Transmission Oil Cooler Flushing

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Because late-model transmissions are characterized by closer tolerances, solenoid valves, computer controls, and OEM required flow tests; flushing a transmission oil cooler is a crucial service practice when replacing a transmission and is a requirement for warranty on any OEM or remanufactured unit you may install.

The oil cooler is critical to the life of the unit. The cooled fluid returns from the cooler to lubricate bearings, bushings, etc.; before returning to the pan. We have determined the average size of normal wear material, throughout the life of a transmission that can pass through the cooler, to be 600 micron (common beach sand is known to be 200 micron). Sensitive controls and solenoids are very susceptible to debris related failures. This is supported by the OEM's integration and use of internal screens on the solenoids and in valve body plates protecting these sensitive controls.

Debris will settle out of the flow stream into corners and crevices of the oil cooler and become bound by the varnish and "waxy" deposits that are byproducts of overheating of transmission fluid. As time goes on, a minor wear particle scenario grows much bigger as larger debris flows into the torque converter; clutch material from the converter is giving up under this debris load. Every particulate ends up in the cooler. Because of the fine mesh design and small passageways of most in-radiator heat exchangers; the oil cooler is now used as a filter for these larger particles, which are beginning to impede or completely block sufficient oil flow and cooling. This is why you must know the flow direction and always backflush first; to back out the larger debris that cannot be pushed through the cooler.

Merely hanging an auxiliary oil cooler is not an effective alternative to flushing the OEM cooler. The OEM required method to add an auxiliary cooler for severe duty is to run through the OEM cooler first (not to eliminate it), then the auxiliary cooler. The OEM circuit uses water temperature to regulate optimum transmission oil temperature. In some cases excessive overcooling can be as damaging as overheating. The computer in some newer models is looking for minimum and maximum temperatures to be achieved and regulated in specific time periods, failure to ever see these optimum temperatures could set a trouble code. Our recommendation is to flush, returning the OEM designed efficiency of the OEM cooler; and to add an auxiliary cooler only when excessive loads require it. Always install auxiliary coolers per the OEM instructions. When needing to flush an existing pair (OEM and Auxiliary), be sure to isolate and flush each cooler separately to be sure debris is not pushed out of one cooler and into the other.

We now need to choose the correct cleaner. Petroleum Distillates (Mineral Spirits, White Solvents, Stoddard Solvents, HECAT Safe-Flush, etc) have a high solvency for "hard-to-clean" organic soils, including heavy oil, grease, and tar. The chemical properties of such a cleaner will displace, dissolve, or in some way chemically alter the contamination on a surface. The physical properties of a solvent such as surface tension effects the fluids ability to penetrate small spaces, cracks, holes, and get between the contaminant and the surface to displace the contaminant. These are the trusted chemicals of choice for cleaning dirty oily parts and are proven and effective chemicals for flushing oil coolers.

Can we use transmission fluid? The "Detergent Dispersant Package" in transmission fluid, is designed to help prevent formation of varnish at normal temperatures. Excessive temperatures associated with transmission failures allow varnishes and "waxy" buildups to form in the cooler trapping debris. Using transmission fluid is akin to trying to clean out the buildup in a coffee pot with coffee. Solvents, we believe, represent the only effective method to dissolve and remove varnish and "waxy" buildups.

Borrowing from the experience encompassed in industry standard methods to clean heat exchangers in aircraft, refineries, oil rigs, heavy equipment, trucks, and automobiles will require some form of appropriate volume, velocity, and agitation.

Lubrication systems for the most part are designed for smooth linear flow without cavitations or vibration, and therefore require some turbulence in order to provide effective cleaning. Linear flow allows for swirls, eddies, and pools to occur in the corners and crevices of heat exchangers where residues will accumulate and trap or bind debris. This is why simple flow cleaners do not get heat exchangers clean. Even the best suited chemicals for the job will produce inferior results if not introduced with the adequate energy necessary to scrub the internals, dislodge trapped debris and carry it away.

Some form of mechanical energy is almost always used to enhance a solvent cleaning process. The brush in your parts washer, agitation, pulse, vibration, and ultrasonic; are examples of methods used to apply energy that enhances a cleaning process. Mechanical energy must be used to overcome the "path of least resistance" rule.

Velocity is also a critical energy component for successful heat exchanger cleaning. The solvent must be introduced with adequate velocity to completely flood the component. In practice, this velocity is the necessary energy component needed to carry away weighted debris. Velocity cannot be sustained if the solvent is not introduced with an adequate volume to support it. Small volume cleaners, introduced through smaller orifices cannot attain an adequate velocity to remove debris from the system.

Some final comments; always be sure to remove the cleaning solvent. Always perform a cooler flow test; either with capable test equipment, or by the generic OEM test method (2 quarts of flow in 20-30 seconds). Particulate trapping external and serviceable filters are insurance worthy of consideration.

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