Zinc Reduction and Paint Room Optimization

Lou-Rich Inc.

Patrick Liesch
MnTAP Intern 2009

Advisor: Paul Pagel
Lou-Rich Inc. Overview

• Contract Manufacturing
  - John Deere
  - General Electric
  - Scotsman
  - Toro
  - Lennox

• Contract Engineering
Motivations for Change

• Comply with regulations
• Cost savings from process improvements
• Reduce environmental impact
• Use resources more efficiently
Reasons for MnTAP Assistance

- Failed three straight quarterly tests and one follow up test for zinc in the phosphatizing effluent
- Planning to install a new coating system and were considering waste water treatment system
- Optimize the new coating system
Determining Sources of Zinc

• Determine pipe flow
• Research manufacturing processes and materials that contain zinc
• Simulate the 5-stage washer on a smaller scale
• Investigate City of Albert Lea sampling procedure
Paint Room Pipe Flow

- An effluent audit was done. Each area was identified, researched, and considered.
Sources of Zinc

• Scuff Black Paint
• Aluminum Castings
• Galvanized Steel
• Surfactant in Chemicals
• Waterfall Grease
Areas of Paint Room With Above Permit Zinc Concentration

• Paint Stripper Tank
• Paint Sludge Runoff
• Sludge in Bottom of Stage #1 Pit
City of Albert Lea Water Sampling
Solutions/Zinc Reduction

• Reformulate Scuff Black Paint (Zinc Free)
• Evaluate Every New Paint (Liquid or Powder)
• Keep Drain Pits Clear of Sludge
Compressed Air System

- Leaks
- No Regular Inspection
- Argon
New Paint Line Optimization

- Dumping Chemical Stages
- RO Water
- Separate Parts Washer
Documenting Benefits of Phosphate-Free, Low Temp, and Powder Paint

- VOC’s
- HAPs
- Natural Gas
- Phosphorus Reduction
- Zinc Elimination
## Recommendations: Compressed Air

<table>
<thead>
<tr>
<th>Waste Reduction Option</th>
<th>Change Type</th>
<th>Annual Reduction</th>
<th>Initial Cost</th>
<th>Annual Savings</th>
<th>Simple Payback Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regularly Check Compressed Air System for Leaks</td>
<td>Procedure</td>
<td>*</td>
<td>$3000</td>
<td>*</td>
<td>*</td>
<td>In Progress</td>
</tr>
<tr>
<td>Use Shut Off Valves for Work Areas With No Demand</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fix Compressed Air System Leaks</td>
<td>Procedure</td>
<td>99,213 kWh</td>
<td>$1,585</td>
<td>$7,125</td>
<td>3 Months</td>
<td>In Progress</td>
</tr>
<tr>
<td>Inspect Rest of Building for Leaks</td>
<td>Procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fix Argon Leaks</td>
<td>Procedure</td>
<td>59,600 ft³ Argon</td>
<td>$350</td>
<td>$1,750</td>
<td>2.4 Months</td>
<td>Implemented</td>
</tr>
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*The savings will vary based upon the amount of leaks in the system.*
## Recommendations: Paint Line Optimization

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<tr>
<td>Use Large Holding Tanks to Self-neutralize Chemical Baths</td>
<td>Procedure/Equipment</td>
<td>1020 gal. of pH Neutralizing Chemicals</td>
<td>$3,800</td>
<td>$17,300</td>
<td>3 months</td>
<td>Recommended</td>
</tr>
<tr>
<td>Use RO Water to Fill Chemical Baths and Rinse Water</td>
<td>Procedure</td>
<td>565 gal. Chemicals&lt;br&gt;179,000 gal. water&lt;br&gt;Better Paint Adhesion</td>
<td>$40,000</td>
<td>$5,000***</td>
<td>8 years</td>
<td>Recommended</td>
</tr>
<tr>
<td>Use Separate Parts Washer for Parts That are Not Painted</td>
<td>Equipment</td>
<td>15,780 therms&lt;br&gt;40,680 kWh&lt;br&gt;15.3 drums of chem.&lt;br&gt;246,500 gal. of H2O&lt;br&gt;800 Operational hours</td>
<td>$65,000</td>
<td>$71,300**</td>
<td>0.9 years**</td>
<td>In Progress</td>
</tr>
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</table>

**Includes depreciation of the value of the system and doesn’t include savings on reduced overtime pay but it also includes savings on outsourcing parts for painting. Savings without depreciation is $82,300/yr with a simple payback period of 0.8 years**

***Estimated results. Accurate estimates of the extended life of the bath have not been verified. Conservative estimation of a longer bath life of 25% is realistic***
# Recommendations: Paint Line

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<tr>
<td>Use Chemical Feed Softener Instead of Softener Salt in New RO System</td>
<td>Equipment</td>
<td>N/A</td>
<td>$0</td>
<td>$1,800</td>
<td>N/A</td>
<td>Recommended</td>
</tr>
<tr>
<td>Have A Conveyor Belt To Allow For One Person To Operate Separate Parts Washer</td>
<td>Equipment</td>
<td>800 hours of labor</td>
<td>$15,000</td>
<td>$12,500</td>
<td>1.2 years</td>
<td>Recommended</td>
</tr>
<tr>
<td>Use RO Reject Water For Cooling and for Toilets</td>
<td>Procedure</td>
<td>684,600 gal. H20</td>
<td>$3,500</td>
<td>$3,600</td>
<td>1.0 years</td>
<td>Recommended</td>
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Personal Benefits

• Gained real world engineering experience
• Helped develop professionally
• Project management experience
• Experience working with other companies, vendors, and other industry experts
Questions?