Process Engineering: Paint Transfer & Energy Efficiency
Nordic Ware, St. Louis Park
Roopesh Pushpala

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Nordic Ware Supervisors: Bette Danielson, Tony Fisher
Company Background

• Leading manufacturer of kitchenware products since 1946

• Cookware manufacturer
  • Metal fabrication
  • Coatings applications
  • Plastics molding

• Wide range of products including castings, formed and molded products

https://www.nordicware.com/
Project Overview

• Opportunities to increase transfer efficiencies of the spray painting
• Process improvement through the coating line
• Optimize the washer processes
• Conserve energy while increasing the production throughput
Coating Applications

Analysis

• Transfer efficiency in coating lines
  • Surface area, coating thickness, paint used

• Process in coating applications
  • Working of compliant spray guns and delivery of the coating.
  • Belt speed, rotating speed and air pressure related to output.

• Opportunity to improve
  • Chain on edge without spinning
  • Electrostatic spray guns
  • Overhead line
Findings
• Transfer efficiency for grills: 42.3%
• Transfer efficiency without rotation: 53%
• New fixture for better coverage
• Present line with infrared (IR) partial bake and existing oven
• Overhead line with IR cure

Recommendation
Overhead line with electrostatic spray and IR cure
• Load up to 6 parts on a fixture
• Fewer touches and smaller system footprint
# Recommendations – Potential Annual Savings

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Paint Reduction</th>
<th>VOC Reduction</th>
<th>Labor Reduction</th>
<th>Increase in Production</th>
<th>Savings</th>
<th>Investment</th>
<th>Payback Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead Line with IR Oven</td>
<td>3,300 gallons</td>
<td>6.80 tons</td>
<td>75%</td>
<td>200%</td>
<td>$370,600</td>
<td>$475,000</td>
<td>1.3 years</td>
<td>Recommended</td>
</tr>
<tr>
<td>IR Bake and Existing Oven</td>
<td>2,500 gallons</td>
<td>5.11 tons</td>
<td>37.5%</td>
<td>-</td>
<td>$189,000</td>
<td>$420,000</td>
<td>2.3 years</td>
<td>Needs further analysis</td>
</tr>
<tr>
<td>Without Rotation</td>
<td>1,700 gallons</td>
<td>3.54 tons</td>
<td>-</td>
<td>-</td>
<td>$56,900</td>
<td>-</td>
<td>Immediate</td>
<td>Needs further analysis</td>
</tr>
</tbody>
</table>
Washer Analysis

- Working process
  - Wash (1), rinse (2&3) and dryer, air knife
  - Belt speed, water consumption

- Optimize the washing process
  - Foam in the rinse tank
  - High water use

- Opportunity to improve
  - Eliminate foam
  - Efficient use of air knife
  - Upgrade spray nozzles
Findings

• Foam formation in stage 2 due to soft water
• Initial washer settings
• 6 GPM with present nozzles

Recommendations

• Pressure of the nozzles in stage 2 & 3
• Air knife height adjustment - 4 inches
• Conductivity of the deionized (DI) tank
• City water usage in stage 2
• Low volume high pressure nozzles - 0.3 GPM
• Standard work procedure

<table>
<thead>
<tr>
<th>Washer 1 &amp; 2</th>
<th>Air Knife</th>
<th>Rinse Pressure (psi)</th>
<th>Water used (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Top</td>
<td>Bottom</td>
</tr>
<tr>
<td>Initial</td>
<td>12 inches</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>
Recommendations – Potential Annual Savings

<table>
<thead>
<tr>
<th>Optimize Washer</th>
<th>Reduction</th>
<th>Savings</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water &amp; Sewer (Based on 2015)</td>
<td>9,093,000 gallons</td>
<td>$57,400</td>
<td>Implemented</td>
</tr>
<tr>
<td>Softener Salt</td>
<td>28.5 tons</td>
<td>$7,800</td>
<td>Implemented</td>
</tr>
<tr>
<td>DI Recharge</td>
<td>9 tanks</td>
<td>$21,200</td>
<td>Implemented</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$86,400</td>
<td></td>
</tr>
</tbody>
</table>

Washer 1 & 2 | Air Knife | Rinse Pressure (psi) | Water used (GPM) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>Bottom</td>
<td>DI</td>
<td>Soft</td>
</tr>
<tr>
<td>Present</td>
<td>4</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>
# Summary – Potential Annual Savings

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Reduction</th>
<th>Savings</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement Overhead Line with IR Oven</td>
<td>3,300 gallons of paint 6.80 tons of VOC 75% Labor</td>
<td>$370,600</td>
<td>Recommended</td>
</tr>
<tr>
<td>Optimize Washer Operation</td>
<td>9,093,000 gallons of water 28.5 tons of salt 9 DI tanks</td>
<td>$86,400</td>
<td>Implemented</td>
</tr>
<tr>
<td>Standard Work</td>
<td>Defects in working process</td>
<td>-</td>
<td>In Process</td>
</tr>
<tr>
<td><strong>Total Savings</strong></td>
<td></td>
<td><strong>$457,000</strong></td>
<td>-</td>
</tr>
</tbody>
</table>
Next Steps

- Planning and implementation of the new coating line
- Standard work procedure for coating processes
- Automation of the washer process
- Evaluating the throughput based on the standard work for the washer
Personal Benefits

- Industrial experience
- Professional exposure
- Manufacturing principles
- New contacts in the industry
- Ability to approach a problem
Thank you ...

This project was sponsored in part by CCAI