PREVENTION OF PREMATURE HYDRAULIC COMPONENT FAILURES

Premature failure of hydraulic components decreases the productivity and increases the operating cost of hydraulic equipment. Premature failure is simply defined as the failure of a component prior to it achieving its expected service life. The expected service life of individual components within a hydraulic system varies and is influenced by a number of factors, which include:

- type of component;
- circuit design;
- operating load;
- duty-cycle; and
- operating conditions

Component type, circuit design, operating load and duty cycle are largely determined by the machine or system manufacturer at the design stage. Therefore, from an operation and maintenance perspective, the factor that has the most impact on component service life are the conditions under which the hydraulic system operates. The following conditions have a negative impact on hydraulic component service life and, if chronic within a system, will lead to premature failures.

High fluid temperature

Fluid temperatures above 180°F (82°C) damage seals and reduce the service life of the hydraulic fluid. In cases where the temperature/viscosity limits of the fluid are exceeded, inadequate lubrication due to low fluid viscosity causes damage to system components.

To avoid system damage through overheating, consider fitting temperature alarms and investigate and rectify high temperature indications immediately. Systems that operate consistently above 185°F (85°C) usually have insufficient cooling capacity for the ambient air temperature.

Incorrect fluid viscosity

Optimum operating efficiency is achieved with a fluid viscosity in the range of 80 to 170 SUS (16 to 36 cSt). Maximum bearing life is achieved with a minimum viscosity of 120 SUS (25 cSt). Excessively high fluid viscosity can result in damage to system components through cavitation, while low fluid viscosity can result in damage through inadequate lubrication.

To avoid system damage through incorrect fluid viscosity, specifications for operating temperature limits and fluid viscosity must be met simultaneously. For further information refer to our Technical Library document titled Hydraulic Fluids.

Fluid contamination

Contaminants of hydraulic fluid include air, water, solid particles or any other matter that impairs the function of the fluid.

Air contamination can result in damage to system components through loss of lubrication, overheating and oxidisation (burning) of seals. Common entry points for air contamination include vortex effect at the pump suction (due to low reservoir oil level) and in some systems, faulty pump shaft seal. To avoid damage to system components through air contamination, maintain the reservoir oil level at maximum, consider fitting a low fluid level alarm to the reservoir, and maintain pump shaft seals in good condition.
Water contamination can result in damage to system components through corrosion, cavitation and altered fluid viscosity. To avoid damage to system components through water contamination, ensure that all penetrations into the reservoir air space are sealed and that maximum oil level is maintained to minimize condensation within the reservoir.

Solid particle contamination, which reduces the service life of components through abrasive wear, can be generated internally or externally ingested. Common entry points for particle contamination are through the reservoir air space and on the surface of cylinder rods. To minimize entry of contaminants in these two areas, and thereby reduce the contamination load on the system’s filters ensure that:

- all penetrations into the reservoir air space are sealed and that the reservoir breather incorporates an air filter of 5 micron or better;
- the chrome surfaces of cylinder rods are free from pitting, dents and scores, and rod wipers are maintained in good condition.

To avoid damage to system components through particle contamination, change filters regularly, consider fitting filter bypass alarms to warn of premature clogging, and monitor fluid cleanliness level through regular oil sampling. For detailed information on fluid filtration and cleanliness levels refer to our Technical Library document titled Filters.

**Incorrect commissioning or adjustment**

Incorrect commissioning of hydraulic components during initial start-up can result in damage through inadequate lubrication, cavitation and aeration that may not manifest itself for hundreds or even thousands of service hours. To avoid damage to system components during initial start-up, follow manufacturers’ commissioning procedures. For information on commissioning hydraulic systems refer to our Technical Library document titled Hydraulic System Commissioning Procedures.

Incorrect setting of hydraulic system adjustments can result in component damage through over-pressurization, cavitation and aeration. To avoid damage to system components through incorrect set-up, check hydraulic system adjustments at regular intervals and if necessary re-set according to manufacturers’ specifications.

**After the event**

When a premature failure does occur, conduct a thorough failure analysis in order to determine the cause of the failure. Consult a hydraulic specialist if necessary. While failure analysis is not conclusive in all cases, it can provide valuable clues to identifying the cause of failure, which is essential in order to effect action to prevent the reoccurrence of similar failures.

[Email this article to a friend or colleague!](#)

For more articles like this one, [sign-up for our FREE newsletter](#).