

GREGORY POWER PARTNERS
Sherwin Alumina
Gregory, TX

CRITICAL

Sample ID: GPP-297228
Equip. Desc.: GTG 1A; Gas Turbine
Lubricant Type: Chevron GST-32
Reservoir Cap.: 6,200.00 Gal(s) 23,467.00 Ltr(s)
Machine Time: 72,874.0 Hr(s)
Lube Time: 1,587.6 Hr(s)

Sample Date: 6/30/2009
Received Date: 7/9/2009
Test Date: 7/10/2009
Prev. Sample: 5/12/2009 **M**
First Sample: 4/9/2001
No. Samples: 87

Recommendation(s):

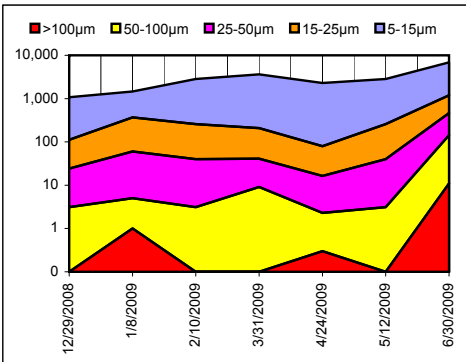
RESAMPLE this equipment at your earliest possible convenience to verify the generation of Babbiting wear and case hardened steel. Consider scheduling this equipment for maintenance action in the near future. Specifically, possible wiped journal bearing. CHECK OPERATING LOADS & TEMPERATURES to ensure that they are within O.E.M. specifications.

Discussion of Test Results:

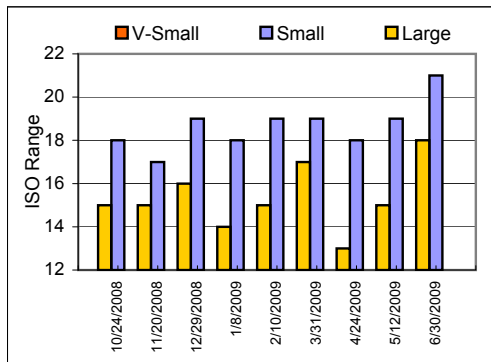
Although the equipment particle concentration (EPC) has decreased for this equipment from 2,845 to 1,581, analytical results show the re-appearance of 45 micrometer (um) High Carbon (~12%) steel Severe Sliding wear and 125um case tempered Hardened steel Rolling Contact (Bearing) wear particles. Tempering is the rainbow coloration resulting from elevated temperatures at the critical contact pint. Temperatures at this critical contact point are in the 330°C (626°F) range. Analysis also shows the appearance of 125um white non-ferrous metal Severe Sliding wear and Black Metal Oxides (Fe₃O₄). The white non-ferrous metal particles are most likely Aluminum, however, Chrome, Nickel and Stainless Steel are also other possibilities. These particles are of great concern. These particles are of sufficient size to cause a metal to metal interference with close tolerance components.

QUANTITATIVE TESTING:

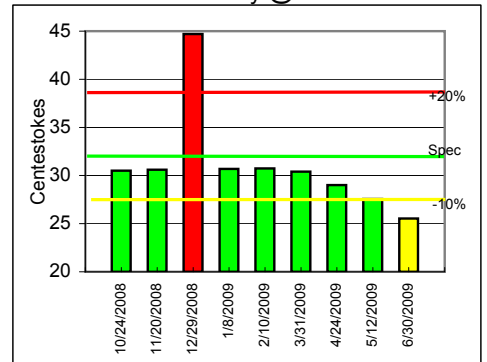
NAS-1638 Particle Count



ISO-4406 Solid Contamination Code



ASTM-D-445 Viscosity @ 40°C



QUALITATIVE TESTING:

Ferrous Metal Wear:

| Classification | 1 | 5 | 10 | µm | Max |
|--|---|---|----|----|------|
| Rubbing | █ | █ | | | ≤ 15 |
| Severe Sliding | █ | | | | 45 |
| Cutting/Plowing | | | | | |
| Rolling Cont (Bearing) | █ | | | | 125 |
| Spheres | | | | | |
| Gear | | | | | |
| Black Oxides (Fe ₃ O ₄) | █ | | | | N/A |
| Red Oxides (Fe ₂ O ₃) | █ | | | | N/A |
| Corrosive (FeO) | | | | | |
| Other | | | | | |

Non-Ferrous Metal Wear:

| Classification | 1 | 5 | 10 | µm | Max |
|------------------------|---|---|----|----|------|
| Rubbing | █ | | | | ≤ 15 |
| Severe Sliding | █ | | | | 125 |
| Cutting/Plowing | | | | | |
| Rolling Cont (Bearing) | | | | | |
| Spheres | | | | | |
| Gear | | | | | |
| Oxides | | | | | |
| Other | | | | | |

Contaminants:

| Classification | 1 | 5 | 10 | µm | Max |
|-------------------|---|---|----|----|-----|
| Filming | █ | | | | N/A |
| Sand & Dirt | █ | | | | N/A |
| Fibers | █ | | | | N/A |
| Spheres | | | | | |
| Plastic/Ceramic | | | | | |
| Carbon & Organics | | | | | |

| Non-Ferrous Metal Alloys | Copper | White | Babbitt |
|--------------------------|--------|-------|---------|
| | | █ | █ |

| Particle Data | | Lube Data | |
|---------------|---------------|--------------|-------|
| 2-5 µm | N/P | 40°C cSt: | 25.54 |
| 5-15 µm | 5,678 | Water-IR: | 464 |
| 15-25 µm | 725 | TAN D-974 | 2.12 |
| 25-50 µm | 321 | Color D-1500 | 2.0 |
| 50-100 µm | 132 | Flash D-92 | 375°F |
| >100 µm | 11 | R-BOT | 1,560 |
| EPC: | 6,867 | Cu D-130 | 1B |
| PLP | 17.3% | | |
| ISO Scale: | N/P 21 18 | | |

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Discussion of Test Results (cont'd):

The viscosity of the lubricant is more than 10% below specification. This low viscosity has been confirmed kinematically. Please confirm that the lubricant type listed in the report header is the correct lubricant for this equipment. The low viscosity has contributed to the increased wear in this equipment.

ASTM-D-1500 - remains at 1.5 to 2.0 (GE 2.0 max) Color

ASTM-D-974 - has worsen, increasing from 0.14 to 1.50 to 2.12 mg/KOH (GE 0.20 max) Total Acid Number

ASTM-D-130 - has improved slightly from 1A / 1B to 1A (GE 1B max) Copper Strip Corrosion - the previous test was performed on 3/31/2009.

ASTM-D-2272 - has decreased for this sample from 2,468 to 1,560 minuets (GE 500 min.) Oxidation Stability by Rotary Bomb last results on 3/31/2009 sample.

Image 1

Interpretation:

Shown in this image an example of the 125um Case Hardened steel Rolling Contact (Bearing) wear particles seen in this equipment. Note that this image was taken AFTER heat treatment.

Image 2

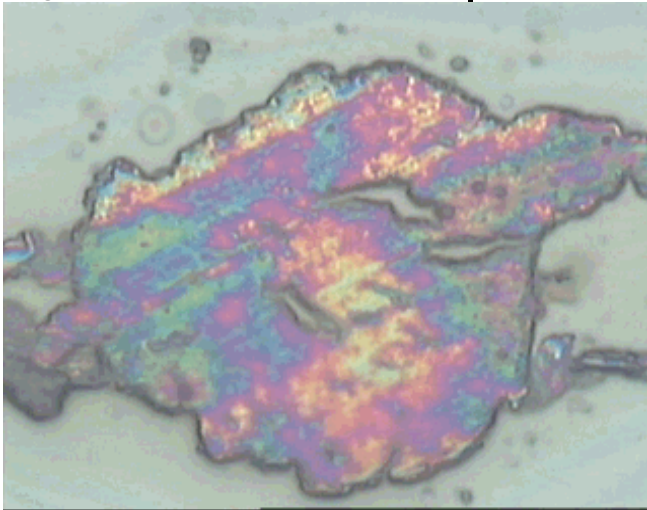
Interpretation:

This image displays an example of the 125um white non-ferrous Babbiting alloy Severe Sliding wear particles seen in this equipment. Note that this image was taken AFTER heat treatment.

Lighting: White Reflected & Green Transmitted

Magnification: 500X

35 µm



Lighting: White Reflected & Green Transmitted

Magnification: 500X

35 µm

