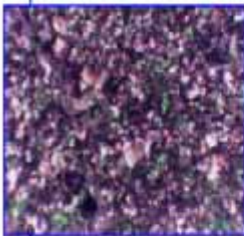


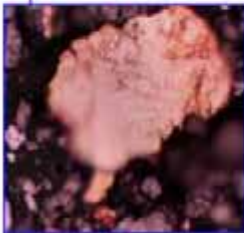


<b>Machine ID:</b>	Unit 316	<b>SampleID:</b>	OIL-000029
<b>Component Name:</b>	Differential	<b>Date Sampled:</b>	09 September 2002
<b>Manufacturer:</b>	Caterpillar	<b>Machine Hrs:</b>	44200
<b>Model:</b>	789 Haul Truck	<b>Oil Hrs:</b>	900
<b>Site:</b>	Camberwell Coal	<b>Filtered Oil Hrs:</b>	5
<b>Maintenance Division:</b>	Caterpillar 789 Haul Trucks	<b>Filter Hrs:</b>	5



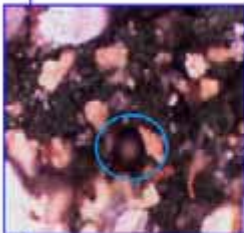
#### Contaminant @ 100um

100x magnification overview of wear and contamination particles.



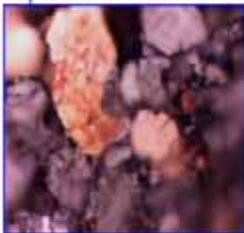
#### Platelet @ 500um

124um copper alloy platelette. These particles are formed by the passage of a wear particle through a rolling contact. Platelette particles may be generated throughout the life of a bearing, but at the onset of fatigue spalling, the quantity generated increases. An increasing quantity of platelette particles in addition to spherical wear is indicative of rolling-bearing fatigue microcracks.



#### Spheres @ 500um

25um Spherical Particle: These particles are generated in the bearing cracks. If generated, their presence gives an improved warning of impending trouble as they are detectable before any actual spalling occurs. Rolling bearing fatigue is not the only source of spherical metallic particles. They are known to be generated by cavitation erosion and more importantly by welding or grinding processes.



#### Fatigue @ 500um

Non-ferrous copper alloy fatigue chunks up to 95um. Fatigue chunks results when cracks develop in the component surface allowing the generation and removal of particles. Leading causes of fatigue wear include insufficient lubrication, lubricant contamineation, and component fatigue. The removal of wear and contamination debris can increase the useful life of the lubricant and reduce the incidence of continued abrasive wear.



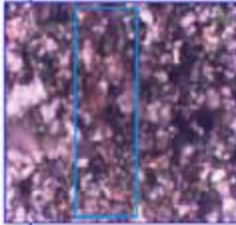
#### Tempered @ 500um

Heat tempered particles. Redish blue tempering indicates that the wear particles have reached temperatures up to 290 degrees centigrade.



**Machine ID:** Unit 316  
**Component Name:** Differential  
**Manufacturer:** Caterpillar  
**Model:** 789 Haul Truck  
**Site:** Camberwell Coal  
**Maintenance Division:** Caterpillar 789 Haul Trucks

**SampleID:** OIL-000029  
**Date Sampled:** 09 September 2002  
**Machine Hrs:** 44200  
**Oil Hrs:** 900  
**Filtered Oil Hrs:** 5  
**Filter Hrs:** 5



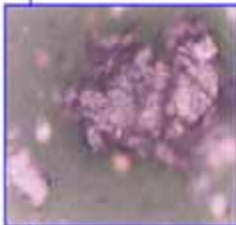
#### Cutting @ 500um

1200um Copper alloy swarf. Cutting Wear can be caused when an abrasive particle has imbedded itself in a soft surface. Equipment imbalance or misalignment can contribute to cutting wear. Proper filtration and equipment maintenance is imperative to reducing cutting wear by removing hard contaminants from the lubrication system.



#### Scuffing @ 500um

45um scuffing wear particle. Scuffing or Scoring Particles is caused by too high a load and/or speed. The particles tend to have a rough surface and jagged circumference.



#### Fatigue @ 500um

120um fatigue chunk.

#### Comments

A variety of wear types and dust contaminants were observed. The majority of the wear debris observed was non-ferrous material. It appears that the filter is effectively trapping particulates from 2um and above.