HVAC Energy Efficiency Strategies


Mary Bentsen, Training Coordinator, SAIC an Ameren Illinois ActOnEnergy Partner
Practical Items

If you can't hear me, please type a message in the Chat window located on the right-hand side of your screen.

Please type any questions you have during the presentation into the Chat window located on the right-side of your computer screen.
Quiz Questions:
What do you already know about energy efficiency for HVAC systems?

1. How much of a commercial business's energy usage comes from its HVAC system?
2. What is the average lifespan of a steam trap before it will need repair or replacement?
3. What can a VFD control?
Commercial Energy Use

- Space Heating: 20%
- Lighting: 18%
- Space Cooling: 13%
- Water Heating: 10%
- Electronics: 8%
- Refrigeration: 6%
- Wet Cleaning: 3%
- Cooking: 3%
- Ventilation: 3%
- Other: 8%
- Computers: 2%
- Adjust to SEDS: 6%
Heating and Your Business: Basic Facts

• 33% of a commercial business's energy usage comes from its HVAC system
• 30% of the energy usage comes from heating the air or water

• Commercial facilities spend $1.19 per square foot on energy costs annually
• Hospitals spend $2.26 per square foot on energy costs annually
Changing Times

- Equipment energy improvements
- Better controls to high tech processes
- Mandated improvements
- Climate changes?
- Cost of process, materials and energy to do business
# Types of Systems

<table>
<thead>
<tr>
<th>Type</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td>Electric, gas or a heat pump</td>
</tr>
<tr>
<td>AC</td>
<td>Air condensers, Chillers (air or water)</td>
</tr>
<tr>
<td>Rooftop (package unit)</td>
<td>Combine heat and AC</td>
</tr>
<tr>
<td>Split systems</td>
<td>Separate heat and AC components</td>
</tr>
<tr>
<td>Boilers</td>
<td>Hot water or steam</td>
</tr>
<tr>
<td>Geothermal heat pump</td>
<td>Package or split</td>
</tr>
<tr>
<td>Mini splits</td>
<td>PTAC/PTHC, high velocity AC</td>
</tr>
<tr>
<td>Hot Water heaters</td>
<td>Tank or tankless over 90% AFUE</td>
</tr>
</tbody>
</table>
## Efficiency Ratings

<table>
<thead>
<tr>
<th>Rating</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AC</strong></td>
<td>Air Conditioning 12,000btu = 1 Ton AC</td>
</tr>
<tr>
<td><strong>SEER</strong></td>
<td>Seasonal Energy Efficiency Ratio</td>
</tr>
<tr>
<td><strong>EER</strong></td>
<td>Energy Efficiency Rating</td>
</tr>
<tr>
<td><strong>IEER</strong></td>
<td>Integrated Energy Efficiency Ratio</td>
</tr>
<tr>
<td><strong>IPLV</strong></td>
<td>Integrated Part Load Value (chillers)</td>
</tr>
<tr>
<td><strong>BTU</strong></td>
<td>A basic measure of thermal (heat) energy. One BTU is the amount of energy needed to heat one pound of water one degree Fahrenheit</td>
</tr>
</tbody>
</table>
What type of HVAC system(s) do you have at your business?

Select all that apply.
Split System

Split furnace
Split System

- Mix and match components
- Flexibility to use dual fuel
- Adaptable to space and situations
- Best control of goals
Geothermal

• Ground source heat pump
• Water circulated to heat and cool air from wells, ground loops, or bodies of water
• Package and split systems
Chillers and More

- Chiller advancements
- VFD’s to chiller and motors
- New software
Rooftop

AC:
- SEER 5 ton & below
- EER used above 5 ton
- Staging available AC
- Industry standards will go higher

Heat:
- Gas, Electric, Heat pump
- Gas furnace with 80% AFUE
- Staging available Heat
Control your Saving-Optimizing Your System

- Install a VFD on AC motors/pumps
- Install DDC controls
- Multi-staged heat and ac equipment
- Install upgraded gas valves on heating equipment
Condensing Boilers

- New designs allow for AFUE above 93% to complete with best systems
- Smaller designs and multiple units to replace large boilers
- Gas valves and systems that ramp up or down to the current heat needs
- Higher tech control systems that help fix problems quickly
- New accessory items to help distribution
Saving Today and Beyond

- A commercial building recently converted their aging large single boiler to 3 smaller boilers and reported a savings of thousands per month through the heating season.
- The new setup all sits in half the space of the old boiler.
- The boilers are staged to use only the capacity that the control sensors and computer program tell it to use.
- The boilers often only use one of the three boilers in milder weather such as most of this winter.
- The new control systems allow for better comfort and savings for the whole facility.
- VFDs were added to the pumps for savings on pump motors operation.
- An EMS system works with both the boiler and AC system for year-round savings!
Are you using variable frequency drives (VFDs)?

A. Yes
B. No
C. Don’t know
Boiler Old Versus New Condensing Boilers
Examples of Potential Savings: Furnaces

- In Illinois, going from a furnace rated at 65% AFUE to 95% AFUE

- Savings depend on the size of the equipment and facility
Energy Management Systems

- EMS remember when we don’t!
- Many types available
- Simple to complex
- Zoning
- Economizers
Steam Heating or Industrial

Typical Applications

• Steam is rarely used for space heating today – hot water systems are less maintenance intensive

• Exceptions

• Hospitals – need steam for sterilizers

• Older district heating systems

• Industrial plants which require process steam will use the same system for heating
Broken Traps Waste Energy

Steam traps – particularly bucket traps – have limited life

- If a trap fails closed: will interrupt production or heating
- If a trap fails open: production/heat will continue with no problem, but large amounts of steam will be wasted

- Our program offers incentives to help cover the cost of the steam trap survey and replacements as well as incentives to help pay for boiler tune-ups
# Classes of Steam

<table>
<thead>
<tr>
<th>Low Pressure Heating Steam</th>
<th>Medium Pressure Steam</th>
<th>High Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 15 psig</td>
<td>• 15-125 psig</td>
<td>• Above 125 psig</td>
</tr>
<tr>
<td>• Actual code is more restrictive</td>
<td>• Used in hospitals, district steam systems, some industrial heating</td>
<td>• Strictly industrial and power generating applications</td>
</tr>
<tr>
<td>• Used strictly for space heating systems and single effect absorption chillers</td>
<td></td>
<td></td>
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<tr>
<td>• Piping becomes large for higher capacity systems</td>
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</table>
### ActOnEnergy® Incentives Available

<table>
<thead>
<tr>
<th>STANDARDS</th>
<th>CUSTOM</th>
<th>RETRO COMMISSIONING (RCx)</th>
</tr>
</thead>
</table>
| • Lighting  
  • HVAC/Water Heaters  
  • VFDs  
  • Steam Traps  
  • Leak Survey & Repair  
  • Specialty Equipment | • Custom  
  • New Construction  
  • Feasibility Study | • Compressed Air  
  • Healthcare  
  • Commercial Buildings  
  • Industrial Refrigeration |
PY6 Applications

Pre-Approval not required
• Standard Incentives less than $10,000
• application submitted within 120 days of equipment purchase date

Pre-Approval required
• Standard Incentives greater than $10,000
• All Custom and Retro Commissioning projects (regardless of incentive)
• Submit application before commitment to project is made
• AC tune-up
• AC replacement options
• Furnace replacement
• Boiler replacement
• VFD
• Water Heater
ActOnEnergy Incentives: Water Heaters

• Water heaters are a great way to save on the water you have to heat for business.

Incentives on HVAC application:

• Tank electric or gas $150 to 300

• Pipe insulation, shower heads, faucet aerators also have incentives
Process Steam/Steam Trap

- Steam Trap Survey & Replacement
- The average steam trap last 7 years.
- Open failed traps can waste energy for years!
ActOnEnergy® Incentives Available

Custom (Electric & Gas)
• Incremental cost must fall in the range of 10% to 50%
• Incentives paid at 50% after facility receives $200,000
• Pre-approval required
• Large Incentive Request Form (LIRF) required

<table>
<thead>
<tr>
<th>CUSTOM DETAILS</th>
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<tbody>
<tr>
<td>Incentive</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
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<tr>
<td>Payback</td>
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</tbody>
</table>
## PY6 Applications

### Incentive Caps

<table>
<thead>
<tr>
<th>Incentive Type</th>
<th>Amount per Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard &amp; Custom (Electric)</td>
<td>$600,000</td>
</tr>
<tr>
<td>Standard &amp; Custom (Gas)</td>
<td>$400,000</td>
</tr>
<tr>
<td>Retro Commissioning</td>
<td>$600,000</td>
</tr>
<tr>
<td>New Construction</td>
<td>$100,000</td>
</tr>
</tbody>
</table>

- Standard and Custom incentives are paid out at 100% up to $200,000 and the remaining, up to $600,000, paid out at 50%.
- Retro Commissioning incentives are paid out at 100% up to the $600,000 cap.
Support

Contact Us   -or-
Your local AOE Energy Advisor

________________________________
Website: ActOnEnergy.com
Phone: 1.866.800.0747
Fax: 1.309.677.7950
Email: ActOnEnergyBusiness@Ameren.com
Opportunities & Support

Energy Advisors

• Located throughout the Ameren Illinois territory

• Assist with projects and applications
What did you learn about energy efficiency in HVAC systems?

1. What percent of a commercial business’s energy usage comes from their HVAC system?

2. How long does the average steam trap last before failure?

3. What can a VFD control?
Questions?
Building Operator Certification Training

- Peoria, IL
- 8 classes

<table>
<thead>
<tr>
<th>BOC Training</th>
<th>Course</th>
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<tbody>
<tr>
<td>Tues-Wed, Sept 10-11, 2013 (2 days)</td>
<td>BOC 1001 - Energy Efficient Operation of Building HVAC Systems</td>
</tr>
<tr>
<td>Tuesday, September 24, 2013</td>
<td>BOC 1007 – Facility Electrical Systems</td>
</tr>
<tr>
<td>Tuesday, October 8, 2013</td>
<td>BOC 1002 - Measuring and Benchmarking Energy Performance</td>
</tr>
<tr>
<td>Tuesday, October 22, 2013</td>
<td>BOC 1003 - Efficient Lighting Fundamentals</td>
</tr>
<tr>
<td>Tuesday, November 5, 2013</td>
<td>BOC 1004 - HVAC Controls Fundamentals</td>
</tr>
<tr>
<td>Tuesday, November 19, 2013</td>
<td>BOC 1005 - Indoor Environmental Quality</td>
</tr>
<tr>
<td>Tuesday, December 3, 2013</td>
<td>BOC 1006 – Common Opportunities for Low-Cost Operational Improvement</td>
</tr>
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