DELIVERING THE DIFFERENCE

THEME: TURBO AND TURBOCHARGED SYSTEM
ENGINE LUBRICATION SYSTEM

BACKGROUND

In a majority of turbo designs, the lubricant flow inside the turbo creates a thin hydrodynamic film around the shaft and its bearings where the rotating shaft slides. The primary role of the lubricant is to facilitate the rotation and eliminate possible frictions. Additionally, the oil flowing through the elements cools them down and extracts the heat from the high speeds and high temperature exhaust gas.

Proper lubrication is one of the most critical conditions for the turbo to operate. In case of improper lubrication, severe failures will occur instantly, causing unrepairable failure of the turbo and abnormal operation of the engine.

PROBLEM

The oil feedline to the turbo is the most common area where restrictions can occur. Its relatively thin diameter makes it easy for clogs to build up inside. Especially, when the line is located close to heat sources such as the exhaust, which can cause oil to carbonize inside it.

The return pipe has a much bigger diameter, seemingly more difficult to clog. Here, oil returns gravitationally from the turbo and is not pressurized. Clogging the line may cause oil overpressure inside the turbo, leading the piston ring seals to blow. Engine crankcase with high-pressure levels can also disturb the oil from returning flawlessly by the gravitation in the return line.

The lubricant degradation is another important factor. The precise mechanism of the turbo shaft and bearings is very sensitive to impurities in the oil. Long change intervals, overheating and impaired filtration may impair the lubricant characteristics and expose the turbo to premature failure.

RECOMMENDED SOLUTION

Make sure the engine lubrication system is in a vital condition and oil is distributed freely across all engine components, specifically to and from the turbo. Additionally, ensure that the correct oil type and volume is applied for the engine. Observe the oil change intervals or change the oil more frequently.

PREVENTING TURBO LUBRICATION FAILURES

Apply the following hints by troubleshooting and whenever replacing the turbo.

- Unrestricted oil supply to/from the turbo is critical – make sure the feed oil pressure is correct and return unhindered
- Clean or preferably replace oil feed/return lines. If cleaning, the lines must be free for any form of restrictions, specifically carbon/sludge.
- Never use silicone/liquid gaskets to seal the oil lines
- Replace oil and oil filter when fitting a new turbocharger
- Prime the replacement turbocharger with oil before fitting
- If an excessive oil degradation/sludge is present in the system, perform engine flushing (applicable for specific engine models, refer to Nissens' Turbo Bulleting for PSA engines)

COMMON TURBO LUBRICATION FAILURES

Insufficient lubrication: Broken shaft caused by lack of lubrication. The high rotation speed and frictions within the moving parts have caused the temperature to increase extremely, the shaft to warm up, and ultimately break by seizing.

Insufficient lubrication: The surface of the turbo shaft is black and carbonized. Insufficient oil supply have caused overheating at first, thus making the steel color change. The blueish-to-yellowish color temperature is a heat tint caused by overheating of the shaft steel. Next, the remaining oil will start coking on the surface, making the black sinters.

Insufficient lubrication: Oil coking on the thrust bearing – failure provoked by insufficient lubrication that caused overheating.

Oil contamination: The clearly visible grooves on the journal bearing surface arise from frictions and excessive material abrasion provoked by impurities in the oil. Despite the presence of oil, shaft of this turbo get seized.

Oil supply disturbance: Oil feedline deformation caused by careless installation. The line is tight but the deformation caused oil thus shortages in lubricant supply to the turbo.

Oil supply disturbance: Severe oil contamination (sludge/carbonizing) caused oil feed line restrictions visible on banjo fitting.

Nissens Training Concept