Feasibility of Using Low Quality Waste Energy

Northern Iron & Machine

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Minnesota Technical Assistance Program

University of Minnesota
Driven to Discover℠
Company Overview

• Ductile Iron Foundry
  – Manufacture off-road machine parts
• 150 Employees
• Machine Shop
Process Changes

• Eliminate Cooling Tower
  – Evaporative heat exchanger
Process Changes (Cont.)

- Replaced With 2 Dry Coolers
  - Water to air heat exchanger
Air Flows through fins then into the building
Motivations for Change

- Energy
- Environment
- Process
Reasons for MnTAP Assistance

- Document effectiveness
- Support University of Minnesota and its Students
- Improve energy management
Approach

• Understand Processes
• Quantify and Verify Heat Transfer
Low Quality Energy

- Energy at low temperatures can’t be used for process heating
  - Low Range (90 deg F)
  - Energy being recouped
  - Comfort heating
# Dry Cooler Savings

<table>
<thead>
<tr>
<th>Energy</th>
<th>Usage</th>
<th>Savings Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save Electricity</td>
<td>60,000 kWh</td>
<td>$3,800</td>
</tr>
<tr>
<td>Save Gas</td>
<td>1350 DkT</td>
<td>$5,400</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well Water</td>
<td>500,000 Gallons</td>
<td>N/A</td>
</tr>
<tr>
<td>Chemical Use</td>
<td>N/A</td>
<td>$1,000</td>
</tr>
<tr>
<td>Waste Water Discharge</td>
<td>18,000 Gallons</td>
<td>$480</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Man Hours</td>
<td>N/A</td>
<td>$2,500</td>
</tr>
<tr>
<td><strong>Total Yearly Savings</strong></td>
<td></td>
<td><strong>$13,000</strong></td>
</tr>
</tbody>
</table>
In Reality

Old System
- Atmosphere
- 30,000 cfm
- 30 Hp max
- 0% Recouped

New System
- Plant
- 40,000 cfm
- 10-30 Hp
- 70% Recouped
Determining Feasibility

• Dry Cooler Benefits
  – Pros and Cons
• Data Collection
• Quantifying Data for Comparison
Plant Benefits

- Conserve Natural Resources
- Reduce New Capital
- Remove MUA
- Reduce Reporting
Maintenance

• Reduce Man Hours
  – Cleaning Pipes
  – Fixing Leaks

• Minimal Maintenance
  – Dirt and fuzz restrict air flow
  – Reduces cooling ability
Maintenance (Cont.)

1 Day Old 1 Week Old 2 Years Old
Feasibility Conclusion

• Energy
• Environment
• Process
Feasibility Conclusion Cont.

• Xcel Energy Rebate
  – $38,000
  – Validated by Engineers
Heat Treat Oven
Personal Benefits

• Work Experience in Industrial Setting
• Analyzed Real World Engineering Applications
• Applied Principals from Classroom
• Improved Writing/Communication Skills
Questions?