Wastewater Loading Reduction
Kerry Ingredients

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Minnesota Technical Assistance Program

University of Minnesota
Driven to Discover®
Company Overview

- Food ingredients and flavors
- Headquartered in Ireland

Rochester Facility - 2004

- Fermentation, spray drying, powder blending, and packaging
- Natural flavors, enhanced textures, extended shelf life
- Ready-to-eat meals, sauces, dressings, dairy products, bakery products, fermented meats
Motivations for Change

• Reduce wastewater loading
  – High BOD
  – Out of spec pH
Reasons for MnTAP Assistance

- Investigate sources of low pH
- Determine major contributors to high BOD
- Consider water conservation throughout plant
- Make recommendations for reducing wastewater loading
Approach

• Monitored cleaning processes
• Observed plant processes that send wastewater to drain
• Talked with operators and staff
• Developed ideas for improvement
Determining Opportunities for Improvement

- Process observations and notes
- Previous observations from Kerry staff
- Measurements which suggested greatest contribution to wastewater loading
pH

Opportunity: CIP systems

- Clean equipment between product runs
- Chemicals cause pH spikes
- Major contributors: evaporator, sterilizer, and large spray dryer
CIP systems

• Solution:
  – Modify CIP recipes, timing of each cycle

• Savings:
  – Reduce pH excursions
  – Save chemicals
  – $550/year
pH

Opportunity: Sewer pit

- Collects wastewater from the plant before sent to the City of Rochester
- Current resonance time of 20 minutes
- Not enough time for chemicals to mix
Sewer pit

- **Solution:**
  - Clean out sewer pit
  - Increase resonance time to 2-6 hours

- **Savings:**
  - Reduce pH violations
BOD

Opportunity: Wet packaging

• Product loss
  – Fall off conveyor
  – Leaking bags
  – Weight

• Bags get emptied down the drain
Wet Packaging

• Solution:
  – Add catch pans
  – Install new conveyor
  – Regular maintenance checks on packaging equipment

• Savings:
  – Over 7,000 lbs of solids
  – Over 34,500 lbs of product
  – $41,400/year
BOD

Opportunity: Spray Dryers

• During CIPs, built up product gets washed down the drain
• Contributes to BOD in wastewater
Spray Dryers

• Solution:
  – Divert first rinse of CIP
  – Add filter sock

• Savings:
  – Divert rinse: 74,500 lbs, $26,300
  – Filter sock: 13,500 lbs, $4,800

• Consider:
  – Additional hauling costs per year: $17,000
Water Conservation

Opportunity: Fix water leaks

- Measured/documented various leaks in plant

Gallons of water/year

<table>
<thead>
<tr>
<th></th>
<th>CIP 1</th>
<th>CIP 2</th>
<th>Sterilizer – running</th>
<th>Sterilizer – idle</th>
<th>Centrifuge</th>
<th>Large dryer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIP 1</td>
<td>213,000</td>
<td>102,200</td>
<td>404,700</td>
<td>59,600</td>
<td>14,000</td>
<td>150,000</td>
<td>943,500</td>
</tr>
</tbody>
</table>

- Savings:
  - 943,500 gallons of water/year
  - Hundreds of gallons of chemicals/year
## Successful Process Changes

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Waste/ energy reduced (per year)</th>
<th>Savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimize CIP processes</td>
<td>Reduce pH violations</td>
<td>$550</td>
<td>Immediate</td>
<td>Recommended</td>
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<tr>
<td>Clean out sewer pit</td>
<td>Reduce pH violations</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Partially Implemented</td>
</tr>
<tr>
<td><strong>BOD reduction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modify wet packaging line</td>
<td>7,000 pounds of solids</td>
<td>$41,400</td>
<td>3-6 months</td>
<td>Recommended</td>
</tr>
<tr>
<td>Divert dryer rinse</td>
<td>74,500 pounds of solids</td>
<td>$26,300</td>
<td>Needs further investigation</td>
<td>Needs further analysis</td>
</tr>
<tr>
<td>Attach filter sock</td>
<td>13,500 pounds of solids</td>
<td>$4,800</td>
<td>2.5 months</td>
<td>Needs further analysis</td>
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<tr>
<td><strong>Water Conservation</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repair water leaks</td>
<td>943,500 gallons of water</td>
<td>$5,800</td>
<td>Unknown</td>
<td>Partially Implemented</td>
</tr>
</tbody>
</table>
Additional/Future Ideas

Centrifuge
• Solution:
  – Divert effluent to silo
• Savings:
  – 22,500 pounds of solids/year
  – $8,700/year

Dry packaging
• Solution:
  – Add catch pans
  – Vacuum
• Savings:
  – Decrease BOD
  – 5-10 lbs/day
  – $1,000/year
Personal Benefits

- Real-world engineering experience
- Food industry environment
- Communication skills
- Independence
- Confidence
Questions?