Stages of Maintenance and the Impact to the Plant

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SPWRP
Overview

- Introduction
- Preventive maintenance
- Predictive maintenance
- Corrective Maintenance
- Impact on the plant and the process
Introduction
Corrective Maintenance

- Rectify a Failure or Fault
- Least favorable form of maintenance
- Most costly
- Creates a backlog
Causes of Corrective Maintenance

- Unintentional neglect
  - Chasing emergencies
  - Succession planning
  - Short Staffed
- Environment
  - Corrosive
  - Wet/Damp
  - Galvanic corrosion
- Human Error
  - Communication
  - Lack of Training
Preventive Maintenance

- Prevent failures
- Prolong the life of equipment
  - Most favorable
- Maintenance performed on equipment at regular intervals
  - Motor/Bearing greasing
  - Oil changes/top offs
  - Belt tension
  - Cleaning
  - Replacement of worn out components
  - Inspections
  - Change filters
Preventive Maintenance

- Laser Alignments
  - Rotalign Touch
  - Belt Hog
Predictive Maintenance

- Predict Failures before they happen
  - Perform maintenance to prevent those failures
    - Replace worn parts
- Monitoring
  - Vibration Analysis
  - Amp Readings
  - Oil Analysis
  - IR scanning
- Predictive maintenance programs have been shown to lead to a tenfold increase in ROI, a 25%-30% reduction in maintenance costs, a 70%-75% decrease of breakdowns and a 35%-45% reduction in downtime.
Predictive Maintenance

- Tools we use to predict failures
  - Horizon (oil analysis company)
    - Detailed reports of the contaminants in our oil
  - SCADA
    - Diagnose abnormal occurrences before failure
    - Live monitoring
      - Vibration
      - Current
      - Temperature
      - Pressure
  - EAM
    - Work order generation
SCADA
SCADA
**Horizon**

**Filter Information**
- Filter Type: NONE
- Micron Rating:

**Miscellaneous Information**
- Product Manufacturer: Information Requested
- Product Name: Information Requested
- Viscosity Grade: Information Requested

**Comments**
- SUGGEST INSPECTING this unit for excessive bearing wear. We recommend an Analytical Ferrogram be performed for this sample to clarify the type of wear and/or contamination present. Please contact Customer Service for additional test information. Suggest monitoring the drain interval and equipment operating temperature. Acid Number is SEVERELY HIGH, which may be due to oxidation, contamination with an acidic product, or lubricant mixing. Elevated acid levels lead to corrosive component wear. Bearing metal is at a SEVERE LEVEL; Data flagged indicates that risk of FAILURE IS HIGH for this unit if MAINTENANCE IS NOT PERFORMED; MANGANESE is at a MODERATE LEVEL; Abrasives (silicon/dirt) are at a MINOR LEVEL; Aluminum may be present in the form of alumina/silica (Dirt); In order to properly compare data to the correct standards, please provide COMPONENT MANUFACTURER and MODEL, and the FLUID MANUFACTURER, PRODUCT NAME, and VISCOSITY GRADE.

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Wear Metals (ppm)</th>
<th>Contaminant Metals (ppm)</th>
<th>Multi-Source Metals (ppm)</th>
<th>Additive Metals (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Iron</td>
<td>Chromium</td>
<td>Nickel</td>
<td>Aluminum</td>
</tr>
<tr>
<td>1</td>
<td>4762</td>
<td>75</td>
<td>20</td>
<td>564</td>
</tr>
</tbody>
</table>

**Sample Information**
- Date Sampled: 05-Jun-2018
- Date Received: 24-Jul-2018
- Lube Time: 0 h
- Unit Time: 0 h
- Lube Change: Yes
- Lube Added: No
- Fuel Change: % Vol
- Dilution: % Vol
- Soot: % Vol
- Water: % Vol
- Viscosity 40°C: 243 cSt
- Viscosity 100°C: 0.59 cSt
- Acid Number: mg KOH/g
- Base No.: D4729
- Oxidation: abs/cm
- Nitration: abs/0.1 mm

**Particle Count (particles/ML)**

**Additional Testing**
Impacts to the Plant

- Efficiency gains
  - Direct cost savings
- Process improvement
  - Increase flow (air/wastewater)
- Less down time
  - Minimize failures
  - Reduce PM intervals
- Redundant systems
- Promotes communication and collaboration
- Morale