

Hydraulic Filtration and Contamination

All hydraulic systems have a common need for protection from harmful contaminants. Good contamination control means cost effective filtration. Filtering out the particles large enough to be harmful to your system prevents damage and allows the longest possible filter service life. Minimizing maintenance costs through good contamination control practices requires proper filter application based on the specific contamination problems.

Contaminants, the natural enemy of hydraulic systems, cause more than 70% of all failures. If not controlled, particles too small to be seen can reduce hydraulic system efficiency. System efficiencies may be reduced as much as 20% before it is recognized that something is wrong. Contamination affects hydraulic systems in many ways.

- Corrosion of hydraulic systems from acids that form due to fluid breakdown and mixing of incompatible fluids in the system
- Increased internal leakage which lowers the efficiency of pumps, motors, and cylinders. It decreases the ability of valves to control flow and pressure accurately. It also wastes horsepower and generates excess heat.
- Sticking of parts due to sludge or silting. Silting is a collection of fine particles in critical areas, which will impair proper system operation.
- Seizure of parts or components caused by large amounts of contaminants getting stuck in the clearances.

There are several major sources for system contamination. They are: (1) contamination built-in at the point of manufacture, (2) hydraulic fluid contamination, (3) environmental contamination, (4) system wear contamination and (5) contamination introduced during the servicing process.

Built-in contamination, or primary contamination, is caused during the manufacture, assembly and testing of the hydraulic components. Metal fittings, small burrs, pieces of Teflon tape (other sealing compounds), sand and other contaminants are routinely found in initial clean up filtration of newly manufactured systems. These can be the most damaging particles to your system. Filtering them out immediately with a fine filter (often finer than needed for normal operating life) will prevent early catastrophic system failure, or continuing system leakage problems.

Assume all hydraulic fluid is contaminated. Even "new" hydraulic fluid is contaminated to a level that is higher than acceptable for most hydraulic systems. Always filter new hydraulic fluid for system filling or just "topping-off" a system. Otherwise contaminants will be introduced into the system by the new hydraulic fluid. Check the hydraulic fluid to be sure it meets the ISO 4406 code for the system in which it will operate.

Ingressed or external contamination comes from the environment. Dirt can enter the hydraulic system fluid supply through rod seals, breather caps and worn cylinder rods.

The internal operation of the system generates contaminants that need to be removed. Internal rod ends, valve spools, pump vanes and hoses all generate minute particles that will contaminate a hydraulic system.

When systems are checked or disassembled for inspection or repair, the system is vulnerable to dust and air borne contaminants entering. The dust and air borne contaminants will adhere to filler caps, breathers, funnels, transfer pumps, and replacement parts. Care must be taken during all repairs to keep the system free from contaminants.

In order to work on hydraulic systems properly and safely, you should:

- clean exterior surfaces of dust, dirt, oil, etc. before removing covers
- make sure new parts are clean
- use a vigorous wash when cleaning parts
- keep parts protected prior to assembly
- protect system openings use covers, tape, plastic wrap, etc.
- clean transfer containers, funnels, nozzles, etc.
- use covers to protect drums from becoming dirty or wet around their lids
- filter fluids before filling sumps, don't remove filler screens
- clean filters for all hydraulic fluid handling
- use clean-out filters to clean system after assembly

For additional information, contact:

Filter Manufacturers Council
P.O. Box 13966
Research Triangle Park, NC 27709-3966
Phone: 919/406-8817 Fax: 919/406-1306
www.filtercouncil.org
Administered by Motor & Equipment Manufacturers Association