Building Energy Efficiency – Case Studies

Ben Sliwinski
Technical Director
SEDAC
University of Illinois at Urbana-Champaign
Sauk Valley Community College
General Characteristics

- Single building, 355,000 sf, 1970s vintage
- A little over half the roof has been upgraded to 4 inches of insulation.
- Originally used absorption chillers for cooling
- About 30 to 50 percent of glazing is double glazed
- Steam boilers and hot water converters
- CO₂ sensors for ventilation control
Audit Recommendations

- Replace Absorption Chillers with Electric Chillers
- Super T8 Lighting Retrofit
- Improved Control of Kitchen Ventilation
- Lighting Occupancy Sensors for Restrooms
- Lighting Dimming Ballasts
- Pulse Start HID for Gym Lighting
- Two Way Chilled Water Valves and VFD
Implemented

- Replace Absorption Chillers with Electric Chillers
- Improved Control of Kitchen Ventilation
- Lighting Occupancy Sensors for Restrooms
- Two Way Chilled Water Valves and VFD
Vent Hood
Vent Hood – what about it?

- We found it running during the site inspection which was during a break period.
- We recommended demand control ventilation
- Found out it was too expensive
- Opted for a simpler manual solution – based on input from Sauk Valley College.
Electric Usage – dropped!
Why Electric Usage Dropped

- Change from absorption chillers to electric significantly reduces cooling tower fan and pump energy.
- Better match of chiller capacity to load improves overall efficiency.
- Two-way valves and VFD significantly reduce pumping energy usage.
- Boiler auxiliary electric usage (induced draft fans, boiler water pumps) eliminated.
Gas Usage – dropped a lot
## Bottom Line

<table>
<thead>
<tr>
<th>Metric</th>
<th>Before</th>
<th>After</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>103.0</td>
<td>66.3</td>
<td>kBtu/sf/yr</td>
</tr>
<tr>
<td>Cost</td>
<td>1.32</td>
<td>0.99</td>
<td>$/sf/yr</td>
</tr>
<tr>
<td>Electricity</td>
<td>9.68</td>
<td>8.62</td>
<td>kWh/sf/yr</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>0.70</td>
<td>0.34</td>
<td>Therm/sf/yr</td>
</tr>
</tbody>
</table>
Danville Area Community College
General Characteristics

- Multiple buildings, 445,000 sf, 1890s to modern vintage
- Wide variety of roof types, some likely with little insulation.
- Central steam plant with distribution system
- Most glazing is double glazed
- Individual chillers or RTUs for each building
- Mostly T8 lighting
Audit Recommendations

- T12 to T8 lighting retrofit
- T8 to Low Wattage T8 retrofit
- Lighting occupancy sensors
- Energy System Shutdown and Setback During Breaks
- High Bay Lighting Retrofit for Gym and Tech Center
- Modular Boiler System for Central Plant
- VAV Reheat Retro-Commissioning
- Thermostat Setback
- Demand Control Ventilation
Implemented Measures

- Energy System Shutdown and Setback During Breaks
- Thermostat Setback
Bottom Line

- While not as spectacular, overall savings of about $93,000 per year
- Still many opportunities for additional savings

<table>
<thead>
<tr>
<th>Metric</th>
<th>Before</th>
<th>After</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>225</td>
<td>207</td>
<td>kBtu/sf/yr</td>
</tr>
<tr>
<td>Cost</td>
<td>$2.52</td>
<td>2.30</td>
<td>$/sf/yr</td>
</tr>
<tr>
<td>Electricity</td>
<td>18.8</td>
<td>17.2</td>
<td>kWh/sf/yr</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1.6</td>
<td>1.5</td>
<td>Therms/sf/yr</td>
</tr>
</tbody>
</table>