Auditing Your Facility

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Traditional P2 Approach
Traditional P2 Approach

• Time consuming
• Typically requires walkthroughs to gather information
• Perhaps better process if your perspective is from outside an organization
Alternative P2 Approach

1. Look for P2 Opportunities
2. Select P2 Opportunities
3. Conduct P2 Problem Solving
4. Conduct P2 Decision-Making
5. Manage P2 Program
Alternative P2 Approach

• Main difference between this method and traditional method is that the P2 Program is established after much of the information has been gathered rather than at the beginning of the process
• Tends to build on momentum not just overcome inertia
• Probably a better approach if developing a program from within an organization
• More encompassing and potentially sustainable approach
Alternative P2 Approach

- Step 1: Looking For P2 Opportunities
  - Map all of the organizations processes
    - Think connected flow charts
  - Account for all resources
  - The process maps become templates for maintaining information about the process.
Alternative P2 Approach

• Step 2: Selecting P2 Opportunities
  – Every use of a resource in a process represents an opportunity to conserve the use of that resource.
  – Every loss of a resource in a process represents an opportunity not to lose that resource.
  – Every process in every organization will produce P2 opportunities.
  – Decide on ranking of opportunities: volume, costs, hassles
Alternative P2 Approach

- **Step 3: P2 Problem Solving**
  - Worker teams assembled to address these problems using root cause analysis to first ask *why* each is a problem.
  - The only way to find a good P2 alternative is to find many alternatives.
  - Previous P2 success stories should be used only to provide ideas to the team using this problem-solving method.
  - Home-grown solutions are often more readily implemented than expert-generated solutions from the outside.
Alternative P2 Approach

• Step 4: P2 Decision Making
  – Which ones to choose to implement?
    • Matrix grading
    • Segregation into different horizons
      – Near, medium, and long term horizons
    • Measurable, effective, doable
    • Develop written, action plans
Alternative P2 Approach

• Step 5: P2 Program Management
  – P2 program management must be designed to fit the culture of the organization using P2.
  – The organization must provide training for the people participating in the program.
  – There must be understandable policies and a management commitment.
  – Relationships to other organizational programs must be clearly defined.
  – There must be clear oversight of the program (audits, etc.)
  – There must be a way to measure progress and there must be measurable progress
Pollution Prevention is Really Change Management

- P2 by definition requires changes to an organization
- How this change is managed is critical to the success of any program….or any organization
- Change occurs because people as a group accept it
- Thus, P2 can and really should be part of something bigger
- Instituting a P2 program can facilitate change in an organization
Suggestion: Conduct An Audit Like a IAC Assessment

• Follow production flows from raw materials to finished products
• Download Rutgers’ “Self-Assessment Workbook for Small Manufacturers” from the CSU IAC website
Suggestion: Conduct An Audit Like a IAC Assessment

Three Step Program

1) Quantify unit costs for energy and utilities

2) Obtain a list of major plant energy consuming equipment

3) Identify and quantify savings opportunities in the Manufacturing Process
Audit Goals

• Identify the Most Significant Energy Usage and Waste Streams
• Take Measurements and Talk to Plant Personnel
• Gather Documentation to Estimate Energy Usage of Specific Equipment/operations
• Quantify the Volumes of Waste Generated and Associated Waste Management Costs
Audit Goals

- Identify/estimate major ENERGY streams and concerns
  - i.e., Lighting, Compressors, HVAC
  - Peak Demand
  - Electricity vs. Gas
  - Most concerned with streams that plant can do something about
  - Also concerned about things we can and have recommended that work
Energy Baseline

• Baseline previous year or two
• Use actual utility bills
• Contact your customer rep for rate structure
• For electricity, track kWh, kW, and costs
• For gas, track ccf/MMBtu/therms and cost
• Use baseline to determine what’s important
On-Line Resources - Materials

- See CSU IAC home page for links
  - http://www.engr.colostate.edu/IAC
- CSU IAC Sample Report (pdf format)
- CSU IAC Energy Conservation Recommendations
- CSU IAC/WMAC Pollution Prevention Recommendations
- CSU IAC Site Data Collection Sheets
- OIPEA Self-Assessment Workbook
- CSU IAC Pollution Prevention Handbook
- Rutgers-OIT Industrial Productivity Training Manual
- Rutgers-OIT Modern Industrial Assessments: A Training Manual Version 2.0
DOE Resources - Software

- See CSU IAC home page for links
  – http://www.engr.colostate.edu/iac
- DOE MotorMaster+ 4.0 Efficient Motor Software
- NAIMA 3M Plus Insulation Selection Software
- DOE Pumping System Assessment Tool (PSAT)
- DOE Fan System Assessment Tool (FSAT)
- DOE Steam System Assessment Tool (SSAT)
- DOE Steam System Assessment Tool (SSAT)
- DOE Process Heat Assessment System Tool (PHAST)
- DOE AirMaster+ Software
DOE Resources - Software

• See CSU IAC home page for links
  – http://www.engr.colostate.edu/IAC
• DOE NREL Energy-10 Building Design Software
• DOE Combined Heat and Power Tool
• DOE Chilled Water System Assessment Tool
DOE BestPractices

• BestPractices helps you identify opportunities to save substantial amounts of energy in industrial manufacturing plants.
  – Informational resources and tools
  – Technical Assistance
  – Demonstrated emerging technologies
DOE Best Practices

- Best Practices teams with industrial companies
  - Hands-on energy assessments
  - Training in energy management practices
Mike’s Energy Efficiency Strategies

• Use the most efficient equipment – energy efficiency
• Turn off equipment when not needed – energy conservation
• Turn off or reschedule equipment when needed – demand control
• Treat your workplace like your home
• Use common sense
Mike’s Energy Efficiency Strategies

- Turn off equipment when not needed – energy conservation (ala Jimmy Carter)
- Use the most efficient equipment – energy efficiency (ala GHW Bush)
- Turn off or reschedule equipment when needed – demand control
- Look for oversizing & redundancy
- Consider part load efficiencies
Mike’s Energy Efficiency Strategies

• Be ready when maintenance opportunities strike!

• Consider new and emerging technologies

• Seek assistance from your energy professionals
  – In-house staff, utilities, consultants, vendors, gov’t (DOE & OEMC), CSU

• Treat your workplace like your home
Top 10 Energy Efficiency/Conservation Tips

1. Turn off lights when not needed
2. Remove unneeded lamps
3. When replacing lamps, use lower wattage or more efficient lamps
4. Lower heating settings
5. Raise air conditioning settings
Top 10 Energy Efficiency/Conservation Tips

6. Reduce heat & A/C during unoccupied hours
7. Turn off heat & A/C before end of day
8. Have HVAC equipment service and adjusted
9. Turn off equipment when not needed
10. Make sure automatic controls are set properly and are in good working condition
Energy Efficiency/Conservation Opportunities

- Lighting
- Building Envelope
- Heating and Cooling
- Hot Water
- Equipment and Machines
Energy Efficiency/Conservation Opportunities - Lighting

- High bay fluorescents replace metal halide lamps as appropriate
- New T-8 fluorescent lamps and ballasts
- LED exit signs
- Lower lighting levels as appropriate
- Lighting occupancy sensors
- Consider daylighting
Energy Efficiency/Conservation Opportunities – Bldg Envelope

• Insulate as appropriate
• Install efficient windows and doors as appropriate
• Weatherstrip
• Window treatments
• Keep doors and windows closed
Energy Efficiency/Conservation Opportunities – HVAC

- When replacing, get the most efficient equipment available
- Change heating and cooling setpoints during occupied hours
- Change heating and cooling setpoints during unoccupied hours
- Install and set proper controls
- Keep equipment maintained
Energy Efficiency/Conservation Opportunities – HVAC

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<th>Heating Degree Days</th>
<th>Energy savings** if thermostat setting is reduced by:</th>
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<tr>
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<tr>
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** If temperature is reduced for entire time heating system is in operation.

Energy Efficiency/Conservation Opportunities – HVAC

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NOTE: Based on 65°F temperature and 14 hour night setback. Assumes full weekend setback.

Energy Efficiency/Conservation Opportunities – Hot Water

• Reduce use of hot water
• Replace electric with gas or solar units
• Lower hot water setting
• Use waste heat from other sources to help heat water
• Consider instantaneous hot water heaters
Energy Efficiency/Conservation Opportunities – Equipment

- Develop demand control strategy
- Replace with more efficient equipment
- Turn off equipment when not in use
- More specific suggestions depend on equipment