Diagnosing Filters With Collapsed Center Tubes or Elements

When a collapsed filter element is discovered, the natural tendency is to assume something is wrong with the filter itself (Figure 1). Generally, this is not the case, but is usually a symptom of problems elsewhere in the engine.

Automotive engines incorporate a by-pass valve across the inlet and outlet of the full flow filter, which serves to by-pass oil around the filter if its restriction becomes excessive (Figure 2). The by-pass flow circuit insures oil flow to the engine when there is a significant restriction across the filter due to loading or cold start conditions. Typically, engine manufacturers design by-pass valves to open at a filter differential pressure of 10 psi (70 K Pa), with some opening as high as 30 psi (206k Pa). Some engines have the by-pass valve mounted in the engine block, while others locate the by-pass valve in the filter.

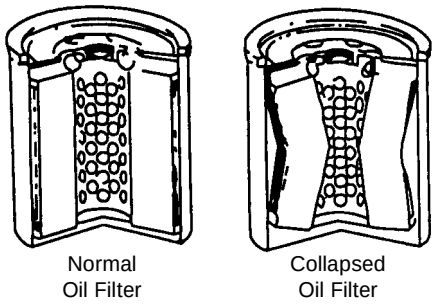

Figure 1

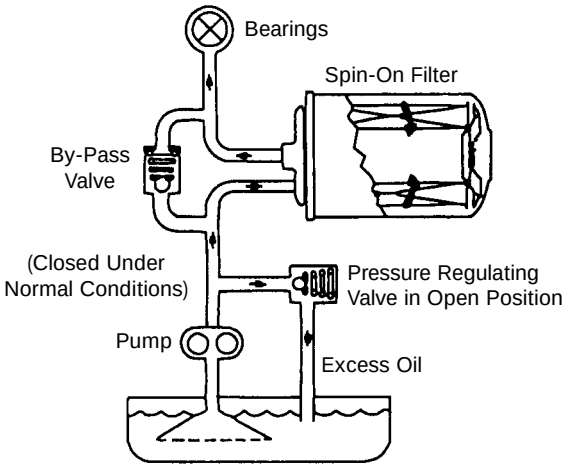

Figure 2 – Normal Pressure

Automotive lube oil filters are designed to withstand differential pressures significantly greater than those experienced under normal operating conditions without collapsing. Therefore, when an element has collapsed, it is usually the result of a “sticky” or otherwise malfunctioning by-pass valve.

In some instances, a “sticky” filter by-pass valve alone is not enough to collapse a filter. The oil pressure regulating valve may also stick, resulting in increased pressure and flow through the filter. Although this condition may be only momentary, it can quickly collapse the filter center tube if the by-pass valve fails to relieve the pressure.

A collapsed filter can lead to a loss of filtration and oil flow to the engine; there is the possibility that interior parts of the filter or filtering material may be torn away and move into the fluid system and interfere with the oil flow.

The malfunction of the by-pass and oil pressure regulating valves and the subsequent collapse of the filter may not cause noticeable damage but at times it can result in a catastrophic failure to the engine; seizure of a piston or of rod or main crankshaft bearings.

The malfunction of by-pass valves and regulating valves has been traced to:

- Sticky surfaces caused by cold, highly viscous oil;
- Oil contaminated by excessive condensation, coolant, or oxidation;
- Neglect – extended oil drain and filter change intervals;
- Carbon grit that temporarily jams a valve;
- Sudden acceleration of the engine with any of the above conditions.

Discovery of a collapsed filter calls for inspection of the filter by-pass valve and the pressure regulator valve and a review of the engine and its performance and maintenance history.

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