Industrial Assessment Center (IAC) Program

Beka Kosanovic, PhD.
Industrial Assessment Center
Mechanical & Industrial Engineering Department
University of Massachusetts - Amherst

Connecticut Business & Industry Association (CBIA)
Environment & Energy Conference
Waterbury, CT
June 6, 2014

Outline

- Advanced Manufacturing Office Programs
  Technology Deployment Activities
    - Industrial Assessment Center Program
      - Program Goals
      - Eligibility
      - Assessment Scenario
      - Examples
    - DOE Combined Heat & Power Technical Assistance Partnerships
Beginning in 1984 with four Schools

Industrial Assessment Centers 2012-2016

24 Centers at 32 Universities Nationwide

For more information on IAC program and participating schools visit:

http://iac.rutgers.edu/database/centers/

Industrial Assessment Center at the University of Massachusetts

• Provides assistance to New England Industry since 1984

• US DOE Funding allows the IAC Program to provide no cost energy conservation, waste prevention and productivity assistance to small and medium sized industrial firms within S.I.C. 20 through 39
Client Criteria

- Have Annual Energy Costs Less Than $2.5 Million
- Have Gross Sales Less Than $100 Million
- Have Less Than 500 Employees
- Have No In-house Energy Staff
- Be Within 150 Miles of Amherst, MA

UMASS Clients 1984-2013

- Over 730 plants visited since 1984
- Over $12 billion in gross annual sales
- $300 million in annual energy costs
- Over 80,000 employees
- Over 4,300 recommendations with $82,000 average annual cost savings per assessment
Assessments Scenario

• Identify Interested Plant
• Schedule Plant Visit
• Obtain Historic Data
  • Electrical
  • Fuel Oil
  • Natural Gas
  • Water
  • Waste
• Visit Plant with Assessment Team
• Collect Plant Data
• Plant Review With Client
• Identify Assessment Recommendations
• Estimate Energy and Waste Savings
• Find Productivity Gains
• Prepare Report for Client

Identifying Effective Energy Saving Options

• Major energy users
• Major pieces of equipment
• Motors
• Boilers and Furnaces
• Compressors/Chillers
• Hot exhausts
• Compressed air leaks
• Cooling Towers
• Variable Frequency Drives
• Energy-efficient Motors
• Consider CHP
• Energy Management Systems
• Steam Trap Replacement
• Improve Boiler Efficiency
• Chiller Water Plant Operation
• Process Heat Recovery
Example: Wastewater Heat Recovery

- Discharge 75 million Gallons per year (~210 gal/min) @ 120 °F
- Preheat fresh water to 70 °F
- Potential Savings: 25,000 MMBtu
- Potential Cost Savings: $150,000
- Implementation Cost: $250,000

Example: Air Heat Recovery

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air-to-Air Stainless Steel Heat Exchanger</td>
<td>$60,000</td>
</tr>
<tr>
<td>Two Exhaust Fans and 20 hp Motors</td>
<td>$25,000</td>
</tr>
<tr>
<td>Decalaging System</td>
<td>$3,000</td>
</tr>
<tr>
<td>Ducting</td>
<td>$20,000</td>
</tr>
<tr>
<td>Labor</td>
<td>$50,000</td>
</tr>
<tr>
<td>Engineering</td>
<td>$15,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$175,000</strong></td>
</tr>
</tbody>
</table>

- Annual Energy Savings
  - Electricity: (322,740 kWh) at (33% kW)
    - 46 Oak: 26,590 MMBtu
  - Demand: (518 kW)
  -طلع: $17,190
  - كن: $140,140
  - $158,370

- Implementation Cost:
  - Capital: $130,000
  - Other: $65,000
  -  $195,000
Install VSD on Refiner Pump

- 70% of headbox outflow goes to the wire
- 30% returned to refiner pump
- 60 hp pump

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Annual Energy Savings</th>
<th>Annual Cost Savings</th>
<th>Implementation Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity: 143,600 kWh Demand: 203 kW</td>
<td>$9,779</td>
<td>$1,918</td>
<td>$9,616</td>
</tr>
<tr>
<td></td>
<td>$11,697</td>
<td></td>
<td>$11,100</td>
</tr>
</tbody>
</table>

Annual Cooling System Operations

- Chiller
  - 375,100 kWh
  - $23,000
- Tower
  - 105,700 kWh
  - $6,500
- Pumps
  - 653,500 kWh
  - $40,000
- ~1,134,300 kWh
  - $69,500
Implementation of All Cooling System Improvements

- Install VSD on tower Pumps
- Install VSD’s on tower fans
- Vary Tower Water Temperature with Outside Temperature Potential Cost Savings

Potential Annual Savings:
- 147,927 kWh
- $9,060

“Free Cooling”

Without Using Free Cooling
- 3,478,900 kWh actual ($296,000 annually)

With Free Cooling
- 489,100 kWh and $41,570 actual savings
Improve Furnace Combustion Efficiency

- \( \text{O}_2 \) measured @ 12%
- Should be reduced to 7%
- Annual Energy Savings: 3,996 MMBtu/yr per furnace
- Potential Cost Savings: $39,960
- Potential Savings for Three Furnaces: ~$119,900

CHP Technical Assistance Partnerships

**Key Activities**

- **Market Opportunity Analysis.** Supporting analyses of CHP market opportunities in diverse markets including industrial, federal, institutional, and commercial sectors

- **Education and Outreach.** Providing information on the energy and non-energy benefits and applications of CHP to state and local policy makers, regulators, end users, trade associations, and others.

- **Technical Assistance.** Providing technical assistance to end-users and stakeholders to help them consider CHP, waste heat to power, and/or district energy with CHP in their facility and to help them through the development process from initial CHP screening to installation.

http://eere.energy.gov/manufacturing/distributedenergy/chptaps.html
What is CHP

- Form of Distributed Generation (DG)
- An integrated system
- Located at or near a building / facility
- Provides at least a portion of the electrical load and
- Uses thermal energy for:
  - Space Heating / Cooling
  - Process Heating / Cooling
  - Refrigeration/Dehumidification

CHP provides cost-effective, clean and reliable energy – today and for the future.

30 to 55% less greenhouse gas emissions

Source: http://www1.eere.energy.gov/manufacturing/distributedenergy/chp_basics.html
Questions?

Contact Information:
kosanovic@umass.edu
Ph.: 413-545-0684
Fax: 413-545-1027