

HYDRAULIC SYSTEM SURVIVAL TECHNIQUES FOR OILGEAR EQUIPMENT

You may have a new system or one that has been running for years. In either case, there are some parameters in which to stay in order for your Hydraulic System to run long and within specifications. We feel that if your maintenance department understands the requirements, our equipment can be installed and will run properly.

This bulletin will describe these Survival Techniques.

A. FLUID

By running a pump with the correct viscosity fluid, the bearings, pistons, and other parts are protected. Viscosity is affected by the viscosity grade and inlet temperature. These requirements are shown in the Fluid Recommendation Bulletin 90000 and Fluid Suppliers in Bulletin 90008. Keep in mind that oil tends to retain air when run below 120° F so this is a good operational temperature.

B. CONTAMINATION

It is obvious, that if the heavily loaded fluid separating high speed parts contains excessive contaminants, rapid wear will occur. The maximum contamination level defined by the ISO code is shown in the Fluid Recommendation Bulletin 90000 and is explained and correlated to the Oilgear grade in the Filtration Bulletin 90007.

It is recommended that the contamination level be determined every 3 months so that you can detect a rise in the level. This might indicate a pending component failure, filters that are not being maintained, or inadequate filtration. If assistance is required, call your Oilgear sales representative. For other periodic checks and tests, refer to Service Suggestions Bulletin 910000.

C. STORAGE

If you have a pump in storage, you want it to perform well when ever it's installed. If the unit is stored for many years and its not protected, damage can occur. As the pump changes temperature, air is exchanged and moisture can be left inside. After about a year, the rust inhibitor in our test oil may be depleted and rusting can occur. A rusty piston can stick in the cylinder bore causing the destruction of the pump.

We recommend plugging the open holes and filling the pump with fluid as described in Storage Recommendation Bulletin 90006. Kits can be supplied to prepare your stock unit for long term storage or a repair or exchange unit can be supplied, prepared, and filled. The pump should then survive an almost indefinite storage period.

D. SERVICE

While your equipment is running, a routine check of critical parameters will maximize your up-time and minimize operational problems. Our suggestion for items to check on a daily basis

and items to check less frequently are shown in Service Suggestions Bulletin 910000. Keep in mind, Oilgear can provide field servicemen who can run the more difficult periodic checks such as system and pump efficiency tests or a periodic tune-up of a more complicated system.

For information on keeping the pumping pistons in contact with the thrust rings in our C and D type pump, refer to Bulletin 90021.

E. REPAIRED OR REPLACEMENT UNITS

If you have had a pump failure, the system is often saturated with debris and a pile of debris can be on the floor of the reservoir just below the pump suction pipe. A repaired pump with tight fits may not be able to tolerate this high level of contamination. Therefore, the system should be cleaned, see Bulletin 90022.

F. EDUCATION

One of your best Preventative Maintenance efforts is in a well trained maintenance staff. By their knowing about the operation and required maintenance of our equipment, you will be assured of proper running and minimum downtime. Call the Oilgear Service Department for information on the Fluid Power or Electronic School schedule. For an in-plant school, call your local district office or the Milwaukee Service Manager.

G. CAVITATION

Many of the pumps that are returned to the factory for repair show signs of cavitation. The evidence ranges from slightly eroded surfaces to deep irregular cavities. If left uncorrected, it can lead to the early destruction of a pump.

Cavitation occurs when either a void or an air bubble in the fluid is suddenly exposed to high pressure. The pressure causes the void/bubble to collapse at extremely high velocities. When the collapsing void/bubble disappears, the high velocity oil literally runs into itself causing spot pressures that can reach 200,000 psi. Sudden pressures of this magnitude cause noise and eat away at the metal surfaces.

The Solution is to eliminate voids and air bubbles in the oil. Voids occur when high vacuum is present in the suction line. This vacuum causes the entrained air (air that is normally in solution at atmospheric pressure) to come out of solution thus creating a void. Avoid restrictions in the suction lines including strainers, elbows, and pipe reductions.

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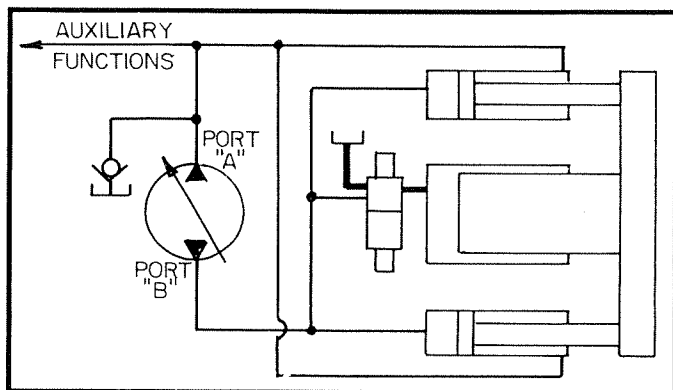
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If the cause was air, the bubble will diesel causing oxidation and nitration. This burned fluid will cause the components to become coated with a varnish like material resulting in sticking valves, etc.

Air bubbles can be eliminated by:

- Repairing loose suction pipes.
- Ensuring that all return lines terminate below oil level.
- For presses using two-way pump circuits:
 - repair all leaks in high pressure piping.
 - maintain packings and rod seals on the side cylinders.
- Maintain oil level in reservoir at maximum safe level.
- Install baffle plates over the tank pre-fill connections.
- Maintain oil temperatures at or above 120° F.

Besides contamination, cavitation is the most frequently occurring condition leading to catastrophic destruction of pumping equipment. Furthermore, this cavitation is almost always attributable to air ingestion, especially in older systems. The importance of the elimination of air cannot be overemphasized.



Two-Way Pump Circuit Example

During extrusion on "B" port, air can be ingested through:

1. Leaking connections anywhere on "A" port side.
2. Worn rod packings on side cylinders.
3. Low reservoir level.

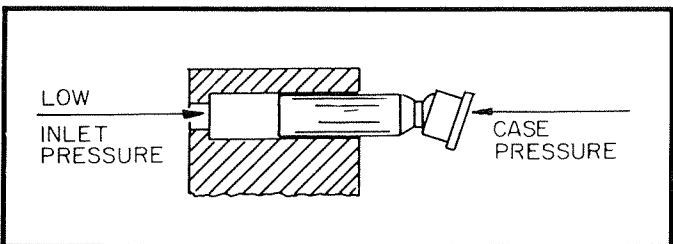
When delivering at "A" port, air can be ingested through:

1. Leaking connections anywhere on "B" port side.
2. Worn main ram packings.

H. CASE PRESSURE

Many of our pumps have a drain line that runs from the case back to the reservoir. It is generally important that this line does not combine with other lines, filters, or coolers before it enters the reservoir because excessive case pressure may be created.

In many pumps, if the case pressure is higher than the inlet pressure there can be a net force on the piston that pushes it into the cylinder on the suction side which then slams back on the shoe running surface when it sees high pressure. After doing this for a while, catastrophic damage can occur.



Besides restricted drain lines, high case pressure can be caused by controls that shift suddenly and discharge into the case, directional valves shifting suddenly sending a pulse into the drain

line, relief valves that suddenly blow into the drain line, etc. Often, a high speed recorder is required to detect this spike in case pressure because pressure gages are too sluggish.

Large diameter, short drain lines that run directly to the reservoir is the best solution to this problem.

I. PARTIALLY FILLED CASE

Many of our units are designed to run with the case full of oil. If they run partially full, the fluid tends to centrifuge to the outside leaving foam toward the center. The limited lubrication causes parts to overheat and burn up. The impact of moving parts on the foam causes cavitation. The end result can be a pump failure.

Often, about one gpm of oil from an external source into the case is required to keep it full and to flush out the foam. Refer to the pump specifications on your unit or contact your Oilgear salesman for a specific recommendation.

Our C, D, and some A pumps run case empty. They are designed to properly lubricate themselves as the drain leakage falls out of a drain hole in the bottom of the pump. No external lubrication is necessary. An unvented case drain filter is not recommended since it causes the pump to run with the case full.

J. RESERVOIR TEMPERATURE

Fluid Recommendation Bulletin 90000 gives the operational temperature for a variety of fluid viscosities. By keeping the fluid at a fairly steady reasonable temperature, the system operation should remain uniform.

If an oil to water heat exchanger is used and the only control on water flow is a shut-off valve, the oil is often too cold. This oil then tends to retain air causing pump cavitation and spongy operation. For good air release, the oil should be kept at 120° F.

Control is reasonable for a while if an inexpensive, small automatic water regulator is used where a bulb senses oil temperature which works through a capillary to regulate a water valve. These valves tend to stick and then are removed and a shut-off valve is the controller. The larger assemblies, which are very reliable, are resisted because of their cost.

A good solution is to use a thermostat set at 120° F in the reservoir that turns on a solenoid operated shut-off valve in the water line. This reliable assembly will turn on and off through the day, keeping your temperature at a uniform level allowing your system to run smoothly.

K. EQUIPMENT INSTALLATION

I. New Equipment

Filling - Particular care must be taken when filling the main reservoir. Fluid should be pumped using a portable filter unit having an element with a Beta 10 ratio of at least 15 and a good by-pass indicator. The system should then be flushed with a temporary pump and system filter elements checked and cleaned/replaced as necessary.

Samples - Fluid samples should be taken at various intervals during this flushing procedure to ensure that contamination is being removed and to indicate when the fluid is at its acceptable level. See Bulletin 90000. An ISO contamination level of 18/15 or an Oilgear level of 2 would be a typical maximum.

Flushing - After the full flushing run and all pipework has been reconnected, the system should be run unloaded for a while to expel any air that has been trapped and the reservoir level re-

checked. This will probably involve stroking cylinders and in some cases they will also need to be bled. Be aware of any "high" points in the system where air may be trapped.

2. Replacement Equipment

To properly install and start-up replacement equipment so it can run as well as and have the life potential of new equipment, see Bulletin 90022.

3. Piping

For information on piping, refer to Bulletin 90011. The fluid velocity in lines should be slow enough so it doesn't generate excessive heat, line loss, water hammer, or turbulence in a reservoir. A reasonable velocity in pressure lines is 20 feet per second and in suction lines or lines returning to the reservoir is 5 feet per second. The return line can be enlarged near the reservoir to reduce the velocity. To calculate line velocity in f/s:

$$V = .408 \times G/ID^2$$

G = gpm of pump
ID = pipe or tube inside diameter (in inches)

4. Unusual Fluids

If your equipment is running near hot parts or equipment, a fire resistant fluid should be considered by you and your insurance company. Our equipment generally has viton seals and the paint is an epoxy, both stand up to a variety of fluids. When you determine the fluid type, contact your Oilgear salesman for a confirmation on the compatibility.

- Phosphate Ester - see Bulletin 90000 Fluid Recommendations for proper viscosity.
- Water Based - see Bulletin 90009, High Water Content Fluid, for our Laboratories Report.
- There are other types of fluids that are less fire resistant, however, that have fewer compatibility problems than a water base or Phosphate Ester fluid. See your fluid supplier and insurance company for a recommendation.

NOTES:



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