Filter Manufacturers Council

Filter Knowledge, Unfiltered

Technical Service Bulletin 96-2

Diagnosing Hydraulic Filters with Collapsed Center Tubes

When investigating hydraulic system performance problems, an inspection of the system filters should be conducted. If it is discovered during the inspection that a center tube has collapsed, further system inspection and servicing must be conducted.

The two main causes of center tube collapse are (1) malfunction of the bypass valve and (2) the incorrect pressure rating of the bypass valve located either within the hydraulic system or integrated into the filter itself.

The purpose of the bypass valve is to relieve excessive differential pressure. Differential pressure is the difference in fluid pressure between a filter's inlet (dirty) side, and the filter's outlet (clean) side. Under normal operating conditions, differential pressure or restriction increases as the filter is loaded with contamination. At a certain point, the differential pressure becomes high enough to open the bypass valve and route the fluid around the filter media. This is a filtration condition commonly known as "plugged".

A malfunctioning bypass valve can cause large differential pressures and lead to center tube collapse. Listed below are some of the more common causes of bypass valve malfunction:

- Sticky surfaces caused by cold hydraulic fluid or residue buildup on valve
- Hydraulic fluid high in chemical contamination (i.e. water, acids)
- Improper servicing of the bypass valve assembly during filter change
- Broken pressure spring

Bypass valve settings differ from system to system. An incorrectly sized bypass valve can also cause large differential pressure and lead to center tube collapse. Hydraulic filters can be subjected to both periods of very high flow and high pressure spikes.

High flow rates may be caused by the following:

- Malfunctioning valves or valve bodies
- A rapid return of fluid to the tank (i.e., a load being dropped quickly)
- Momentary malfunction of the system's pressure regulating valve

Large pressure spikes can be caused by:

- Sudden shift in direction of the fluid within the system

Bypass valves must also be sized to handle different environmental factors. For example, cold weather startups often require the use of a bypass valve. When fluid is cold, the viscosity is high making it difficult for the fluid to travel through the filter media. For a short period, the pressure may need to be relieved through the use of the bypass valve. If this pressure is not adequately reduced, the center tube may collapse under the excessive differential pressure.

For further information about hydraulics refer to the latest FMC Technical Service Bulletins 96-1, 96-3, and 97-1, as well as the NFPA (National Fluid Power Association) Publications Catalog.

For additional information, contact:

Filter Manufacturers Council
P.O. Box 13966
Research Triangle Park, NC 27709-3966
Phone: 919/549-4800 Fax: 919/549-4824
www.filtercouncil.org
Administered by Motor & Equipment Manufacturers Association