Technical Bulletin

Subject: **TROUBLESHOOTING COMPRESSOR OIL PASSING**

GENERAL COMMENTS

Some oil carryover from the air compressor into the air brake system occurs as a normal part of all air compressor operation. It is typical to find some presence of oil at the inlet and discharge ports of the air. Oil present at the exhaust of drain valves, air dryers or aftercoolers is normal and indicative these components are functioning properly, removing contaminants from the system.

Vehicles equipped with a desiccant type air dryer that incorporates a filter (separator) for removing oil from the air will normally minimize oil passed through to the reservoir. The oil collects in the air dryer with condensed moisture and is periodically purged. Often, the routing or location of the air dryer exhaust port can amplify concerns about oil passing, depending on where the purged oil / water mixture is expelled on the vehicle, e.g. on a rear fender or onto a fuel tank. This can mistakenly be identified as “problem” oil passing, when in actuality the air dryer and compressor are functioning as intended.

Oil Passing & Air Dryers

If excessive oil is passing from the air compressor, the air dryer filter element and desiccant may become saturated. One of the first signs of an oil saturated filter element or desiccant cartridge is moisture appearing in the reservoirs. In this case, the air dryer filter element and desiccant need to be serviced and the reason for excessive water and oil must be determined.

Areas that should be explored are:

* Frequency of reservoir draining.
* Length of time in service; i.e. age of the compressor and desiccant cartridge.
* Brake system maintenance, particularly the leakage of air from the vehicle system.
* Vehicle accessories which may cause high air usage; i.e. air suspension, air wipers, air starters, kneeling systems, etc.
* Vehicle vocations that may cause high air usage.

Vehicles may be equipped with condensing type aftercoolers or drain valves instead of an air dryer. These devices have little or no effect on preventing oil or water from being passed through the system and into the reservoir.

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FACTORS INFLUENCING OIL PASSING

There are a number of application factors that can influence the oil passing rate of an air compressor, including:

* The inlet air supply.
* The effectiveness of the oil drain from the compressor.
* The coolant flow through the compressor.

Inlet Air Supply

Inlet air normally drawn from one of three locations:

1. Through the engine air cleaner - connected to the suction side of the turbocharger.
2. Through a compressor mounted air filter.
3. From the pressure side of the turbocharger.

With methods 1 and 2, strict adherence to recommended filter maintenance schedules is necessary to avoid introducing excessive restriction and / or inlet contamination, both of which will increase oil passing. Caution must be exercised in converting a compressor to a turbocharged inlet to avoid causing other serious failure modes. It is recommended that the vehicle manufacturer or compressor supplier be contacted for approval prior to converting to turbocharged inlet.

Oil Drain From the Compressor

Restrictions present in the oil drain connection from the compressor to the engine can cause a build up of oil in the compressor crankcase sump and increased oil passing. Recommendations for oil return lines are discussed on the attached troubleshooting procedure. For flange mounted compressors which are internally drained back to the engine, it is important that the drain ports are aligned and not restricted by gasketing or sealant used during the compressor installation.

On flange mounted compressors, poor drainage may aggravate compressor oil passing. If this is prevalent, it is recommended to bottom drain the compressor per step 2 of the "Oil Passing Troubleshooting Procedure". Bottom cover with drain port is available to convert the compressor.

Coolant Flow

Insufficient coolant flow can promote increased oil passing. Indicators of insufficient cooling include heavy carbon deposits in the discharge line or fittings, carbonized oil deposits in the inlet cavity and discoloration of the compressor cylinder head. Reference step 4 of the "Oil Passing Troubleshooting Procedure" for compressor coolant flow requirements.

The attached procedure is intended to assist in determining the possible causes when excessive oil passing is suspected and felt to be air compressor related. If the concern is still present after following this procedure, consult your local dealer or distributor to determine the manufacturer's representative in your region for additional assistance.

Oil Passing Troubleshooting Procedure

STEP 1: Restricted Air Intake

Check engine or compressor air cleaner and replace if necessary. Check compressor air inlet line for kinks, excessive bends and be certain inlet lines have the minimum specified inside diameter. Recommended minimum inlet line inside diameter is 5/8" (15.9mm). Recommended maximum air inlet restriction is 25" (6.2kPa) of water.

STEP 2: Restricted Oil Return (to engine)
Oil return to the engine should not be in any way restricted. Check for excessive bends, kinks and restrictions in the oil return line. Minimum recommended oil return line size is 1/2" I.D. (12.7mm). Return line must CONSTANTLY DESCEND from the compressor to the engine crankcase. Make certain oil drain passages in the compressor and mating engine surfaces are unobstructed and aligned. Special care must be taken when sealants are used with or instead of gaskets.

STEP 3: Poor Filtered Inlet Air
Check for damaged, defective or dirty air filter on engine or compressor. Check for leaking, damaged or defective compressor air intake components (i.e. induction line, fittings, gaskets, filter bodies, etc.). The compressor intake should **not** be connected to any part of the exhaust gas recirculation (E.G.R.) system on the engine.

STEP 4: Insufficient Compressor Cooling (compressor runs hot)
For air-cooled portions of the compressor:
---- Remove accumulated grease, grime or dirt from the cooling fins. Replace components found damaged.

---- Check for damaged cooling fins. Replace components found damaged.

For water-cooled portions of the compressor:
---- Check for proper coolant line sizes. Minimum recommended size is 3/8"I.D. (9.5mm) tubing.
---- Check the coolant flow through the compressor. Minimum allowable flow is 2.5 gallons (9.5L) per minute at maximum engine governed speed, and 0.5 gallons (1.9L) per minute at engine idle speed. If low coolant flow is detected, inspect the coolant lines and fittings for accumulated rust scale, kinks and restrictions.
---- Water temperature should not exceed 200°F(93°C).
---- Optimum cooling is achieved when engine coolant flows into the compressor cylinder block at one end and out the compressor cylinder head at the opposite end. Where coolant flows through the head (no cylinder block coolant flow), optimum cooling is achieved when engine coolant flows into the compressor cylinder head at one end and out the compressor cylinder head at the opposite end.

STEP 5: Contaminants Not Being Regularly Drained from System Reservoirs
Check reservoir drain valves to insure that they are functioning properly. It is recommended that the vehicle should be equipped with functioning automatic valves or have all reservoirs drained to zero (0) psi (0kPa) daily or optimally to be equipped with a desiccant type air dryer prior to the reservoir system.

STEP 6: Compressor Runs Loaded an Excessive Amount of Time
Vehicle system leakage should not exceed industry standards of 1 psi (6.9 kPa) pressure drop per minute without brakes applied and 3 psi (20.7 kPa) pressure drop per minute with brakes applied. If leakage is excessive, check for system leaks and repair.

STEP 7: Excessive Engine Crankcase Pressure
Test for excessive engine crankcase pressure and replace or repair crankcase ventilation components as necessary. (An indication excessive of crankcase pressure is a loose or partially lifted dipstick.)

STEP 8: Excessive Engine Oil Pressure
Check the engine oil pressure with a test gauge and compare the reading to the engine specifications. Bendix does not recommend restricting the compressor oil supply line because of the possibility of plugging the restriction with oil contaminants. Minimum oil supply line size is 3/16"I.D. (4.8mm) tubing.

STEP 9: Faulty Compressor
Replace or repair the compressor only after making certain none of the preceding installation troubles exist.