Water and Energy Efficiency
GE Power and Water Technologies

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Company Overview

Key
- CMS Manufacturing Sites
- ES Manufacturing Sites
- Technology Sites
- GE Global Research Centers
- Locations with 75+ Employees

Headquarters | Trevose, PA | USA
Manufacturing/R&D | Minnetonka, MN | USA
Manufacturing/R&D | Oakville, ON | Canada
Manufacturing/R&D | Hungary | Europe
Manufacturing/R&D | Wuxi | China
R&D | Cotia | Brazil
Company Overview

• Provide water treatment products for businesses and homes
  – Depth Filters
  – Membranes
  – RO Systems
Process Overview

- Non-contact cooling water
- Polypropylene
- Energy
Motivations for Change

- Optimize the use of water resources
- Reduce wastewater
- High energy costs
Reasons for MnTAP Assistance

- Analyze and understand water flow
- Quantify and reduce water use
- Understand the distribution of energy usage
Approach

• Understand cooling water effects throughout the process

• Develop relationship between water flow and temperature
Project Considerations

• Criteria:
  – Prevent overheating the hopper
    • Account for temperature fluctuations
    • Ensure the flow of cooling water during operation
  – Avoid hot surfaces

• Water and temperature data collection

• Interactions with the team
Flow Rates on Line 1 and 5

- Non-contact cooling water
- Temperature change
Flow Rates on Lines 1 and 5

• Opportunity
  – High water flow

• Solution
  – Adjust flow rate (metering valve, flow meter)

<table>
<thead>
<tr>
<th>Line</th>
<th>Current Flow Rate (gal/min)</th>
<th>Recommended Flow Rate (gal/min)</th>
<th>Reduction in Water Consumption (gallons)</th>
<th>Financial Savings Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.2807</td>
<td>0.5</td>
<td>1,400,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>5</td>
<td>1.8376</td>
<td>1.5</td>
<td>150,000</td>
<td>$300</td>
</tr>
<tr>
<td>Total</td>
<td>5.1183</td>
<td>2.0</td>
<td>1,550,000</td>
<td>$3,300</td>
</tr>
</tbody>
</table>
Surface Temperatures

- Exposed hot services
- Safety hazard
Surface Temperatures

- **Opportunity**
  - Surface temperatures on Lines 2 and 4 are above 120°F

- **Solution**
  - Adjust flow rate (metering valve, flow meter)

<table>
<thead>
<tr>
<th>Line</th>
<th>Current Flow Rate (gal/min)</th>
<th>Recommended Flow Rate (gal/min)</th>
<th>Increase in Water Consumption (gallons)</th>
<th>Financial Savings Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.3525</td>
<td>0.5</td>
<td>50,000</td>
<td>-$100</td>
</tr>
<tr>
<td>4</td>
<td>0.3709</td>
<td>0.5</td>
<td>50,000</td>
<td>-$100</td>
</tr>
<tr>
<td>Total</td>
<td>0.7234</td>
<td>1.0</td>
<td>100,000</td>
<td>-$200</td>
</tr>
</tbody>
</table>
Water Flow During Shutdown

- Continuous water flow
- Extruder shutdown
Water Flow During Shutdown

• Opportunity
  – Unable to automatically shut off water supply when a line is turned off

• Solution
  – Normally-open solenoid valve with interlock system
Line 6 Flow Rates

- In the process of measuring flow rates
- Low temperatures
- Opportunity for significant water flow reduction

<table>
<thead>
<tr>
<th>Line</th>
<th>Estimated Flow Rate (gal/min)</th>
<th>Recommended Flow Rate (gal/min)</th>
<th>Estimated Water Savings Per Year (gal)</th>
<th>Estimated Financial Savings Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-1</td>
<td>1.10</td>
<td>0.5</td>
<td>315,360</td>
<td>$668</td>
</tr>
<tr>
<td>6-2</td>
<td>1.70</td>
<td>1.0</td>
<td>367,920</td>
<td>$779</td>
</tr>
<tr>
<td>6-3</td>
<td>1.10</td>
<td>0.3</td>
<td>420,480</td>
<td>$890</td>
</tr>
<tr>
<td>6-4</td>
<td>1.09</td>
<td>0.3</td>
<td>415,224</td>
<td>$878</td>
</tr>
<tr>
<td>6-5</td>
<td>1.10</td>
<td>0.3</td>
<td>420,480</td>
<td>$890</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>1,900,000</strong></td>
<td><strong>$4,100</strong></td>
</tr>
</tbody>
</table>
Energy

• Components:
  – 5 large extruders with heaters
  – 5 small extruders with heaters
  – 4 air compressors
Energy Demand Charge

• Opportunity
  – Energy spikes cause a substantial energy demand charge

• Possible Ideas
  – Adjust start-up schedule
  – Increase efficiency of electrical equipment
# Successful Process Changes

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Water reduction per year (gallons)</th>
<th>Net savings (per year)</th>
<th>Payback Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Install metering valve on Line 1-5</td>
<td>1,450,000</td>
<td>$3,100</td>
<td>~9 months</td>
<td>Proposed</td>
</tr>
<tr>
<td>Reduce flow rates on Line 6 extruders</td>
<td>1,900,000</td>
<td>$4,100</td>
<td>~3 months</td>
<td>Testing</td>
</tr>
<tr>
<td>Install solenoid valve and an interlock on all water supply pipes</td>
<td>&gt;950,000</td>
<td>$2,000</td>
<td>~1.6 years</td>
<td>Proposed</td>
</tr>
<tr>
<td>Install thermocouple with display on all lines</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Proposed</td>
</tr>
<tr>
<td>Adjust start-up schedule and improve efficiency of electrical equipment</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Collecting Data</td>
</tr>
<tr>
<td>Totals</td>
<td>4,300,000</td>
<td>$9,200</td>
<td>1.4 years</td>
<td>-</td>
</tr>
</tbody>
</table>
Personal Benefits

• Experience working in an industrial environment
• Professional/technical development
• Better understanding of project planning and management
• Data collection and analysis
• Deeper understanding of safety/health policies
• Working alone and on a team
Thank you to everyone at MnTAP and GE for making this project possible