOT OVER-TIGHTEN ANCHOR BOLTS OR THE STAND MAY BE DISTORTED.

GROUTING

When the alignment is correct, the unit should be grouted using a high grade non-shrinking grout.

Do not fill the pipe sleeves with grout.

If leveling nuts are used, make sure they are not embedded in grout. Provide access in the grout to the leveling nuts so that they can be backed off after the grout has cured. Allow the grout to fully cure before backing off the leveling nuts (if used) and firmly tightening the foundation bolts. Then recheck the alignment before connecting the piping.

PIPING

WARNING

DO NOT OPERATE THE PUMP IF YOU ARE EXPERIENCING EXCESSIVE SYSTEM LIFE SURGES. CONSULT WITH YOUR DESIGN ENGINEER.

CAUTION

ALL PIPING CONNECTIONS MUST BE MADE WITH THE PIPE IN A FREE SUPPORTED STATE, AND WITHOUT THE NEED TO APPLY VERTICAL OR SIDE PRESSURE TO OBTAIN ALIGNMENT OF THE PIPING WITH THE PUMP DISCHARGE FLANGE. DO NOT USE PUMP TO SUPPORT DISCHARGE PIPING.

CAUTION

AFTER ALL THE PIPING IS CONNECTED, THE PUMP AND DRIVER ALIGNMENT MUST BE RECHECKED.

All piping should be independently supported near the pump so that pipe strain will not be transmitted to the pump volute. The suction and discharge piping should be one or two sizes larger than the pump flange sizes. Any flexible joints installed in the piping must be equipped with tension rods to absorb piping axial thrust.

The suction pipe must be air tight and sloped upward to the pump flange to avoid air pockets which will impair satisfactory pump operation. The discharge pipe should be as direct as possible with a minimum of valves to reduce pipe friction losses.

A check valve and gate valve should be installed in the discharge line and a gate valve in the suction line. The check valve between the pump and gate valve should protect the pump from water hammer. Never throttle a pump by use of a suction gate valve.

AUXILIARY PIPING CONNECTIONS AND GAUGES.

In addition to the primary piping connections, your pump may require connections to the mechanical seal and seal filter (see the "stuffing box" and "mechanical seal" sections of this manual), stuffing box drain, discharge and suction flange pressure gauges, or base plate drain connections. All lines and gauges should now be installed.

PUMP VENTING

All vertical style pumps require a vent to allow air to escape from behind the impeller and prevent air binding. The vent should be piped back to the wet well or sump pump pit. Pump vent should be checked on a regular maintenance schedule.

FINAL COUPLING ALIGNMENT

The alignment of the coupling must be carefully checked during the installation and as the last step before starting the pump. If realignment is required, the piping should be disconnected first. After aligning, reconnect the piping in accordance with the previous instructions and again recheck the alignment.

A flexible coupling must not be used to compensate for misalignment resulting from poor installation or temperature changes.

ESSCO pumps are available with many different types of commercial couplings. Always check the coupling manufacturer's instruction manual prior to final alignment.

WARNING

CHECK SAFETY CODES, AND ALWAYS INSTALL PROTECTIVE GUARD OR SHIELD AS REQUIRED BY THE VARIOUS FEDERAL, STATE AND LOCAL LAWS AND THE REGULATIONS CONCERNING OSHA.

WARNING

COUPLING SLEEVES MAY BE THROWN FROM THE ASSEMBLY WHEN SUBJECTED TO A SEVERE SHOCK LOAD.

DOWELLING

When dowelling is required after the piping is connected and the final coupling alignment completed, the pump and driver should be drilled, reamed and dowelled to the baseplate using a minimum of two dowels each for the pump and driver.

VERTICAL FLEXIBLE SHAFTING ALIGNMENT

WARNING

THE WEIGHT OF THE INTERMEDIATE SHAFT MUST NOT BE SUPPORTED BY THE PUMP BEARINGS. IF THE WEIGHT OF THE SHAFT CANNOT BE SUPPORTED BY THE DRIVER BEARINGS, A SPECIAL THRUST BEARING SHOULD BE INSTALLED IMMEDIATELY BELOW THE MOTOR.

For installation and alignment of the intermediate flexible shafting, refer to the manufacturer's installation guide.

ROTATION

Before connecting the coupling halves, bump start the motor and verify rotation is in the proper direction. The correct pump rotation is indicated by an arrow on the pump casing.

MECHANICAL SEALS

CAUTION

DRY OPERATION OF THE PUMP WILL CAUSE DAMAGE TO THE MECHANICAL SEAL.

Double mechanical seals must be lubricated and cooled by clean or filtered liquid supplied to the bottom (lowest) seal housing pipe connection. Before starting the pump, all air and oil used for storage protection must be flushed out through the upper (highest) seal housing pipe connection.

TYPICAL-DOUBLE MECHANICAL SEAL

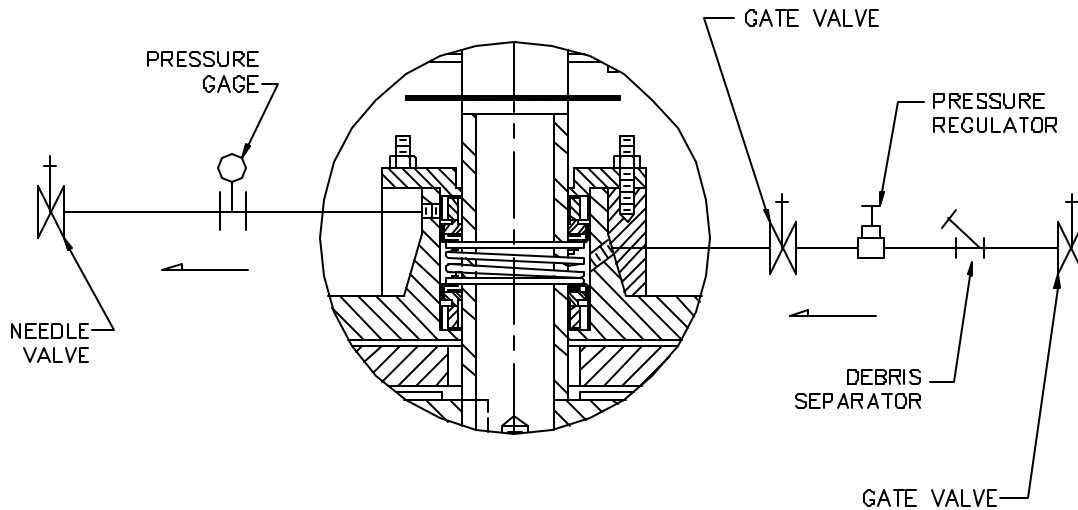
If an outside source of seal liquid is used, a pressure of 5 to 10 PSI higher than maximum pump discharge pressure must be maintained in the seal housing.

For operation of mechanical seals at higher pressure, circulation of the liquid may be required. Refer to the seal manufacturer for specific details.

Because of the many possible combinations of pumps and motors (drivers) this booklet is not meant to be a specific application operating manual. However, there are general rules and practices that apply to all pump installations and operation.

WARNING

BEFORE APPLYING POWER TO PUMP MOTOR CHECK SUPPLY VOLTAGE TO BE SURE IT IS CORRECT. BE SURE MOTOR IS WIRED FOR CORRECT VOLTAGE.



CAUTION

BEFORE STARTING OR OPERATING THE PUMP, READ THIS ENTIRE MANUAL, ESPECIALLY THE FOLLOWING INSTRUCTIONS.

A. PRIOR TO STARTING THE PUMP, ROTATE THE SHAFT ASSEMBLY BY HAND TO ASSURE ALL MOVING PARTS ARE NOT BOUND.

B. PRIOR TO STARTING THE PUMP, INSTALL GUARDS AROUND ALL EXPOSED ROTATING PARTS.

C. OBSERVE AND HEED ALL CAUTION OR DANGER TAGS ATTACHED TO THE EQUIPMENT.

D. BEFORE STARTING THE PUMP, FILL THE CASING AND SUCTION LINE WITH LIQUID. THE PUMP MAY BE PRIMED BY USING A PRIMING SYSTEM.

E. BEFORE STARTING A MECHANICAL SEAL PUMP, TURN ON THE SEAL WATER, VENT THE SEAL HOUSING AND CONFIRM SEAL WATER IS AT SUFFICIENT PRESSURE.

F. BEFORE STARTING A PACKED BOX PUMP, ADJUST THE PACKING GLAND SO THERE IS SUFFICIENT LEAKAGE TO LUBRICATE THE PACKING AND ASSURE A COOL STUFFING BOX(SEE MAINTENANCE INSTRUCTIONS).

IF EXCESSIVE VIBRATION OR NOISE OCCURS DURING OPERATION, SHUT THE PUMP DOWN AND CONSULT AN ESSCO REPRESENTATIVE.

OPERATING AT REDUCED CAPACITY

In a typical application covering a wide range of flow rates, a variable speed driver is often used to adjust pump capacity and this is taken into consideration by **ESSCO** when selecting the pump and impeller trim. Although these pumps are applicable over a wide range of operating conditions, care should be exercised when doing so, especially when the actual conditions differ from the sold for conditions. You should always contact your nearest ESSCO representative before operating the pumps at any condition other than that for which they were sold.

INITIAL STARTUP OF THE PUMPS

MECHANICAL SEALS

For Dry Pit pumps be sure the vent valve is open to allow air to escape from the volute. If the vent valve is not open an air pocket can form and cause damage to the mechanical seal.

- A. After the pump is installed close the discharge valve closed and start the motor according to the manufacturer's instructions.
- B. Open the discharge valve slowly to prevent water hammer, and to allow the discharge line to fill completely.
- C. Monitor the motor amperage as the discharge gate valve is opened. Do not exceed the service factor of the motor or extreme damage to the motor may occur.

CAUTION

DRY OPERATION OF THE PUMP WILL CAUSE DAMAGE TO THE MECHANICAL SEAL. MAKE ABSOLUTELY CERTAIN THE VOLUTE IS PRIMED.

STUFFING BOX WITH PACKING

CAUTION

EXTREME CARE SHOULD BE TAKEN WHEN ADJUSTING PACKING. THE PUMP WILL BE IN OPERATION AND SEVERE INJURY CAN BE SUSTAINED IF YOU ARE NOT PAYING ATTENTION. KEEP FINGERS, CLOTHING AND JEWELRY AWAY FROM ALL ROTATING PUMP COMPONENTS!!

For Dry Pit pumps with a stuffing box and packing there are 3 common arrangements:

1. Product lubricated packing. This is the most common arrangement where the pumped liquid is used to cool and lubricate the packing. The last ring of packing is normally shipped loose and is to be installed during equipment start up. There are two stainless steel studs on the stuffing box with stainless steel nuts and washers. The pump(s) are shipped with the packing nuts slightly tightened. Upon start up of the pump(s) the packing nuts should be loosened to allow the pumped liquid to lubricate the packing. After starting the pump the packing gland should be tightened to allow a small stream of liquid leak out. The packing nuts should be tightened slowly and continuously until the gland bottoms out making room for the final ring of packing.

Before adding the last ring of packing be sure to disconnect the power to the pump.

After the pump shaft stops rotating loosen the nuts on the packing gland and insert the last ring of packing. Hand tighten the packing gland nuts prior to re-starting the pump. With the pump in operation slowly tighten the packing gland nuts one half turn per side. Do not over tighten or you will damage the shaft sleeve.

The packing will require a 4-6 hour break-in period. Be patient or you will damage the shaft sleeve which will not be covered under warranty.

Once the last ring of packing is installed the packing gland should drip a minimum of 25 drops per minute.

2. Water flushed packing. Connect the water flush line to the packing box. The flush water will enter the stuffing box through the lantern ring and lubricate the packing. **Be sure the flush water always starts before the pump begins operation.**

The flush water pressure should a minimum of 10 PSI greater than the discharge pressure and the flush water temp should be no more than 120° F.

For start up procedure follow the instructions in section 1 under this heading.

3. A third common method of lubricating the packing is with grease. If this method is used then a spring loaded automatic grease lubricator must be installed on the stuffing box flush connection. The spring tension must be greater than the discharge pressure when the pump is in operation. The grease lubricator must be kept full in order to insure proper distribution of grease to the lantern ring. **For gritty applications this is not a recommended packing lubrication.**

BEARING OPERATING TEMPERATURE

ESSCO pumps are designed to operate over a wide ambient temperature range. The bearing temperature, when measured on the outside surface of the bearing housing, should not exceed 190 deg. F. Temperature in excess of 190 deg. F may indicate a lack of lubricant, bearing overload or potential bearing failure. If the temperature exceeds this limit, the pump should be stopped and the cause investigated and corrected immediately to prevent damage.

For Oil Lubricated Bearing use SAE 20 non-detergent oil.

For Grease Lubricated use **Mobilgrease XHP222 Special Premium Lubricating Grease with Moly** or equal.

Service	Example	Lubrication Interval
Easy	Infrequent Operation	Annually
Standard	Two Shifts per Day	Six Months
Severe	Continuous Operation	Three Months
Extreme	Dirty Locations and/or High Ambient Temp.	Two Months

TROUBLESHOOTING

CAUTION

PRIOR TO WORKING ON ANY ELECTRICAL OR PUMP EQUIPMENT, SAFETY ELECTRICAL LOCKOUT CIRCUITS SHOULD BE INSTALLED AND LOCKED OUT TO PREVENT SERIOUS INJURY OR DEATH. REVIEW ALL LOCAL, STATE, FEDERAL CODES AND OSHA REQUIREMENTS BEFORE WORKING ON ANY PUMPING EQUIPMENT.

SAFETY IS YOUR RESPONSIBILITY

VORTEX PUMP TROUBLESHOOTING

If you have followed the installation and startup procedures outlined in this manual, your pump should provide reliable service and long life. However, if operating problems do occur, significant time and expense can be saved if you use the following check list to eliminate the most common causes of those problems.

IF THE PUMP IS OPERATING IN THE REVERSE ROTATION, THE MOTOR WILL DRAW UP TO 50% MORE AMPERAGE THAN WHEN OPERATING IN THE CORRECT ROTATION.

INSUFFICIENT DISCHARGE PRESSURE OR FLOW

1. Pump not primed or vents plugged.
2. Speed too low. Check driver.
3. Discharge head too high.
4. Air leaks into suction piping, stuffing box or gaskets.
5. Impeller damaged.
6. Insufficient suction line submergence.
7. Air in liquid.
8. Impeller diameter too small.
9. Insufficient net positive suction head.
10. Suction line partially plugged.
11. Discharge valves not open.

LOSS OF SUCTION DURING OPERATION

1. Suction line leaks.
2. Water seal line to packing box is plugged.
3. Air or gases in liquid.
4. Air leaks into suction piping, stuffing box or gaskets.

5. Wrong direction of rotation.
6. Insufficient suction lift submergence.

EXCESSIVE POWER CONSUMPTION

1. Pumps are running in wrong direction.
2. Speed too high.
3. Head lower than rating, pumps too much liquid.
4. Specific gravity or viscosity of liquid pumped is too high.
5. Mechanical defects: Shaft bent. Rotating element binds.
6. Misalignment
7. Incorrect diameter impeller.

VIBRATION OR NOISE

1. Misalignment between driver and pump.
2. Foundation bolts loose or defect in grouting.
3. Mechanical defects: Shaft bent. Rotating element binds.
4. Head lower than rating, pumps too much liquid.
5. Pump strain- improperly supported or aligned.
6. Pumps running at shut-off condition.
7. Insufficient suction line submergence.
8. Air in liquid.
9. Suction line partially plugged.
10. Suction line too small.
11. Suction line too long.

OVER-HEATING

1. Bearings (grease lube)
 - Excessive grease
 - Shaft bent
 - Rotating element binds
 - Pipe strain
 - Insufficient bearing lubrication
 - Incorrect type grease
2. Packing box:
 - Packing gland too tight
 - Air not vented out of volute
 - Flush water not circulating
3. Bearings (oil lube)
 - Oil level too low
 - Oil level too high
 - Shaft bent
 - Pipe strain
 - Bearing binding

PREVENTATIVE MAINTENANCE LOG

Pump Model Number:		Pump Serial Number:	
Date	ETM Hour Meter Reading	Amp Reading	Comments