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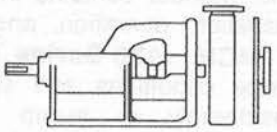

Installation, Operation and Maintenance instructions for MCM 178 SERIES PUMPS

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Introduction

This manual contains instructions for the installation, operation, and maintenance of the **MCM 178 Series** Pump. As pump service conditions and specifications vary considerably in pump installation, this manual cannot possibly cover every situation, but it is hoped that the information included will serve as a guide. Should questions arise, or start-up problems occur, it is suggested that you contact the **MCM** Pump Distributor or Salesman in your area.

There are many principles of proper pump installation and application as well as special considerations for the **178 Series** design which, if followed, will further enhance the performance of your **178 Series** pump.

This document will deal with both general and specific recommendations for improved **178 Series** performance in both oilfield and industrial applications.

General Instructions

1. Operate the pump only in the performance range for which it was designed.
2. The pump driver must drive the pump **CLOCKWISE** when viewed from the coupling end. Reversing the rotation will prevent the pump from operating effectively.
3. Do not operate the pump with the suction or discharge valves closed.
4. Adjust the packing so that a small amount of leakage remains for lubrication and cooling.
5. When operating in drilling mud, prevent packing drippage from clogging the drip area and hardening around the slinger and front seal.

PART I Installation

Interchangeability

178 Series horizontal centrifugal pump outside envelope dimensions are the same as older 1 7/8 inch pumps of the same nominal size so the models can be interchanged without changing existing piping, couplings, or bases.

Location

The pump should be located near the liquid source so that the suction line can be short and direct. The pump should be located below the level of the liquid to eliminate the necessity of priming.

Foundation

The foundation should be sufficiently rigid and substantial to absorb any vibration and support the base plate at all points. A concrete foundation, poured on a solid footing of adequate thickness to support the pumping unit, provides the most satisfactory foundation. The base plate should be installed in a level position.

Note: A detailed description of proper procedures for grouting base plates may be found in the Hydraulic Institute Standards, 13th Edition, Pages 116,117.

When fabricated bases or fabricated skid bases are utilized, the foundation should be sufficiently rigid and level to absorb any vibration and support the base at all points.

Coupling Alignment

Good service life of the pump and driver depends upon good alignment through the flexible coupling. If the electric motor was mounted at the factory, the pump and motor were in alignment when shipped. **The alignment between the pump and driver should be inspected after installation to ensure that transportation or other handling has not caused misalignment of the unit.** Poor alignment may cause failure of the coupling, pump, motor, or bearings. **Alignment must not be attempted until the base is in position and the mounting and flange bolts have been tightened.**

The recommended procedure for coupling alignment is with the use of a dial indicator, as illustrated in Figures 1 and 2. The dial indicator is attached to one coupling half with the indicator button resting on the O.D. of the other coupling half to measure offset misalignment. To measure angular misalignment, the indicator is positioned so that the buttons rest on the face, near the O.D., of the other coupling half. Rotate the shaft and dial indicator one revolution while the other shaft remains stationary and note

the T.I.R. Unless otherwise specified by the coupling manufacturer, offset misalignment should be limited to 0.005 inches T.I.R. Adjust the alignment by loosening the pump or driver mounting bolts and retighten or shim as required.

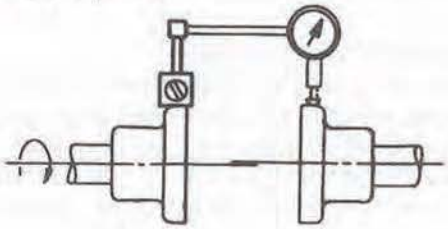

Figure 1
Measuring Offset Misalignment With A Dial Gauge

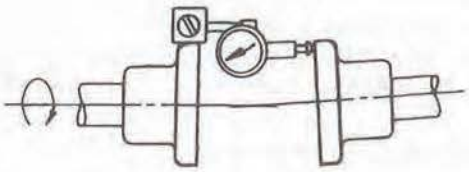

Figure 2
Measuring Angular Misalignment With A Dial Gauge

In areas where a dial indicator arrangement is not available, an adequate job of alignment can be done with a straightedge. This method is especially useful if the coupling used contains a rubber drive element.

To check offset misalignment, lay the straightedge in line with the shafts on the O.D.'s of the coupling halves. There should be no gaps under the straightedge. Check two locations 90 degrees apart. Angular misalignment can be checked by measuring the gap between coupling half faces. There should be no more than a 1/64 inch gap under the straightedge or a 1/64 inch variation in the gap between the coupling halves. See Figures 1A and 2A.

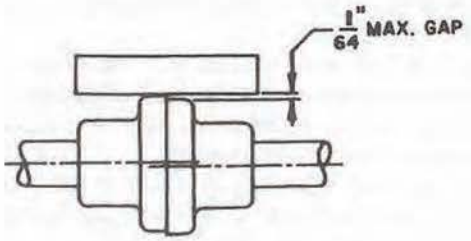

Figure 1A
Measuring Offset Misalignment Using a Straightedge

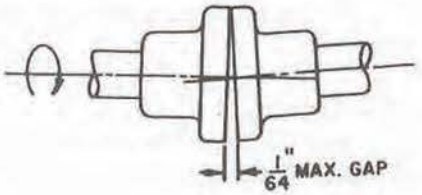

Figure 2A
Measuring Angular Misalignment Using A Straightedge

Note: Further reference on coupling alignment can be found in Hydraulic Institute Standards, 13th edition, pages 177, 120.

Piping (General)

Note: Piping must not be connected to the pump until the grout has hardened and the foundation and pump hold down bolts have been tightened.

Piping should be anchored independently of the pump and as near to it as possible. Pipe companion flanges should line up naturally with pump flanges. **Do not draw the pipe to the pump with flange bolts.**

Piping (Suction)

Properly selected and installed suction piping is extremely important to eliminate vibration and cavitation in the pump. Vibration can cause packing problems or undue bearing loads.

The suction line should be equal to or larger than the pump suction. **The capacity of a centrifugal pump should never be adjusted by throttling the suction line.**

A positive shut-off valve of a type to cause minimal turbulence should be installed in the suction line to permit the closing of the line

for removal of the pump for inspection and maintenance.

The suction line should be designed to eliminate any air pockets. The piping should gradually slope downwards to the supply source to eliminate air pockets.

The suction line should have a straight section into the pump of a length equivalent to at least two times its diameter; i.e. a 4 inch suction line should have a minimum 8 inch straight run.

For temporary hook-up when flexible hose is used, a non-collapsing hose is essential since the suction line pressure is often below atmospheric pressure. A collapsed suction line will result in below average or complete loss of flow.

Piping (Discharge)

A positive shut-off valve should be located in the discharge piping to permit the closing of the line for removal of the pump for inspection and maintenance.

All piping should be independently supported and accurately aligned. **The pump must not support the weight of the pipe or compensate for misalignment.**

If operating conditions are not known with sufficient accuracy, it will be necessary to provide a throttle valve in the discharge line to ensure that the pump operates at the design point.

If the pump is connected to a pressurized system, it is important to install a check valve between the pump discharge and the throttling valve. The check valve will prevent back flow through the pump. Back flow may cause the impeller to become loose on the shaft. A loose impeller will likely result in mechanical damage and fluid leakage beneath the shaft sleeve.

PART II PREPARATION FOR OPERATION

Initial Lubrication

Standard pumps are shipped with oil in the reservoirs. **The oil level must be checked and oil added if necessary before operating the pump.** A good grade of SAE 10W30 oil can be used.

The air vent should be kept clean to prevent pressure build-up due to heating that occurs in normal operation. There is a dipstick that shows the correct oil level.

If vertical operation or grease lubrication of the bearings is preferred, there are plugs in the front and rear bearing caps that can be removed and replaced with grease fittings.

Check Pump Rotation

Most pumps manufactured have clockwise rotation when viewed from the coupling end. The correct rotation can be found by an arrow on the casing.

It is very important that the pump rotation is determined before starting the pump. If the **178 Series** is turned backwards it will not operate as designed.

The best way to check rotation is to disconnect the coupling, but it can be checked without disconnecting the coupling. One person should be at the pump watching the shaft while a second person starts and then immediately stops the pump so the shaft barely turns over.

Priming The Pump

Be sure the pump has fluid in the casing before running. If the pump is operated without fluid, the packing can be destroyed in one minute. Vent air from the suction line and fill it with liquid. Start the pump with the discharge valve cracked open. After discharge pressure stabilizes, gradually open the discharge valve to the required position. If flow is lost, close the discharge valve and wait a few seconds for the discharge pressure to build. Continued flow difficulty indicates improper pump selection or installation.

Run the pump with the discharge valves closed only for short periods of time. The energy going into the pump heats the fluid in the casing. If the pump needs to operate shut in some of the time, be sure to install a small line (1/4 or 1/2 inch) back to the suction tank between the discharge valve and the pump for cooling.

Packing

Loosen the packing on startup. The gland bolt nut should be only finger tight. New packing will expand faster with heat than older packing. Therefore, new packing must be adjusted more slowly than old packing. Too tight and it will not leak. With no cooling it will burn and be no good for sealing.

Start-Up Checklist

1. Pump rotates freely by hand.
2. Coupling aligned.
3. Oiler full and oil level correct.
4. Suction valve fully open.
5. Pump and suction line full of fluid.
6. Discharge valve is slightly open, not fully open. Fully open the discharge valve after the pump is running.

PART III OPERATION

Maximum Operating Conditions

Note: These maximum operating conditions apply to pumps which are exposed to room temperatures without external insulation.

1. Cast Iron: Maximum working pressure is 175 psig at 150° F or 150 psig at 250° degrees F. Interpolate for pressure between 150° and 250° F maximum.
2. Steel: Maximum working pressure and test pressure in accordance with ANSI B 16.5-1973, Tables 2.1 through 2.23 and Table 3.
3. For H-30 and SUPREME HARD alloy, contact **MCM** distributor.
4. Cooling water through the lantern ring is required when fluid being pumped is between 150° and 250° F. In addition, it may be necessary to run water over the exposed shaft to prevent excessive heat build up at the lip seals and bearings.
5. Maximum hydraulic performance is in accordance with published performance curves.

Pump Records

Maintain data cards or pump records whenever possible. This will provide ready access to information for ordering spare parts, and for evaluating pump performance.

Information to be included in these records should be:

1. Pump size and serial number.
2. Pump model number, impeller diameter, material of construction.
3. Mechanical seal manufacturer, type, code, and drawing number.
4. Motor horsepower and speed of operation.
5. Service conditions.
6. Frequency of operation.
7. Record of maintenance, including parts usage and general pump conditions.
8. Nomenclature and part number of replacement items.

On **MCM** built pump packages we put a nameplate on the base with a job number. With this job number we can tell you everything about the pump package, including anything special about the motor, coupling type and size, impeller size, etc. With this information you have much more than what is requested above

Bearing Lubrication

Oil Lubrication

Standard pumps have bearings OIL lubricated from the factory to lower bearing temperature and wear. There is a dipstick to check for correct oil levels. Use a good grade of 10W30 weight motor oil. There is also a plug on the side of the bearing frame. When adding oil, remove this plug. When oil runs out of the plug hole, the oil is at the proper level. Replace the plug. Do not overfill the oil. High levels may cause churning and overheating of the bearings. Oil should be changed every 90 days or 1000 hours.

Grease Lubrication

If the pump is mounted in a vertical position or in another position which oil lubrication is not suitable, the bearing caps have been drilled and tapped for grease fittings. Grease lubrication is suitable for speeds up to 2400 RPM. However, grease normally runs hotter than oil and is more likely to contain contaminates which can damage the bearings. **MCM** recommended bearing greases are Exxon Unirex N2, Chevron SRI-2, Texaco Premium RB, Shell Dolium-R, American Oil Company Rycon Premium Grease and Mobilux EP Multi-Service Grease. Greases available in tubes are the best. Five shots with a standard hand operated grease gun of the above greases or equivalents in each bearing monthly is sufficient for twenty-four hour per day operation.

Packing Lubrication

Grease Lubrication

The stuffing box may be re-lubricated with grease as often as necessary to prevent the packing from overheating. It should be