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| TECHNICAL BULLETIN | | |
|  | June 2010 TB 2538 | |

Engine Oil Sludge on
1999-2007 Volvo Automotive Engines

The AERA Technical Committee offers the following information on engine oil sludge on various 1999-2007 Volvo automotive engines. Engine oil sludge contamination has been reported on various automotive engines and complete engine replacements have occurred on numerous occasions. Volvo has offered information on a less costly repair cleaning attempt depending on the severity of this sludge condition.

Volvo states: It may be required to perform such cleaning if the engine has been contaminated due to the use of engine oil additives, use of engine oils that do not meet the manufacture's requirements, or not following the manufacturer's recommended oil change intervals. Any engine related damage caused by the conditions stated is not considered warrantable. One or more of the following conditions could cause the engine oil to thicken and leave deposits in the engine:

1. wrong oil grade, quality and/or viscosity
2. cars driven too many miles between oil changes
3. cars frequently driven short distances with many cold starts
4. excessive idling
5. fuels of low quality and/or with high alcohol content
6. additives added to oil or fuel
7. high ambient temperature
8. high air humidity

Figure 1 below shows a view of a typical Volvo 2.5L cylinder head once the cylinder head top portion has been removed. Note the burned coloring look of the sludge and casting.

Figure 1. Caked on Oil Sludge

The possible symptoms are indicated as follows:

- An illuminated oil pressure lamp on the dash. Due to clogged oil suction strainer

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to oil pump and/or oil filter. See Figures 2 & 3.

- Noise (whistling). Noise in engine due to high pressure in crankcase. Stops when the oil filler cap is removed. For model year 99-02, see Volvo service bulletin TNN 25-149B.
- Poor driveability issues: Clogged crankcase ventilation can reduce the engine performance.
- Uneven/oscillating idling: Caused by clogged crankcase ventilation.
- Engine oil leak: From engine seals due to restricted crankcase ventilation.
- Engine noise (knocking). Low oil pressure can cause premature bearing wear.
- High oil consumption / noise from turbo. Damaged bearing or seals in the turbo can cause these symptoms.

Figure 2. Clogged Pick Up Screen

Figure 3. Sludge in Oil Filter

If one or more of these symptoms presents itself, and an extremely dirty oil filler cap or screen is found, troubleshoot in the following order.

Diagnosis

The first step is to inspect the oil filter to see if it is abnormally dirty as shown in Figure 3.

An abnormally dirty filter is easily recognized by its thick, black deposits. Engines with spin-on oil filters can be inspected by sawing the filter in half.

Oil Trap check.

If the engine has a problem with carbon deposits, the passageways in the engine block and oil trap may be completely or partially clogged. See Figure 4. Remove and check the oil trap, hoses and their passageways in the engine block. There should not be any major collections of carbon deposits in the hoses or in the passageways in the block.

Figure 4. Restricted Oil Trap

Oil sump/crankcase check

Drain the engine oil. Remove the oil sump and check the oil sump and crankcase for deposits. Normally, there should not be any deposits such as in Figures 5 & 6. A slight light brown discoloration is however normal.

Figures 5& 6. Heavy Oil Sludge Deposits

Figure 6.

The figures shown in Figures 5 & 6 depict an engine with heavy deposits.

Check the suction strainer on the oil suction line for contaminants and deposits.

If no trace of deposits has been found, no further checks are necessary and fault tracing can be considered complete. If deposits have been detected in any of the above steps, follow the instructions below to possibly remedy the problem.

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Checking Big-End Rod Bearings

Note and mark the position of the big-end bearing caps for possible reassembly. Remove and check the big-end connecting rod bearings for the number two cylinder.

If the bearings are undamaged, reinstall the bearings and caps as marked and torque to proper specification. If the big-end bearing at the number two cylinder is damaged, replace all big-end bearings and torque to proper specification. Important Note! If any bearing is damaged, check the crankshaft for scratches, size and damage before replacing the bearings. If the crankshaft is damaged, discontinue troubleshooting and repair or replace the engine.

Figure 7 & 8. Oil Sump passages Figure 8.

Clean the inside of the oil sump by removing any loose deposits before reinstalling it on any engine. Note! Make sure that the oil sump passageway from the oil trap is fully cleaned. See illustration. Blow clear with compressed air to ensure the duct is thoroughly cleaned. Then clean the oil sump as described in the next step. If it is not possible to properly clean the oil sump, oil sump replacement should be considered.

Cleaning/Washing

Washing should be done in a parts cleaning machine at no less than 70°C / 158°F for at least 30 minutes. Repeat if necessary. It is a good idea to change the position of the components several times during the cleaning/washing procedure. Blow dry with compressed air after washing.

Cleaning the Engine Block

Clean the engine block passageway from the oil trap and the oil trap passageway in the block. Use a screwdriver or similar small scraping tool and blow the passageways clean with compressed air. Perform a general cleaning of the crankcase to remove all the carbon deposits. All loose deposits must be thoroughly cleaned no matter what repair method is being attempted.

Figure 9. Block oil passage traps

Cleaning Cylinder Head

No attempt should be made to clean the cylinder head without first removing it from the engine even if only connecting rod bearings are being installed. During engine assembly it is important to use the following new components to prevent future contamination.

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- New filter for VVT solenoid. (Does not apply to S40 (04-)and (V50).
- New oil suction line
- Well cleaned or new oil sump
- New oil trap with new hoses and clamps
- New oil pressure switch
- New oil delivery line for turbocharger when applicable

First Oil Change

Clean the oil filter casing and install the new oil filter. Fill with new Synthetic Oil; this will assist in continuing the cleaning process. ACEA A1/B1, viscosity SAE 5W-30.

Note: Engines subjected to extreme driving conditions are to be filled with ACEA A1/B3, viscosity SAE 5W-30 Synthetic oil. "Extreme" regards driving conditions that generate abnormally high oil temperature or oil consumption, such as driving in mountains with a lot of engine braking or when driving at high speeds on highways. ACEA A3/B3, viscosity SAE 5W-30 Synthetic oil.

Follow Up Oil and Filter Change

Drive 2,000 km/1,200 miles and then replace the oil and filter. Use one of the Synthetic oil grades specified for the specific engine. Advise customer of importance of using synthetic oil and change often.

The AERA Technical Committee

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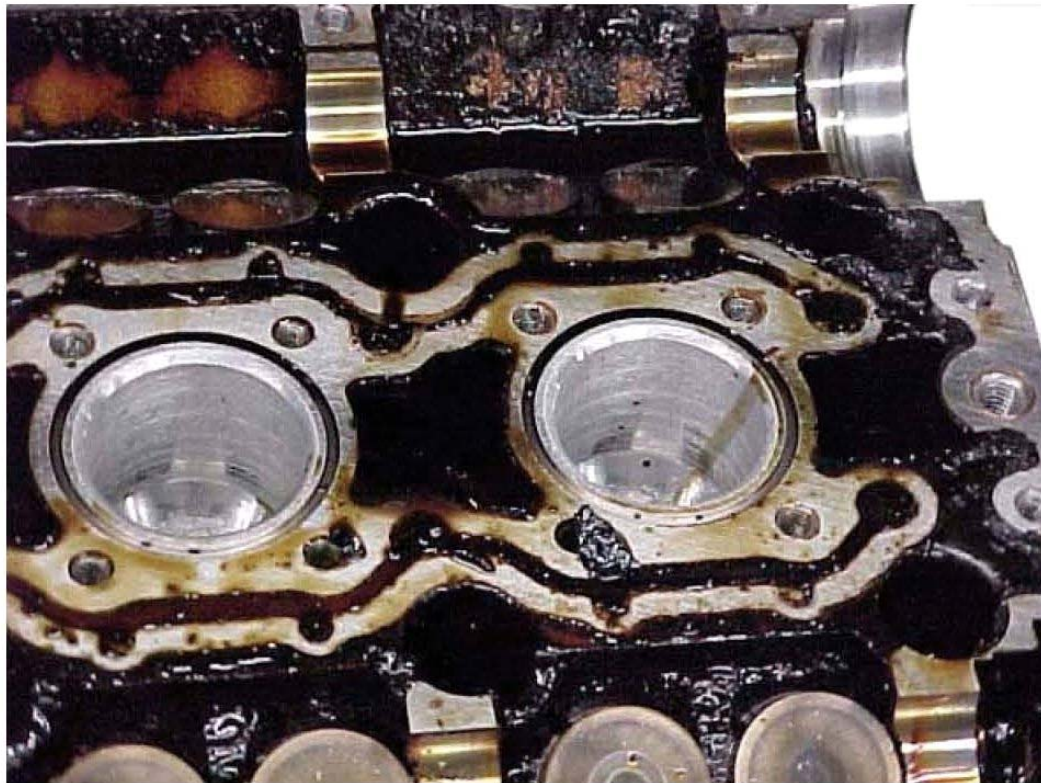
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Bulletin Diagram: FIGURE 1. CAKED ON OIL SLUDGE - CYLINDER HEAD



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Bulletin Diagram: FIGURE 2. CLOGGED OIL PICK-UP SCREEN - FAILURE ANALYSIS



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Bulletin Diagram: FIGURE 3. ACCUULATED SLUDGE IN THE OIL FILTE - FAILURE ANALYSIS



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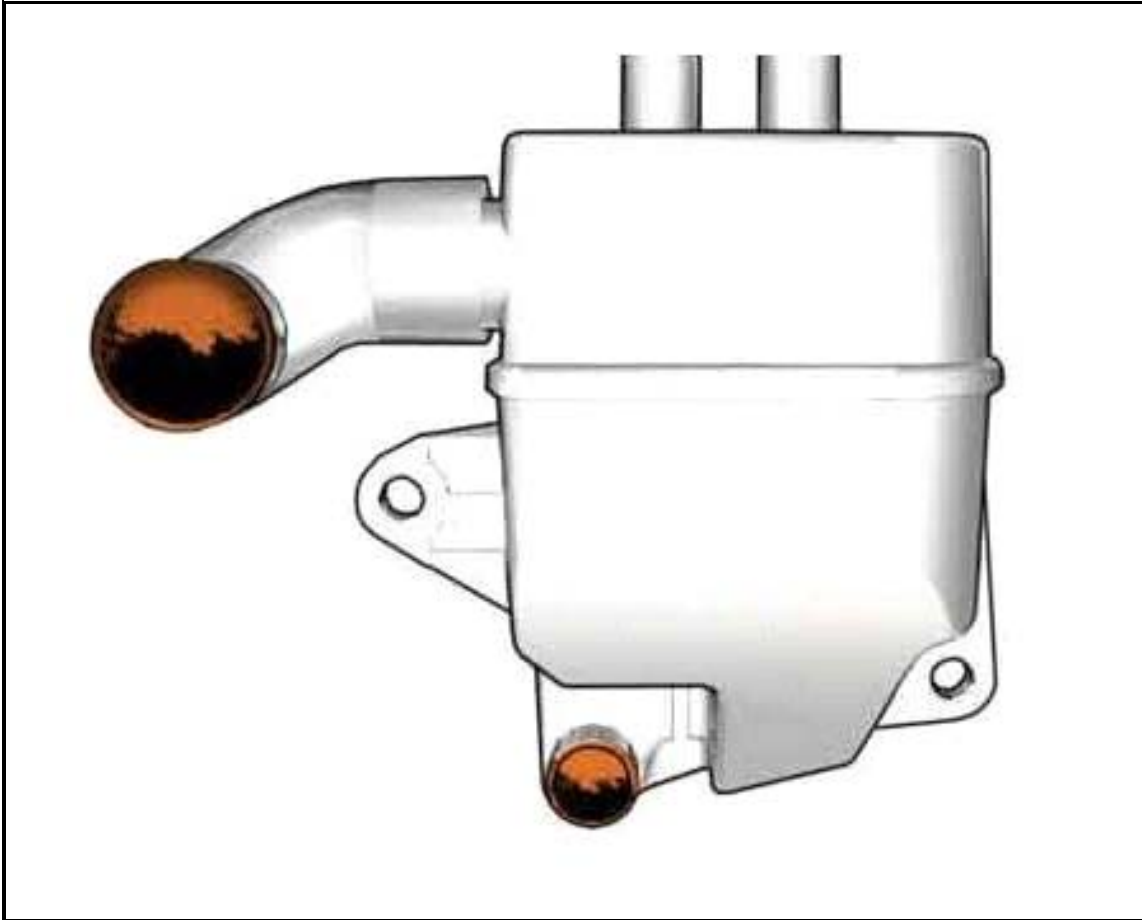
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Bulletin Diagram: FIGURE 4. SEVERELY RESTRICTED OIL TRAP - FAILURE ANALYSIS



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Bulletin Diagram: FIGURE 5. HEAVY OIL SLUDGE DEPOSITS - FAILURE ANALYSIS



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Bulletin Diagram: FIGURE 6. HEAVY OIL SLUDGE DEPOSITS - FAILURE ANALYSIS



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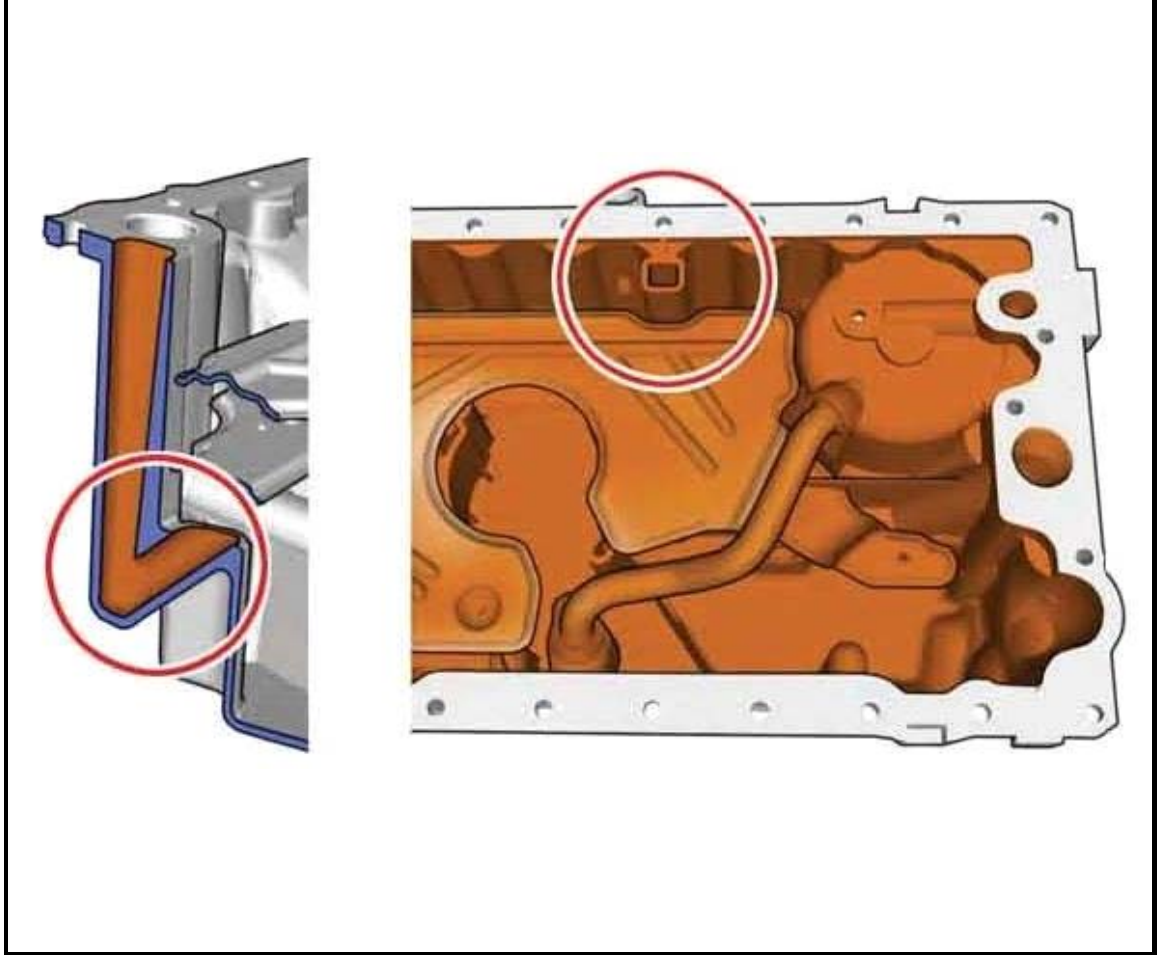
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Bulletin Diagram: FIGURE 7. OIL SUMP PAASSAGES - FAILURE ANALYSIS



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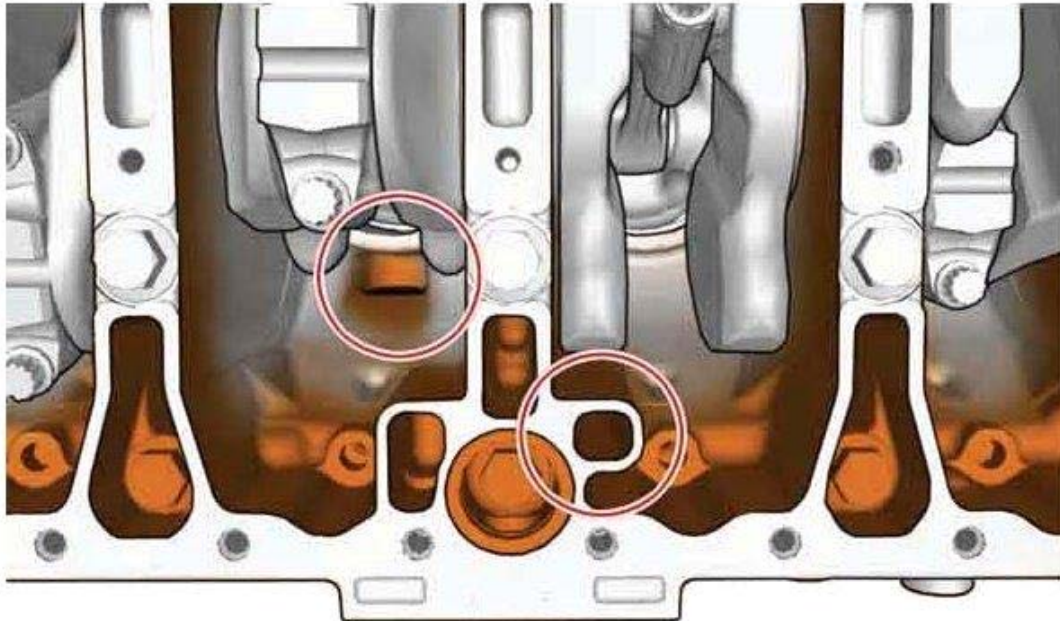
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Bulletin Diagram: FIGURE 8. OIL SUMP PASSAGES - FAILURE ANALYSIS



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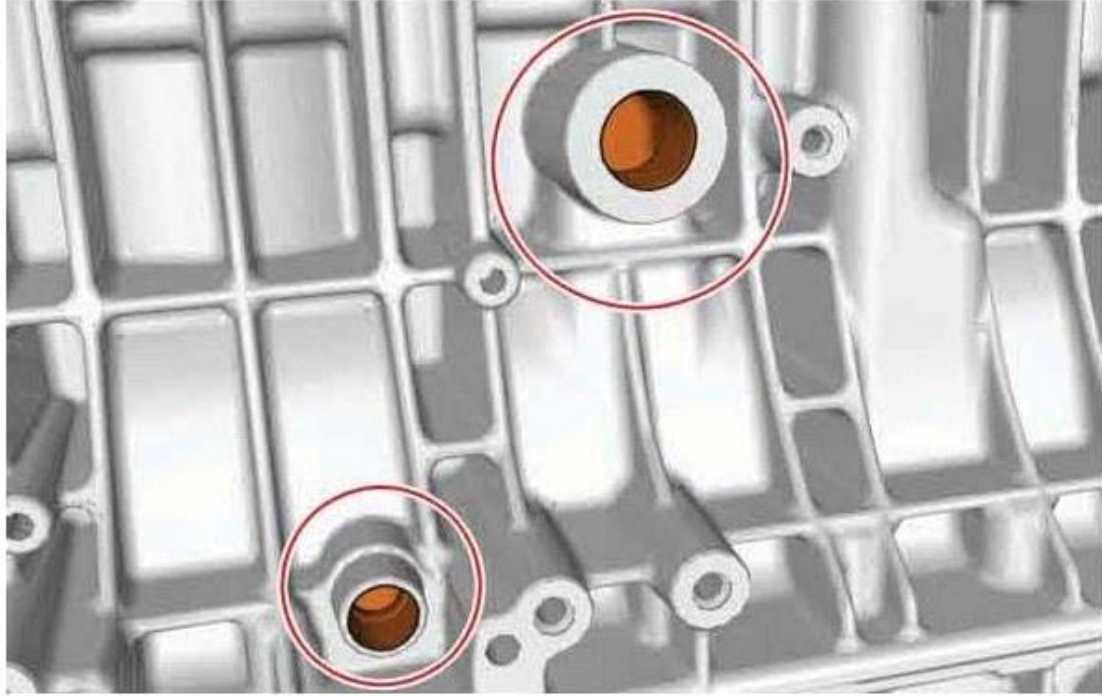
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Bulletin Diagram: FIGURE 9. CYLINDER BLOCK OIL PASSAGE TRAPS - FAILURE ANALYSIS



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