



Analyzing Contaminants on Magnetic Drain and Fill Plugs

WARNING:

To prevent eye injury always wear ANSI Z87.1 approved eye protection when you perform vehicle maintenance or service.

Before servicing a vehicle, it must be parked on a level surface, have chocked wheels and supported with safety stands.

Do NOT work under a vehicle supported by jacks. Jacks can slip and fall over. This can result in serious injury and/or damage to service personnel or components.

Metal Particles on the Magnetic Fill/Drain Plug

The Magnetic fill/drain plug should be checked **every** time the oil is changed. Before reusing a drain plug, verify that it can still lift at least 20 ounces of low carbon steel. If it can no longer lift 20 ounces of low carbon steel, the drain plug should be replaced.

Under normal operation, it is common to find metal fines adhering to the magnetic fill/drain plug. The purpose of the magnetic fill/drain plug is to capture particles and keep them from running through the gear mesh or bearings.

Larger metal particles from gear teeth, bearing or washer fragments and metal shavings are not as common.

You will want to be able to differentiate between metal fines and large metal particles to understand what has occurred and what repairs are needed to prevent further damage.

Remove and Inspect the Magnetic Fill/Drain plug.

Remove the magnetic fill/drain plug.

Inspect the metal particles sticking to the plug

Use the following guidelines to determine if the particles are normal (fines) or problematic (larger particles)

Guidelines

Fine Metal Particles

The metal fines (sometimes called gear fuzz) adhering to the magnetic fill/drain plug (figure 1) are normal. It is normal for internal components to shed metal fines as the gears rotate. There may be a higher rate of metal fine shedding during the break in period.



Figure 1

There are several types of larger particles that may be encountered on the drain/fill plug. These are thrust washer fragments, metal shavings, bearing fragments or gear tooth fragments.

Thrust washer fragments

Losing a part of a thrust washer does **not necessarily** adversely affect the operation of the axle and may not require disassembly, inspection or replacement of the axle. If the fragments are excessive or there is a concern that there is additional component damage, analyze the oil for iron content. If the iron is above 1000 ppm, inspect and repair as necessary.

Metal shavings

Occasionally one sees metal shavings (Figure 2) from the machining of the housing. These shavings do not adversely affect the operation of the axle. It is not necessary to perform further inspections or remove the carrier for cleaning. If they persist through multiple inspections, it would be worth inspecting.



Figure 2

Bearing or Gear tooth fragments

Finding bearing or gear tooth fragments (Figure 3) on the magnetic drain and fill plugs is a serious issue. Continuing to run in this condition can lead to further component damage. **Immediately** remove the carrier, inspect and repair.



Figure 3

Check the condition of the oil

Drive axle oil is usually golden brown or deep red. If the oil looks “milky” or coppery, the oil is contaminated.

Red: Acceptable

Golden Brown: Acceptable.

Black: Black oil is typical if the oil has seen significant time and mileage. Changing from red or brown to black occurs when the additives degrade. Black may not indicate that the oil’s useful life is over. Performing a lubrication analysis will verify that the oil can still be used. Black oil may also be seen if the oil has overheated. In this case, it is often accompanied by an unpleasant odor.

Milky brown: The oil is contaminated with water. Change the oil immediately, determine the source of the water and repair.

Copper: This indicates that the support or thrust washers may have disintegrated. It is possible to confuse a normal oil with a coppery oil. A lubrication analysis can differentiate. If the copper is above 600ppm, remove the input shaft assembly and inspect the helical support washer. If the copper is below 600 ppm, continue to use the oil.

If a used oil analysis shows **iron** levels of **1000ppm or higher**, drain and replace the oil

If **silicon** is **higher than 100 ppm**, drain and replace the oil

If the **water** level is **greater than 0.3%** drain and replace the oil and check for the source of moisture

If the **phosphorous** is **less than 900ppm** the wrong oil may have been used. Only GL-5 gear oils are approved for use in the differential.

If there is **more than 0.10 wt% toluene**, drain and replace the oil