Energy Efficiency and Green Alternatives at IBM in Rochester

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On-site Supervisor: Brian Morgan

University of Minnesota
Driven to Discover™
Company Overview

• Formed 19th century → consolidation of 4 businesses

• 3.1 million square foot

• Previously manufacturing and chemical distribution

• Software and hardware, data center, business, leased space

Source: IBM Rochester Wikipedia
Motivation for Change

• Leader in innovation → move towards reduced energy consumption and environmental responsibility

• Renewable energy procurement and active power demand reductions

• Site-wide optimization software

• Equipment reliability and waste reduction
Reasons for MnTAP Assistance

• Provide technical assistance on-site on projects of interest
• Audit HVAC and utility loop to identify opportunities for reduction
  • Energy consumption through improved efficiency
  • Reduced peak demands
  • Green corrosion inhibitors
• Present findings cohesively with savings and payback
Chilled Water System

A typical chilled water central system

Source: www.slideshare.nettaratitzairconditioning-repaired
Thermal Tank System

• Big battery storing thermal energy
• Discharge during the day to stop power consumption, charge at night to replenish energy
• Tempers loads improving equipment reliability

Source: http://www.cyp-res.com/stratified-chilled-water-storage-schws/
Approach 1 – Thermal Storage Tank

- Calculate reduction potential
- Run experiment to verify dashboard accuracy and calculation accuracy
  - Within 15% of kW calculations
- Work with operators to identify concern areas
- Work with software contractor to automate solutions
Recommendation 1 – Thermal Storage Tank

• Use 2015 consumption as max level
• Bring in tank incrementally (5% step levels) to achieve 700 kW power drop and run reliably
• Increase flow conditionally
• Charge evenly through the night
## Cost Summary

<table>
<thead>
<tr>
<th>Process Description</th>
<th>Reduction (per year)</th>
<th>Implementation Cost ($)</th>
<th>Savings ($/yr)</th>
<th>Payback</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Storage Tank</td>
<td>700 kW</td>
<td>$18,000</td>
<td>$103,600</td>
<td>2 months</td>
<td>Implemented</td>
</tr>
</tbody>
</table>
Approach 2 – Air Handling Unit Audit

• Research components and process of an air handler

• Audit and catalogue opportunities for improvement
  • Use IR camera to determine fouling and plugging

• Run savings calculations
  • Energy, flow, and financial
## Recommendation 2 – Air Handling Unit Audit

<table>
<thead>
<tr>
<th>Project Descr.</th>
<th>Reduction (yr)</th>
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<th>Payback</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Independent Valve</td>
<td>1,100,000 kWh</td>
<td>$170,000</td>
<td>$93,000</td>
<td>21 months</td>
<td>Recommended</td>
</tr>
<tr>
<td>Gauge Replacement</td>
<td>NA</td>
<td>$740</td>
<td>NA</td>
<td>NA</td>
<td>Implementing</td>
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<tr>
<td>Coil Cleaning</td>
<td>26,000 kWh</td>
<td>$21,000</td>
<td>$37,000</td>
<td>7 months</td>
<td>Implementing</td>
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<tr>
<td>Coil Maintenance</td>
<td>NA</td>
<td>$7,500</td>
<td>$15,000</td>
<td>6 months</td>
<td>Recommended</td>
</tr>
<tr>
<td>Coil Plugging</td>
<td>5,000 kWh</td>
<td>$6,000</td>
<td>$24,000</td>
<td>3 months</td>
<td>Implementing</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$205,240</strong></td>
<td><strong>$169,000</strong></td>
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</table>
Approach 3 – Less Hazardous Corrosion Inhibitor

• Water requires shipment to hazardous waste facility from molybdenum levels in corrosion inhibitor

• Identify areas of waste associated with corrosion inhibitor
  • Sidestream chilled water filter
  • Perimeter heating System

• Reach out to NC branch to analyze previous project work

• Identify potential alternative and clean up processes
Recommendation 3 – Less Hazardous Corrosion Inhibitor

Benefits
• Eliminate roughly nine 4,500 gallon tankards of waste water annually
• Save $41,000 in labor, equipment, and shipping costs

Removal Procedure
• Ion exchange resin trailers on-site 65-130 days
• Sidestream 35-400 gpm
• Get molybdenum below 3 ppm
• Perimeter heat – replace in shock tanks as needed

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<tr>
<td>Corrosion Inhibitor Replacement</td>
<td>40,500 gal waste water</td>
<td>$440,000</td>
<td>$41,000</td>
<td>11 years</td>
<td>Recommended</td>
</tr>
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</table>
# Recommendations Summary

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<td>$170,000</td>
<td>$93,000</td>
<td>21 months</td>
<td>Recommended</td>
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<tr>
<td>Coil Cleaning (exterior)</td>
<td>26,208 kWh</td>
<td>$21,000</td>
<td>$37,000</td>
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<tr>
<td>Coil Maintenance</td>
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<td>$7,500</td>
<td>$15,000</td>
<td>6 months</td>
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<td>Total</td>
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<td>$663,000</td>
<td>$314,000</td>
<td>26 months</td>
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Personal Takeaways

• Problem solving with an open mind
• People run business, not numbers
• Somebody knows
• Confidence with results
This project was supported in part by the Minnesota Pollution Control Agency