Motivating Energy Savings at Small Manufacturing Facilities

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CEE Program: Energy Intelligence

• Works with Small-Medium Sized Businesses
  • Helps businesses understand the distribution of their energy usage at their facility
  • Aims to inform businesses of savings opportunities through energy conservation opportunities

• Each business installed with smart meters a few months prior to arrival to identify initial trends in consumption
Project Overview

• Visited four small industrial sites and recommend energy improvements

• Three weeks per site: two weeks on-site and one week at CEE

• Identified major areas of savings at each site
• Founded in 1981
• Designs and prints labels for a variety of industries
  • Wide array of potential applications
• Helps customers find labeling and packaging solutions to fit their needs
• Layout
  • Flexo-printing
  • Digital Printing
  • Warehouse and Shipping
  • Office

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Highlights: Waste Disposal System

- Disposal system operated on compressed air via Venturi effect
  - Large percentage (~80%) of compressed air usage dedicated to system
  - Often left on during breaks and stops in production
  - Cost of ~$9,000 annually to run the system
  - Creates difficult-to-dispose-of waste
  - Exhausts conditioned air outside
Highlights: Label Disposal System

- **New disposal system operated using blower/exhaust fan**
  - No reliance/load on compressed air system
  - Reduces web waste
  - Higher capacity; offers room for expansion
  - VFD; Operable at a range of fan speeds
  - Predicted to Cost $800 to run annually
  - Savings potential of over $12,200 annually

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Findings: Savings Opportunities

- **Total Savings Identified: $19,300**
  - 227,200 kWh of energy consumption savings
  - 58 kW of energy demand savings
  - 1,800 Therms of gas consumption savings

**Table 1** Summary of Recommendations, Savings, and Cost

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Cost of Implementation</th>
<th>Savings Per Year</th>
<th>Energy Savings Per Year (kWh)</th>
<th>payback Period (Yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement New Waste Disposal System</td>
<td>$310,000</td>
<td>$12,200</td>
<td>128,000</td>
<td>≤ 2.0</td>
</tr>
<tr>
<td>Fix Compressed Air Leaks</td>
<td>$1,600</td>
<td>$4,400</td>
<td>69,400</td>
<td>0.4</td>
</tr>
<tr>
<td>Implement Lighting Changes</td>
<td>$2,800</td>
<td>$1,700</td>
<td>13,500</td>
<td>1.7</td>
</tr>
<tr>
<td>Heat Tunnel Management</td>
<td>$0</td>
<td>$700</td>
<td>11,000</td>
<td>Immediate</td>
</tr>
<tr>
<td>Install Line Controls</td>
<td>$300</td>
<td>$300</td>
<td>5,300</td>
<td>1</td>
</tr>
</tbody>
</table>

18% Total Energy Savings
• Grows organic mushrooms year-round

• **Layout**
  • Office space
  • Four grow houses
  • Inoculation chamber
  • Warehouse
Highlights: Energy Recovery Ventilation System

• Designed Air-Air Heat Recovery System
  • Utilizes four, 130 CFM energy recovery ventilators (ERVs)
  • Exchanges humidity and heat with incoming air
  • Saves 32,400 kWh annually from reduced air reheating costs
Findings: Savings Opportunities

- **Total Savings Identified: $18,800**
  - 212,800 kWh of energy consumption savings
  - 21 kW of energy demand savings
  - 5,100 gallons of Propane

### Table 2
Summary of Recommendations, Savings, and Cost

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Cost of Implementation ($)</th>
<th>Savings Per Year ($)</th>
<th>Energy Savings Per Year (kWh)</th>
<th>payback Period (Yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting Changes</td>
<td>TBD</td>
<td>$11,430</td>
<td>167,200</td>
<td>≤2.0</td>
</tr>
<tr>
<td>Steam Trap Replacement</td>
<td>$450</td>
<td>$2,900</td>
<td>(5,100 gal Propane)</td>
<td>0.2</td>
</tr>
<tr>
<td>ERV Implementation</td>
<td>$3,400</td>
<td>$2,400</td>
<td>32,400</td>
<td>1.4</td>
</tr>
<tr>
<td>Insulating Ventilation</td>
<td>$1,000</td>
<td>$1,600</td>
<td>25,300</td>
<td>0.6</td>
</tr>
<tr>
<td>Compressed Air Leak Repairs</td>
<td>TBD</td>
<td>$1,100</td>
<td>13,100</td>
<td>TBD</td>
</tr>
<tr>
<td>Reducing Mixer Motor</td>
<td>$980-$1,130</td>
<td>$950</td>
<td>100</td>
<td>1-1.2</td>
</tr>
</tbody>
</table>
Company C: Diesel Engine Repair

- Services diesel engines and generators
- Layout
  - Office space
  - Parts distribution
  - Truck service area
  - Warehouse
Highlights: Lighting

• Business worked with Onestop Lighting, recommended type B LED replacement for the whole facility

• Too long of payback

• Able to create a shorter payback by mixing use of type A and B LED based on differing operating hours (1.8 yrs)

• $10,200 savings annually
Findings: Savings Opportunities

- **Total Savings Identified: $26,000**
  - 329,000 kWh of energy consumption savings
  - 27 kW of energy demand savings
  - 7,700 Therms of gas consumption savings

### 38% Total Energy Savings

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Cost of Implementation ($)</th>
<th>Savings Per Year ($)</th>
<th>Energy Savings Per Year (kWh)</th>
<th>payback Period (Yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement Lighting Changes</td>
<td>18,200</td>
<td>10,200</td>
<td>133,900</td>
<td>1.8</td>
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<tr>
<td>HVAC System Changes</td>
<td>4,300</td>
<td>9,400</td>
<td>95,000</td>
<td>0.5</td>
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<tr>
<td>Fix Compressed Air Leaks</td>
<td>300</td>
<td>2,900</td>
<td>45,900</td>
<td>0.1</td>
</tr>
<tr>
<td>Implement Computer Power Management</td>
<td>0</td>
<td>2,000</td>
<td>31,500</td>
<td>immediate</td>
</tr>
<tr>
<td>Change Compressor Idle</td>
<td>0</td>
<td>1,400</td>
<td>22,800</td>
<td>immediate</td>
</tr>
</tbody>
</table>
Company D: Medical Devices

- Design and Manufacturing of Medical Devices
- Specializes in improving current treatment options
- Goal to improve quality of life for patients
Highlights: Clean Room Optimization

- **Clean Room Certified to ISO Class 8**
  - Clean room over circulated, had significantly fewer contaminants than the level the room was certified
  - Maintained rate of 63 air changes per hour
  - Opportunity for reducing air exchange rate
Highlights: Clean Room Optimization

• Looked into Industry Standards on Clean Room Circulation
  • Found that ISO 8 certified clean rooms require 5 to 48 air changes per hour
  • Used nameplate data on circulation equipment to determine power draw of the clean room
  • Reducing air exchanges from 63 per hour to 48 saves $2,300 annually over the current settings (30,000 kWh)
  • 50% reduction in operating costs for cleanroom
# Savings Overview

## Table 4: Summary of Savings

<table>
<thead>
<tr>
<th>Site</th>
<th>Energy Savings Annually (kWh)</th>
<th>Natural Gas Savings Annually (Therms)</th>
<th>Savings Annually ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lofton Label</td>
<td>227,200</td>
<td>1,800</td>
<td>$19,300</td>
</tr>
<tr>
<td>Mississippi Mushrooms</td>
<td>212,800</td>
<td>(5,100 gal Propane)</td>
<td>$18,800</td>
</tr>
<tr>
<td>Site C</td>
<td>329,000</td>
<td>7,700</td>
<td>$26,000</td>
</tr>
<tr>
<td>Site D</td>
<td>68,000</td>
<td>N/A</td>
<td>$5,400</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>837,000 kWh</strong></td>
<td><strong>9,500 Therms</strong></td>
<td><strong>$69,500</strong></td>
</tr>
</tbody>
</table>
Personal Benefits

• Developed new tools for analysis and quantification of energy use
• Able to sample a wide array of differing industries
• Built relationships with employees at each site, learned from experience
• Opportunity to look into energy management capabilities
Thank You!