

Diagnosing Hydraulic Filters with Collapsed Center Tubes

Today's hydraulic systems commonly incorporate some sort of filtration in the system design. The most common filtration used in hydraulic systems involves cartridge or spin-on filter elements. When diagnosing hydraulic system malfunctions or performance problems, or when conducting routine maintenance, a review of the system's filter(s) should be conducted. If, during the inspection of the filter the element's center tube is found to have collapsed, further system inspection and servicing must be conducted.

Hydraulic systems that make use of a cartridge or spin-on filter should incorporate a filter by-pass valve that is located somewhere between the inlet and outlet flow pattern of the filter. The purpose of the by-pass 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. The most common cause of high differential pressure is the filter becoming filled with contamination, a condition commonly known as "plugged". As the filter's media becomes more and more contaminated, it becomes more restrictive to the flow of fluid, and thus causes an increase in differential pressure. By-pass valve settings differ from system to system. Most hydraulic systems have the by-pass valve located somewhere in the vicinity of the filter's mounting base.

If a filter is found to have a collapsed center tube, the diagnosis can be one of a by-pass valve malfunction, whether permanent or temporary. If the valve does not relieve the differential pressure, this pressure will increase to the point where center tube damage occurs. High differential pressure may also be caused by an intermittently or permanently malfunctioning fluid pressure regulating valve. If both or either of the valves malfunction, the increased differential pressure may result in damage to the filter.

Malfunction of the by-pass valve and fluid pressure regulating valve may be caused by any one or a combination of the following:

- Sticky surfaces caused by cold hydraulic fluid
- Hydraulic fluid high in chemical contamination (water, acids, etc.)
- Improper servicing (cleaning) of the by-pass valve assembly during filter change

At times the filters used on a hydraulic system may be spin-on type filters that incorporate a by-pass valve assembly within the filter. These valves are designed to allow for the appropriate amount of flow through the filter, should the differential pressure presented to it be of sufficient quantity to activate the valve.

Hydraulic filters can be subjected to periods of very high flow. If this flow is excessive, the by-pass valve may not be able to handle all of the flow that is suddenly presented to it. This would cause very high differential pressure. This too could cause a collapsed center tube. Additionally, this could also occur on a system equipped with a cartridge style filter. If the flow of hydraulic fluid suddenly overwhelms the by-pass valve assembly, excessive differential pressure will occur, as will possible filter damage.

High flow rates may be caused by the following:

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

Any time a filter is discovered to have a collapsed center tube, the system's components should be checked carefully, and serviced as necessary. In addition, the center tube collapse probably resulted in excessive contamination being presented to the entire system. We recommend that the system be serviced and cleaned thoroughly prior to the equipment being returned to use.

For additional information, contact:

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