

Technical Bulletin 2

OVER PRESSURIZATION

Over Pressurized Oil Filters

From time to time every filter manufacturer has had a filter that has been severely over pressurized returned from a customer. Often the deformed filter is the only sign the car owner has that a problem existed in their lube oil system.

It's possible that the damaged filter was not noticed until it was removed during the next scheduled oil change. However, if the pressure was sufficient to blow out the gasket or unroll the lock seam, the car owner may have experienced immediate and costly problems.

With the "evidence" in their hands, they tend to put the blame on the damaged filter. It's not surprising that they are more than a little aggravated when the filter manufacturer denies any responsibility for the damage. What, then, has caused the over-pressurization?

A look at how a lube oil system functions will show that oil pressure is created by the oil pump. The upper limit of this pressure is controlled by a pressure regulating valve which is usually an integral part of the pump. Figure 1 is a simplified diagram of the lube oil system showing the pump, regulating valve, filter and bearings.

The pump supplies sufficient flow to lubricate the bearings and other moving parts of the engine. This oil must be under pressure if it is to properly separate the highly loaded parts of an engine and prevent excessive wear. The purpose of the regulating valve is to provide this pressure which on most passenger cars is between 40 PSI (280 kPa) and 60 PSI (410 kPa).

The regulating valve is made up of a ball or plunger which regulates pressure with the aid of a spring. The spring is calibrated so that the plunger will lift off its seat when the oil pressure reaches the desired amount. Once the valve is open, the pressure remains fairly constant with only small changes occurring as the engine speed varies.

The filter and all other components in the lube system are subjected to the pressure established by the regulating valve. If this pressure is excessive, filter damage may occur. This is the point that many people who are not familiar with lube systems fail to realize.

What can cause the pressure in the system to exceed the regulating valve setting? The answer is that either the valve must be stuck in the closed position or it is sluggish and slow to move to the open position after the engine has started.

Figure 2 shows the system operating with the regulating valve stuck in the closed position. Under these conditions the pressure builds up equally on all components in the system until something happens to relieve the pressure. If the regulating valve becomes unstuck, the pressure will return to normal.

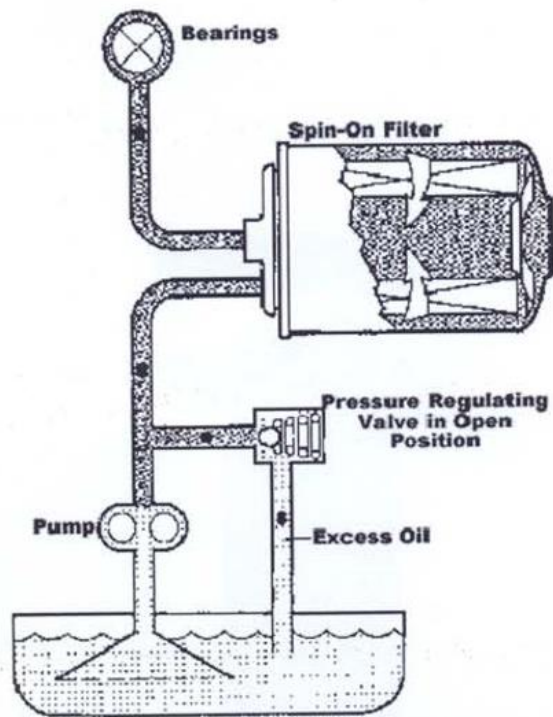
Normal operating pressure causes no permanent deformation of the filter body. When the system pressure reaches 150 PSI (1,000 kPa) due to a faulty regulating valve, most filters become permanently deformed. At this pressure the gasket usually will not blow out and the lock seam will remain sound.

If the regulating valve still remains stuck, the pressure will increase further and the gasket between the filter and the base can be blown out. This will probably cause the loss of all the oil in the system. If the filter has been installed on the tight side, the gasket may not blow out and the lock seam will unwind as the pressure continues to rise. The main point is that the deformed filter is not the cause of this excessive pressure, but is the victim of a faulty regulating valve.

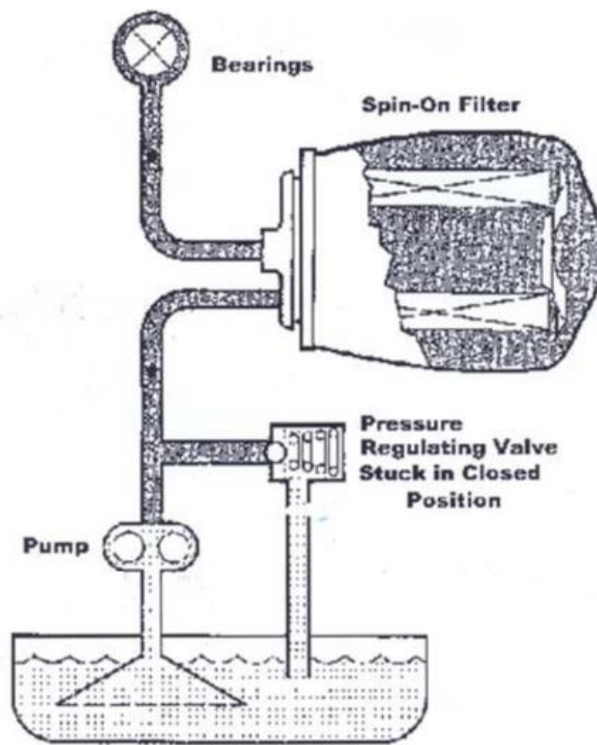
If the customer is alert and shuts the engine off at the first sign of trouble (red light on or reduced oil pressure) they can limit their loss to a tow job, oil change and new filter. If the vehicle continues to be driven, engine failure is probable.

The customer may ask if a plugged filter could have caused the over-pressurized condition. The answer is no; if the regulating valve is functioning properly it will maintain the pressure on the filter at 40 PSI (280 kPa) or 60 PSI (410 kPa) even if the filter is plugged.

In summary, if a lube filter distorts due to excessive pressure in the system, the fault lies with the oil pump pressure regulating valve and not with the filter.



NORMAL PRESSURE
FIG. 1



EXCESSIVE PRESSURE
FIG. 2