

### Filter Debris Analysis Report

Filter MFG: Donaldson

Installed/Removed: 6/8/2012 - 8/13/2012

Report: 3/1/2018

Sample No.: 19-1-1003 ( HMV )

Lube Type: DTE 797

Machine MFG: ACME

Machine MOD: R100-B12

Machine Type: Plain Bearing

ATTN: Jack Boilerman

Great Lakes Generation

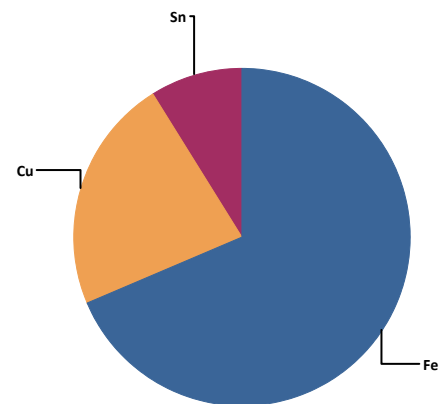
20338 Progress Drive

Strongsville, OH 44149

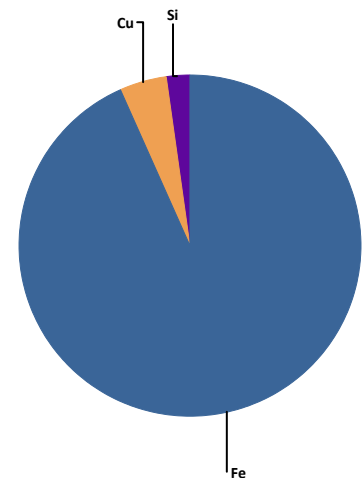
Filter debris analysis indicates the presence of a severe wear mode in this machine. Higher than usual rates of wear particle generation and changing elemental content indicate mechanical issues with this bearing. Immediate inspection of this machine is recommended with a focus on parts containing copper and tin.

|                   |           |          |            |          |           |          |
|-------------------|-----------|----------|------------|----------|-----------|----------|
| Received Date     | 2/1/2018  |          | 11/26/2017 |          | 5/28/2017 |          |
| Days on Filter    | 66        |          | 182        |          | 189       |          |
| Lab Number        | 876339    |          | 876338     |          | 876337    |          |
| EDXRF (%)         | 30 Micron | 5 Micron | 30 Micron  | 5 Micron | 30 Micron | 5 Micron |
| Iron ( Fe )       | 60.8      | 83.4     | 87.2       | 79.9     | 89.9      | 82.2     |
| Copper ( Cu )     | 19.5      | 3.5      |            | 4.2      |           | 3.9      |
| Lead ( Pb )       |           |          |            |          |           |          |
| Aluminum ( Al )   |           |          |            |          |           |          |
| Tin ( Sn )        | 8.4       |          |            |          |           |          |
| Nickel ( Ni )     |           |          |            |          |           |          |
| Chromium ( Cr )   |           |          |            |          |           |          |
| Titanium ( Ti )   |           |          |            |          |           |          |
| Vanadium ( V )    |           |          |            |          |           |          |
| Silver ( Ag )     |           |          |            |          |           |          |
| Silicon ( Si )    |           | 2.2      | 2.1        | 3.6      |           | 2.7      |
| Calcium ( Ca )    |           |          |            |          |           |          |
| Magnesium ( Mg )  |           |          |            |          |           |          |
| Phosphorus ( P )  |           |          |            |          |           |          |
| Zinc ( Zn )       |           |          |            |          |           |          |
| Barium ( Ba )     |           |          |            |          |           |          |
| Molybdenum ( Mo ) |           |          |            |          |           |          |
| Sodium ( Na )     |           |          |            |          |           |          |
| Potassium ( K )   |           |          |            |          |           |          |
| Sulfur ( S )      |           |          |            |          |           |          |
| Chlorine ( Cl )   |           |          |            |          |           |          |
| Cobalt ( Co )     |           |          |            |          |           |          |
| Manganese ( Mn )  |           |          |            |          |           |          |
| Antimony ( Sb )   |           |          |            |          |           |          |
| PATCH             | 30 Micron | 5 Micron | 30 Micron  | 5 Micron | 30 Micron | 5 Micron |
| Mass ( mg )       | 532       | 231      | 70         | 604      | 45        | 507      |
| Rate ( ug/day )   | 8060      | 3500     | 384        | 3318     | 238       | 2682     |
| Metal ( % )       | -         | -        | -          | -        | -         | -        |
| Non-Metal ( % )   | -         | -        | -          | -        | -         | -        |

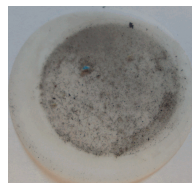
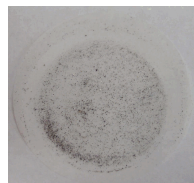
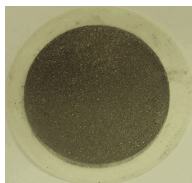
#### 30 Micron



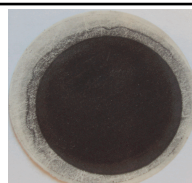
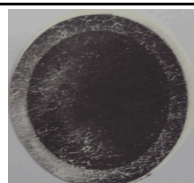
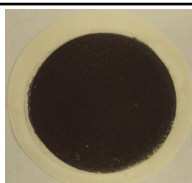
#### 5 Micron



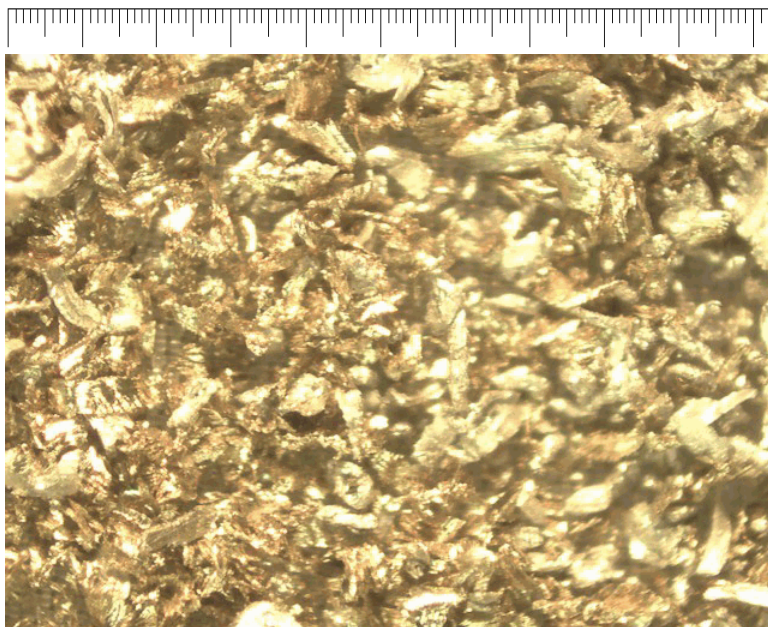
#### 30 Micron Patch



#### 5 Micron Patch

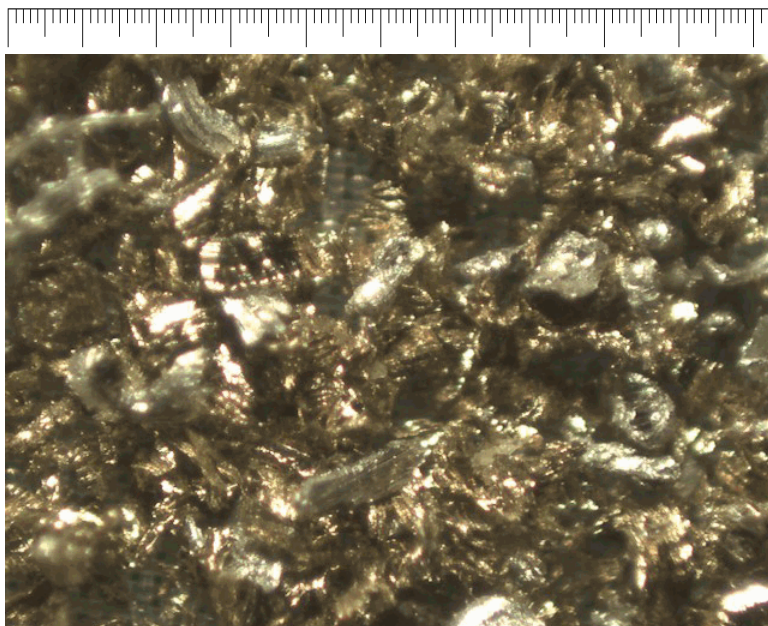


1mm = 28um

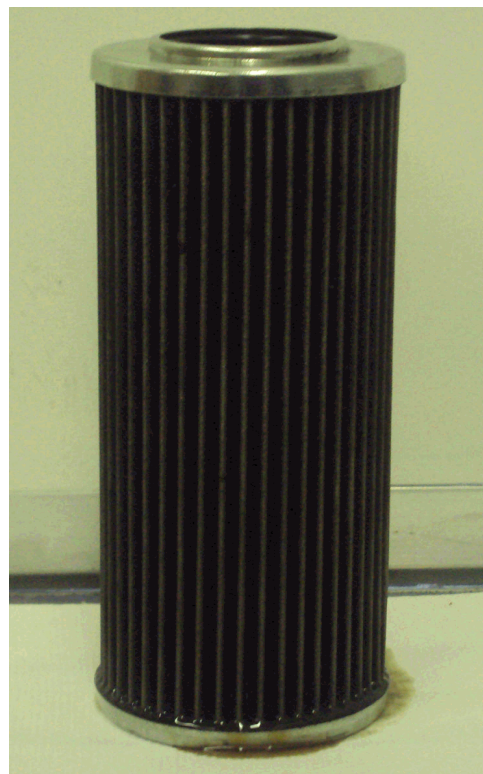


15x 30 micron patch

1mm = 50um



25x 30 micron patch



Filter as received.