Water Conservation at
Aqseptence Group

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MnTAP Advisor: Jane Paulson
On-site Supervisor: Paul Johnson
Company Overview

- Headquartered in Germany
- Collection of water technology companies
- Johnson Screens
  - New Brighton
  - 1904 by Edward Johnson
  - Continuous slot wire wrapped screen
  - Industrial filters and water wells
Products

- Continuous wire wrapped screens
  - Water intake
  - Wells
  - Decoration
Motivations For Change

• **Current situation**
  • 10 million gallons of water per year
  • High levels of chromium
  • Water recycling systems need improvement

• **Goals**
  • Reduce water usage by 30%
  • Recycled water for NSF products
Reasons for MnTAP Assistance

• Audit water usage
  • Evaluate largest sources of consumption
  • Evaluate current recycling systems

• Evaluate strategies to:
  • Improve recycling systems
  • Reduce source water
  • Remove chromium from recycled water

• Determine savings for final recommendations
Approach

• Investigate water consumption processes
  • Map water flow
  • Quantify water usage

• Evaluate current recycling systems
  • Identify successes and shortcomings
  • Understand shortcomings

• Identify material flow
Approach

- Identify top water usage areas
  - Screen Machines > Wire Mill
- Blueprint for recycling system
- Chromium removal
- Address remaining areas
Approach

• Identify top water usage areas
  • Screen Machines > Wire Mill
• Blueprint for recycling system
• Chromium removal
• Address remaining areas
Contaminated Water

- Small particulates and burnt oil
- Oil-water emulsion
- Current recycling system
  - Oil-water coalescing separator
  - Flow pattern in reservoir
  - Centrifuge
Recycling System

- Proposed system: centrifuge and ultrafiltration
  - Centrifuge: particles > 74 microns
  - Ultrafiltration: oil-water emulsion
- Pilot system
  - 4 machines
Recycling System

• Process flow diagram
Recycling System

• New process flow diagram
### Recommendations: Recycling System

<table>
<thead>
<tr>
<th>Recycling System</th>
<th>Water Reduced (gallons per year)</th>
<th>Implementation Cost</th>
<th>Cost Savings (per year)</th>
<th>Payback Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Diameter Implemented</td>
<td>940,000</td>
<td>$4,000</td>
<td>$7,000</td>
<td>6.9 months</td>
<td>Implemented*</td>
</tr>
<tr>
<td>Large Diameter Recommended</td>
<td>1,170,000</td>
<td>$6,000</td>
<td>$8,600</td>
<td>8.4 months</td>
<td>Recommended</td>
</tr>
<tr>
<td>Small Diameter</td>
<td>4,000</td>
<td>$4,000</td>
<td>$30</td>
<td>130 years</td>
<td>Recommended</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,100,000</strong></td>
<td><strong>$14,000</strong></td>
<td><strong>$15,600</strong></td>
<td><strong>10.8 months</strong></td>
<td><strong>--</strong></td>
</tr>
</tbody>
</table>

*Additional ultrafiltration columns need to be added*
Chromium Removal

• NSF certification
• Proposed solution: ion exchange
  • Regenerable resin
  • Pilot scale system
  • Colorimeter
Chromium Removal

- Process flow diagram
- Multiple location options
  - Following ultrafiltration
  - Next to reservoir
- Additional cost for automation
- No downtime
# Recommendations: Chromium Removal

<table>
<thead>
<tr>
<th>Ion Exchange Location</th>
<th>Water Reduced (gallons per year)</th>
<th>Implementation Cost</th>
<th>Cost Savings (per year)</th>
<th>Payback Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next to Reservoir</td>
<td>120,000</td>
<td>$4,500</td>
<td>$870</td>
<td>5.2 years</td>
<td>Recommended</td>
</tr>
<tr>
<td>Following Ultrafiltration</td>
<td>120,000</td>
<td>$2,700</td>
<td>$870</td>
<td>3.1 years</td>
<td>--</td>
</tr>
</tbody>
</table>
Fine Wire Screen Machines

- Electronics cooling water
- Quenching water
- Solution
  - Closed loop system with chiller
  - Recycling system
# Recommendations: Fine Wire

<table>
<thead>
<tr>
<th>Waste Reduction Option</th>
<th>Water Reduced (gallons per year)</th>
<th>Percent Reduction</th>
<th>Implementation Cost</th>
<th>Cost Savings (per year)</th>
<th>Payback Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed Loop Cooling Water</td>
<td>780,000</td>
<td>100%</td>
<td>$4,500</td>
<td>$4,700</td>
<td>11.5 months</td>
<td>Recommended</td>
</tr>
<tr>
<td>Recycling System</td>
<td>390,000</td>
<td>95%</td>
<td>$3,700</td>
<td>$2,900</td>
<td>15.3 months</td>
<td>Recommended</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,170,000</strong></td>
<td><strong>--</strong></td>
<td><strong>$8,200</strong></td>
<td><strong>$7,600</strong></td>
<td><strong>13 months</strong></td>
<td><strong>--</strong></td>
</tr>
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</table>
Quenching Water

- Excess water applied to weld
- Limited control
- Solution
  - Globe valves and flow meters
## Recommendations: Quenching Water

<table>
<thead>
<tr>
<th>Quenching Water Reduction</th>
<th>Water Reduced (gallons per year)</th>
<th>Percent Reduction</th>
<th>Implementation Cost</th>
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<th>Payback Period</th>
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<tbody>
<tr>
<td>With Recycling Systems</td>
<td>82,000</td>
<td>29%</td>
<td>$3,300</td>
<td>$600</td>
<td>5.5 years</td>
<td>Recommended</td>
</tr>
<tr>
<td>Without Recycling Systems</td>
<td>175,000</td>
<td>29%</td>
<td>$3,300</td>
<td>$1,700</td>
<td>2 years</td>
<td>--</td>
</tr>
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</table>
Wire Mill

• Wire washing stage
• Minimal contaminants in samples
• Air wipe in Use
• Suggestion
  • Shutoff water
  • Further testing necessary
# Recommendations: Wire Mill

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<tbody>
<tr>
<td>Cleaning Water in Wire Mill</td>
<td>2,070,000</td>
<td>--</td>
<td>$15,400</td>
<td>--</td>
<td>Testing Required</td>
</tr>
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## Summary

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<td>Fine Wire Screen Machines</td>
<td>1,170,000</td>
<td>&gt; 95%</td>
<td>$8,200</td>
<td>$7,600</td>
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<td>Quenching Water</td>
<td>82,000</td>
<td>29%</td>
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<td>$600</td>
<td>5.5 years</td>
<td>Recommended</td>
</tr>
<tr>
<td><strong>Total (Excluding Wire Mill)</strong></td>
<td><strong>3,500,000</strong></td>
<td><strong>37%</strong></td>
<td><strong>$30,000</strong></td>
<td><strong>$25,000</strong></td>
<td><strong>14.4 months</strong></td>
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Personal Benefits

• Interaction with wide variety of people
• Application of principles learned in school
• Design and construction of recycling system
Questions?