Installation and Start-Up Manual

Axial Piston Pumps

CAUTION – Before performing any service operation on any pump, be sure that all pressure has been relieved from the system.

CAUTION – Before performing any service operation on a pump, disconnect or lock off power supply.

CAUTION – Before starting any pump, be sure that any resulting machine function will not endanger persons or equipment.

GENERAL SPECIFICATIONS

MOUNTING

Any unrestricted mounting position acceptable. Horizontal mounting preferred. The mounting hub and two-bolt mounting flange conform to SAE mounting standards.
Continental Hydraulics does not recommend direct rigid connection of piston pumps to the Prime Mover. Use of a flexible coupling, a coupling that allows for minor misalignment is recommended.

If the shaft connection to the Prime Mover is rigid, the mounting face diametric concentricity and squareness must be within .001 inch (0.03 mm) T.I.R. for a flange mounted pump.

The HPV / HPVR Piston Pumps are designed for inline drive. Angle drive creates side loads on the shaft, and is not acceptable.

SHAFT INFORMATION

Splined: The coupling interface must be lubricated. Continental Hydraulics recommends lithium molydisulfate, or similar grease. The female coupling should be hardened to 27-45 Rc, and must conform to ANSI B92.1 Class 5 Fillet or Flat Root Side Fit.

Keyed: High strength heat treated keys must be used. Replacement keys must be hardened to 27-34 Rc. Key corners must be chamfered .030 - .040 inch (.75 - 1.0 mm) at 45° to clear radii in the keyway.

PLUMBING: Connect inlet and outlet lines to the pump's cover. HPVR fluid connections are SAE straight thread, SAE flange or BSPP. Refer to the Product Catalogs for correct port information and torque values.

Maximum case pressure is 10 psi (0.70 bar). Case pressure must never exceed inlet pressure by more than 15 psi (1.0 bar). To prevent fluid drain-down from the pump when idle, make certain that case drain plumbing passes above the highest point of the pump before entering the reservoir. Or, install a 5 psi (.3 bar) case pressure check valve to assure that the pump is always filled with hydraulic fluid.

The case drain line must be big enough to prevent back pressure in excess of 10 psi (0.70 bar). Hydraulic fluid from the case drain line should be returned to the reservoir below the fluid level, and as far from the supply intake as possible. All fluid lines (whether pipe, tubing or hose) must be of adequate size and strength to assure free flow through the pump. Do not tee return lines together.

SYSTEM RELIEF VALVES Although HPV / HPVR Series pumps have a very fast off-stroke compensator response, fast acting relief valves are recommended in all cases for safety. They also help reduce transient pressure spikes.

RECOMMENDED FLUID

Note: The following fluid recommendations and specifications apply to HPVR series pumps only. Assure that all other components in the hydraulic system have compatible requirements.

Petroleum-based, and most phosphate esters. Fluids should be designated by the manufacturer for use in hydraulic systems. Fluids should be formulated with oxidation inhibitors, anti-rust, anti-foam and deaerating agents. Other fluids may be acceptable, but special O-rings may be required. Nitrile (Buna) seals are standard.

VISCOSITY

Maximum at full power. . . . . 750 SUS (160 Cst)

Optimum for maximum life. . . . 140 SUS (30 Cst)

Minimum at full power. . . . . 60 SUS (10 Cst)

Viscosity Index 90 V.I. minimum. Higher values extend the operating temperature range, but may reduce fluid service life.

Fluid Operating Temperature – Operating temperature should be determined by the viscosity characteristics of the fluid used. Fluid temperature in the reservoir during operation should be kept between 100° F. and 130° F. (38° C. and 54° C.) Because high temperature degrades seals, reduces service life and creates hazards, fluid temperature should not exceed 180° F. (82° C.) at the case drain.

CAUTION – Fluid temperatures in excess of 120° F. (49° C.) can cause serious burns and scalding. Allow fluid to cool before performing any repairs or maintenance.

Fluid Cleanliness – Control particle contamination by changing or cleaning all filter elements periodically BEFORE they become clogged and start to by-pass.

Fluid must be cleaned before and continuously during operation to a cleanliness level of ISO 18/16/13 or

better. This level of cleanliness can usually be accomplished by use of 10 micron filters. Better fluid cleanliness will significantly extend component life. Since contaminant generation varies with each application, each must be analyzed to determine proper filtration to maintain required cleanliness.

After Extended Shutdowns – Some types of hydraulic fluids become tacky after long periods of non-use. If possible, hand turn the pump several times after extended shutdowns to assure that all components move freely before powering up.

CAUTION – Before manually turning any pump, be sure that any resulting machine function will not endanger persons or equipment.

PREVENTIVE MAINTENANCE

This pump is self-lubricating. Preventive maintenance is limited to keeping the system fluid clean by changing filters regularly. Since filtering needs can vary depending on applications, filters used with this pump should be equipped with indicators that show when changes are needed. Do not operate the pump in a system with clogged or bypassing filters.

Keep all fittings and screws tight. Do not operate this pump at pressures or speeds in excess of stated limits. If the pump does not operate properly, check the Trouble Shooting Section of this manual before attempting to overhaul the pump.

Overhauls are relatively simple, and are covered in the Repair Procedures Section of this manual.

Note: It is especially important to keep suction or inlet piping and fittings tight and in good repair. Air drawn into the system through loose or damaged intake fittings can cause the pump to fail.

START UP PROCEDURE FOR NEW INSTALLATION

1. Read and understand the Service Manual. Identify components and their functions.
2. Visually inspect system components and lines for possible damage.
3. Check reservoir for cleanliness. Drain and clean as required.
4. Check reservoir fluid level and fill as required with filtered fluid that meets or exceeds ISO 18/16/13 cleanliness level.
5. **Fill pump through either Case Drain Port**
6. Check drive alignment.
7. Check and activate oil cooler (if included in circuit). Check fluid temperature.
8. Reduce relief valve pressure settings. Make sure accurate pressure readings can be made at appropriate places.
9. If the system includes solenoids, check for proper actuation.
10. Jog electric motor to confirm proper rotation. Jogging the electric motor primes the pump and bleeds air from the system.
11. Start pump drive. Look for leaks, and listen for excessive noise at the pump. If leaks, chattering or other noises are observed, immediately turn the pump off. Corrective actions are covered in the Trouble Shooting Section.
12. Cycle unloaded machine at low pressure, and observe actuation (at low speed, if possible).
13. Increase pressure settings gradually up to required PSI or maximum pump rating.. Check for leaks in all lines, especially in the pump inlet line.
14. Adjust system pressure as needed.
15. Gradually increase system speed to normal operating level. Be alert for trouble indicated by noise, sound changes, system shocks, leaks, or air bubbles in the reservoir, and Case Drain Ports
16. When the system is running normally, check fluid level and temperature at the reservoir. Repeat these checks periodically. Excessive fluid temperatures will damage the pump. If fluid temperature does not stabilize at 140° F (60° C.) or less, stop the system and take appropriate corrective action.
17. System is operational. Follow appropriate maintenance procedures to assure fluid cleanliness and proper operating temperature.

REPLACEMENT PUMP INSTALLATION

To prevent premature pump failure, make sure that the entire hydraulic circuit is flushed completely clean before installing and operating a replacement pump.

Simply draining the reservoir or relying on the system's filters is not enough to adequately clean the fluid. Debris trapped in other components or lines may damage the components themselves, or be drawn into the pump. Failure to properly flush the system before installing a replacement pump voids the pump's warranty.

The following procedures checklist will help you replace a hydraulic pump with confidence that it will provide satisfactory pump life.

1. Determine the cause of the failure (be sure you have found the cause, and not simply a symptom).
2. Eliminate the cause of the failure.
3. Drain the entire circuit, including cylinders, motors, reservoirs, Control valves, heat exchangers, and filters.
4. Remove system lines and components. Flush with a compatible solvent, or clean filtered oil to remove contamination that may have entered the system when the pump failed. Be certain that fluid has been flushed from cylinders.

5. Visually inspect components for possible contamination, and for proper operation. Pay special attention to wipers on cylinder rods. Be sure that the rods are free of nicks and scratches.
6. Flush the reservoir using pressurized solvent. Use clean, dry, lint-free cloths to ensure a clean interior. Inspect the filler/breather (if used) and the suction strainer for cleanliness.
7. Install a new filter with a 10 micron or better element, and low Beta ratio. If the machine does not have a filter, install one that meets these specifications.
8. Fill the reservoir with new, FILTERED oil of the recommended type. Be certain to monitor the fluid level, since the entire system (not just the reservoir) must be filled.
9. Re-install all system lines. Visually inspect to make sure they are clean, and free of contamination. Be sure that all inlet fittings are tight and clean.
10. Install the new pump.
11. Follow the start-up procedures given on pages 2 and 3 of this manual.
12. Cycle all cylinders and operate all motors at normal operating speeds for 20 minutes. While operating, observe the reservoir fluid level, since all components will be filling with hydraulic fluid.
13. Replace the filter element, and check the fluid level. Add new, clean, filtered oil if required.

To assure that your replacement pump performs at the same level as the original pump, check daily for proper fluid level, filter condition and leaks. Change fluid at recommended intervals. Good fluid maintenance is especially important when using other than mineral based fluids.

TROUBLESHOOTING GUIDE

Component problems and circuit problems are often interrelated. A poorly designed circuit may operate with apparent success, but cause a component of the system to fail. The component failure is the effect, not the cause of the problem. The following general guide is offered to help you locate and eliminate the cause of problems by studying their effects.

Problem	Possible Cause	Look For
Noisy Pump	Air in fluid	Leak in suction line Leak in shaft seal Low fluid level Turbulent fluid Return lines above fluid level Gas leak from accumulator Excessive pressure drop in the inlet line from a pressurized reservoir
	Cavitation in pump rotating group	Fluid too cold, too viscous or too heavy Shaft speed too high Suction line too small, or collapsed Suction line strainer dirty or too small
Noisy Pump	Misaligned shaft	Faulty installation Distortion in mounting Axial interference Faulty coupling
	Mechanical fault in pump	Piston and shoe loose or failed Bearing failure Incorrect port plate selection or index Eroded or worn parts in displacement control
Erosion on barrel and port plate	Air in fluid	Refer to above
	Cavitation	Refer to above
High wear in pump	Excessive loads Contaminant particles in fluid	Reduce speed or pressure setting Improper filter maintenance Filter too coarse Dirty fluid introduced to the system Reservoir or breather cap open to atmosphere Improper line replacement
	Improper fluid	Fluid too thick or too thin for operating temperature range Fluid breakdown due to age, temperature or shearing effects Incorrect additives in new fluid Reduced additive effectiveness due to chemical aging
	Improper repair	Incorrect parts, procedures, dimensions or finishes
	Unwanted water in fluid	Condensation Faulty breather/strainer Heat exchanger leaking Faulty clean-up practice Water in makeup fluid

Problem	Possible Cause	Look For
Pressure shocks	Cogging or erratic load movement	Mechanical considerations
	Slow acting relief valve	Replace with fast acting relief valve
	Worn relief valve	Repair or replace, as needed
	Worn compensator	Repair or replace, as needed
	Insufficient line capacitance (line volume, line stretch, accumulator effects)	Increase line size or length
Fluid overheats	Excessive pump leakage	Recheck case drain flow, repair as needed Fluid too thin, minimum operating viscosity 60 SUS (10Cst) Improper assembly
	Faulty relief valve	Set too low (compared to load or compensator) Instability caused by back pressure, or worn parts
	Faulty compensator	Set too high (compared to relief) Worn parts
	Faulty heat exchanger	Water turned off, or insufficient flow Ambient water temperature too high Fan clogged, restricted or inoperative Mud or scale buildup Intermittent hydraulic fluid flow through exchanger