



## Technical Bulletin

# How to Analyze Contaminants on Magnetic Drain and Fill Plugs

## Hazard Alert Messages

Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.

### WARNING

To prevent serious eye injury, always wear safe eye protection when you perform vehicle maintenance or service.

Park the vehicle on a level surface. Block the wheels to prevent the vehicle from moving. Support the vehicle with safety stands. Do not work under a vehicle supported only by jacks. Jacks can slip and fall over. Serious personal injury and damage to components can result.

## How to Obtain Additional Maintenance and Service Information

Refer to Maintenance Manual 1, Preventive Maintenance and Lubrication; and Technical Bulletin TP-9539, Approved Rear Drive Axle Lubricants. To obtain these publications, visit Literature on Demand at meritor.com.

## Metal Particles on the Magnetic Fill/Drain Plug

During maintenance procedures it is normal to find fine metal particles adhering to the magnetic fill/drain plug. These particles are generated under normal operating conditions, and the magnets attract the particles and prevent them from passing through the gear mesh or bearings.

However, larger metal particles adhering to the fill/drain plug, such as gear teeth, bearing fragments, thrust washer fragments and metal shavings, are not a normal condition.

It is important to be able to identify the differences between fine and large metal particles to determine how they occurred and what repairs may be required to prevent component damage.

## Remove and Inspect the Magnetic Fill/Drain Plug

Remove the magnetic fill/drain plug. Inspect the metal particles adhering to the plug. Use the Guidelines in this technical bulletin to determine if the metal particles you find are fine (a normal condition) or larger (a condition that is not normal).

## Guidelines

### Fine Metal Particles

The fine metal particles attached to the magnetic plug in Figure 1 are normal. Internal components can shed fine metal wear particles at a steady rate, especially during the break-in period. In addition to the magnetic plugs, Meritor axles are also equipped with four to six magnets in the housing to capture debris generated during extended maintenance intervals used today.

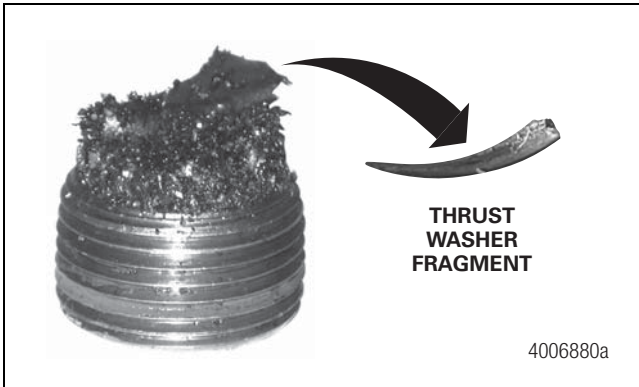


Figure 1

### Thrust Washer Fragments

Figure 2 shows a main differential side gear thrust washer fragment. The loss of a fragment from the thrust washer is not detrimental to the operation of the axle and does not require disassembly, inspection and replacement of the axle.

If you are concerned about additional fragments or component damage, perform an oil sample analysis. If the iron content of the sample is above 1000 parts per million (ppm), inspect and repair the carrier as necessary.



**Figure 2**

### Metal Shavings

Figure 3 shows metal shavings which are remnants from the housing machining process. Metal shavings adhere to the magnets and are not detrimental to the operation of the axle. It is not necessary to perform further inspections or remove the carrier for cleaning.



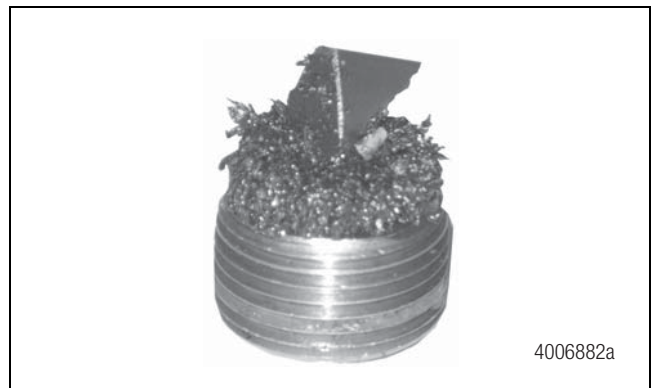
**Figure 3**

### Bearing and Gear Tooth Fragments

Figure 4 and Figure 5 show bearing and gear tooth fragments. Both indicate a significant issue that can result in component damage. Immediately remove the carrier, inspect it, and perform required repairs.



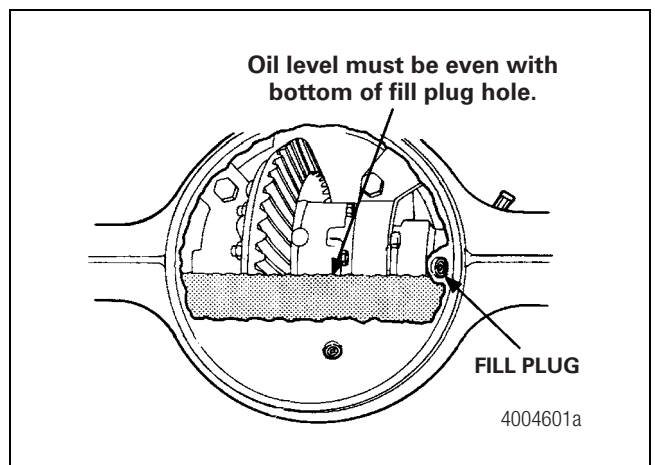
**Figure 4**



**Figure 5**

### Verify the Lubricant Level is Even With the Bottom of the Fill Plug Hole

Verify that the lubricant is even with the bottom of the fill plug hole and not below the fill plug hole. If necessary, add the specified lubricant, until it is even with the bottom of the fill plug hole. Figure 6.



**Figure 6**

# Check the Condition of the Oil

Most drive axle oils are either golden brown or deep red in color. If the oil looks “milky brown” or has a “copper” color, the oil is contaminated.

The oil samples in Figure 7 show how the lubricant may appear during inspection. Refer to Oil Conditions for guidelines.

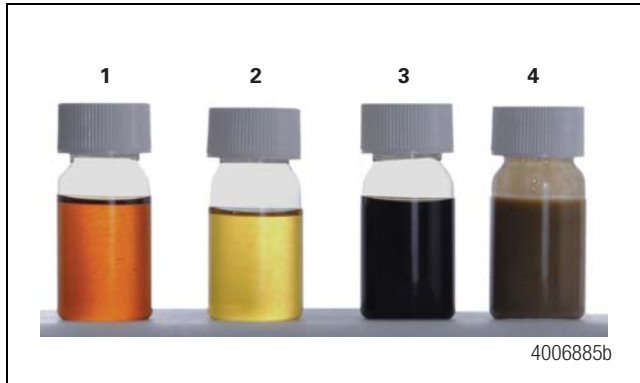


Figure 7

## Oil Conditions

### Sample 1: Red

### Sample 2: Golden Brown

Both the red and golden brown samples show the typical appearance of new GL5 EP oils that meet the SAE J2360 specification. They usually are golden brown, but also can be red in color. Figure 7.

### Sample 3: Black

This black sample is used-oil with significant time and mileage. The color change from red or golden brown to black is the result of a normal chemical process that occurs as the additive package in the oil degrades. The black color does not necessarily indicate that the oil’s useful life has been exhausted. Perform a lubrication analysis to verify that the oil can still be used in the carrier. Figure 7.

### Sample 4: “Milky” Brown

This “milky” brown sample indicates the oil is contaminated with significant moisture well above the allowable change specification of >0.3%. Change the oil immediately. Locate the source of the moisture. Figure 7.

## Copper (Sample Not Shown)

A copper color indicates that the drive helical support thrust washer may have disintegrated. Use care when you evaluate the oil, as a copper color can be confused with the normal color of some oils. Perform a lubrication analysis to determine the amount of copper in the lubricant before you perform a physical inspection.

- **If the copper level is above 600 ppm:** Remove the input shaft assembly and inspect the drive helical support thrust washer.
- **If the copper level is 600 ppm or below:** You can continue to use the oil.

Table A: Used-Oil Analyses (ppm = parts per million)

<b>Iron (Fe)</b>	If the level is 1000-1500 ppm, resample the oil. If resampling indicates that the iron level is above 1000 ppm, drain and replace the oil. If the level is above 1500 ppm, drain and replace the oil.
<b>Silicon (Si)</b>	If the level is greater than 100 ppm, drain and replace the oil.
<b>Water (H<sub>2</sub>O)</b>	If the level is greater than 0.3%, drain and replace the oil.
<b>Phosphorus (P)</b>	If the level is less than 900 ppm, it is possible that the oil is not a GL-5 gear oil. Contact the lubricant manufacturer or Meritor Materials Engineering to determine the expected phosphorus level of a new oil sample. Only GL-5 type gear oils are approved for use in Meritor differentials.
<b>Toluene Insolubles</b>	If the level is greater than 0.100 wt.%, drain and replace the oil.



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