

A Fundamental Approach to Energy Management

CIBO Focus Group: Improving Energy Efficiency
June 9, 2009

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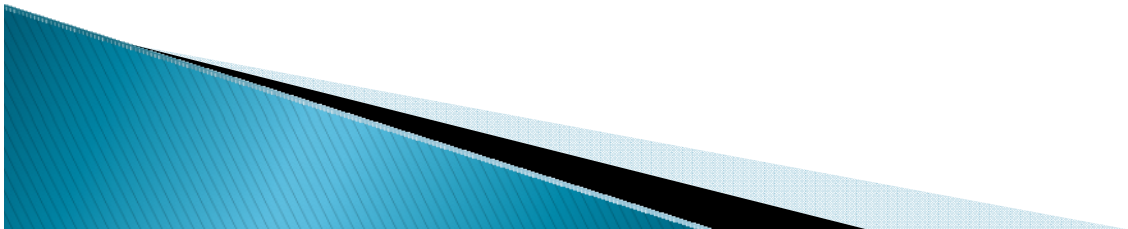
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Overview

- ▶ Background Information: Albemarle Global Energy Management Process
- ▶ Fundamentals of Energy Management
- ▶ Defining the Energy Management (EM) Objectives
- ▶ Defining the methodology
- ▶ Four Tiered EM Model
- ▶ Implementing the EM Program
- ▶ Most effective EM methods and tools
- ▶ Best Practices Document example

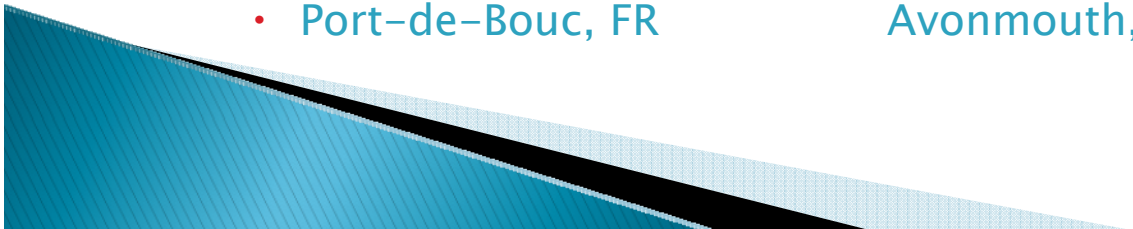


Albemarle Corporation

- ▶ Specialty Chemicals Corporation (\$2.4 B in gross sales/year)
 - Catalysts
 - Flame Retardants
 - Pharmaceuticals
 - Specialty intermediates
 - Completion Fluids

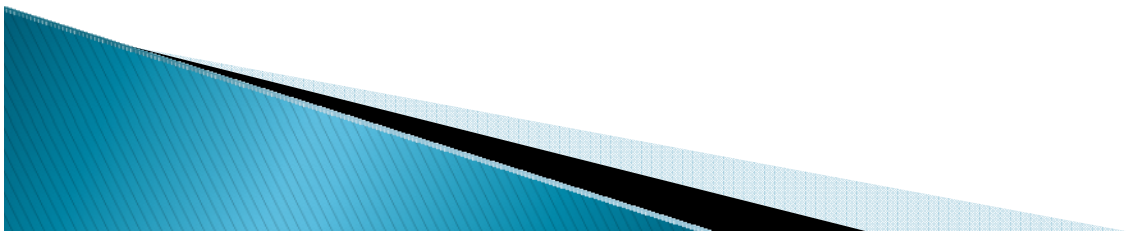
- ▶ 13 Manufacturing Sites Globally (2,500 employees)
 - 7 US Manufacturing Sites
 - Magnolia, AR
 - Pasadena, TX
 - Bayport, TX
 - Tyrone, PA
 - South Haven, MI
 - Orangeburg, SC
 - Baton Rouge, LA

 - 5 EU+ 1ME Manufacturing Sites
 - Bergheim, GR
 - Safi, Jordan
 - Port-de-Bouc, FR
 - Amsterdam, NE
 - Teesport, UK
 - Avonmouth, UK



Albemarle Global Energy Management Achievements

- ▶ Implemented energy reductions equivalent to approximately 14.3% (1.8 trillion BTU/yr) of annual energy consumed globally over 3 year period
- ▶ Received 12 American Chemistry Council Energy Efficiency Awards including Exceptional Merit for the actual EM Process



Fundamentals of Energy Management

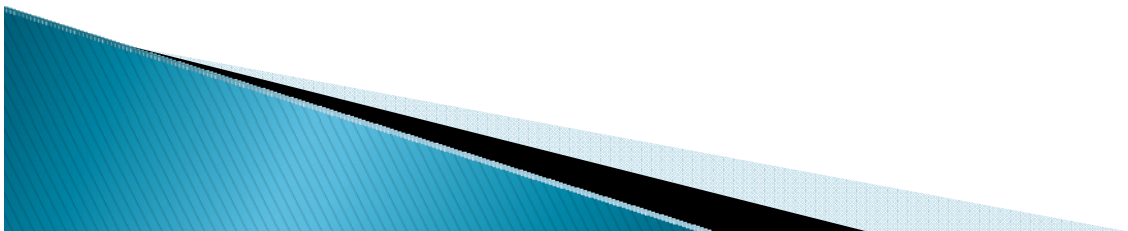
Fundamentals of Energy Management

- ▶ What is Energy Management (EM)?
 - EM is the managing or controlling of energy usage by maximizing the efficient use of a minimal amount of energy to do the desired job or task.
- ▶ E M is a continuous energy efficiency improvement process
- ▶ E M should involve more than just developing energy efficiency cost reduction projects
 - Implementing a culture for energy efficiency
 - Improved work practices
 - Implementing the tracking and control of energy utilizations and their improvements
- ▶ You do not improve what you do not measure!
- ▶ You achieve the greatest benefit where you focus your resources and you want to focus your resources where you get the greatest benefits

Energy Management Program Objectives

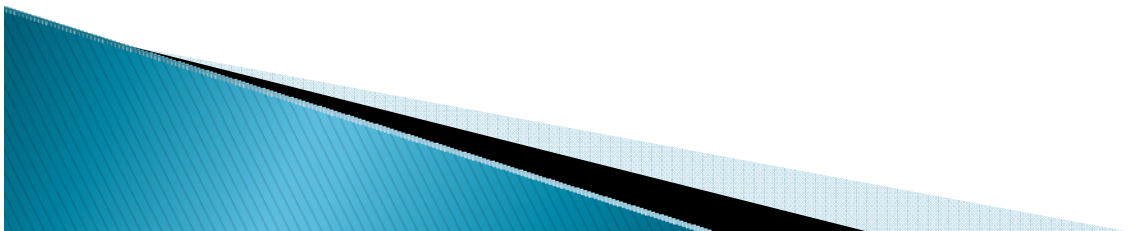
Energy Management Program Objectives

- ▶ Defining the basic objectives of an Energy Management (EM) Program?
 - Improve overall energy utilization/efficiency
 - Eliminate the need for the energy or eliminate the task
 - Minimize the energy consumed for the task
 - Maximize recovery of lost or rejected energy
 - Reduce energy costs (efficiency/price)
 - Leverage new technologies
 - Implement energy utilization tracking and control process
 - Define and measure all Key Energy Variables (KEV's)
 - Develop meaningful energy utilizations and cost trending capability



Energy Management Program Objectives

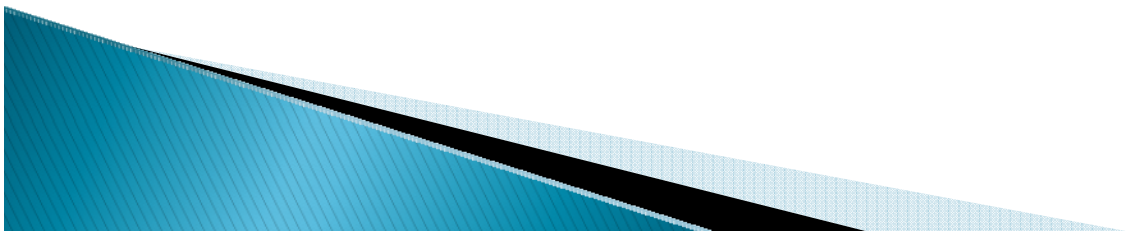
- ▶ Defining the basic objectives of an Energy Management (EM) Program?
 - Develop an effective energy efficiency culture
 - Develop improved work practices through awareness
 - Industry Best Practices
 - Tracking and control capability promotes improved procedures
 - Employee training and awareness
 - Maximize other benefits (environmental, safety, cost, etc.)
 - Provide long term viability with a continuous improvement approach



Defining the EM Program Methodology

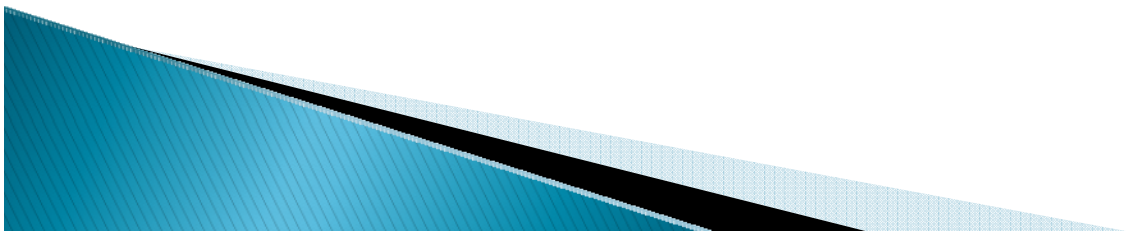
Defining the EM Program Methodology

- ▶ EM is a multi step process (four tiered model)
- ▶ 80%/20% rule usually applies
 - 80% benefits come from 20% of the projects or opportunities
 - 20% of the people control 80% of the energy consumption
 - People solutions are 80% of the answer, technical solutions are 20%
- ▶ A “Best Practices” document is a powerful tool to enhance consistency, generating new ideas and improving the culture
 - Improved work practices
 - Improved procedures
- ▶ Tracking/reporting progress of opportunity successes are essential
 - Drives completions of opportunities
 - Enhances EM momentum and management support



Defining the EM Program Methodology

- ▶ Measurement of process Key Energy Variables (KEV's) and data analysis/trending for major energy consumers
 - Sustainability of improvements
 - Future opportunity development
 - Verification of improvements
- ▶ All forms of energy and major users should be reviewed and monitored
- ▶ EM is a top down model so keep senior management involved
 - Success breeds success



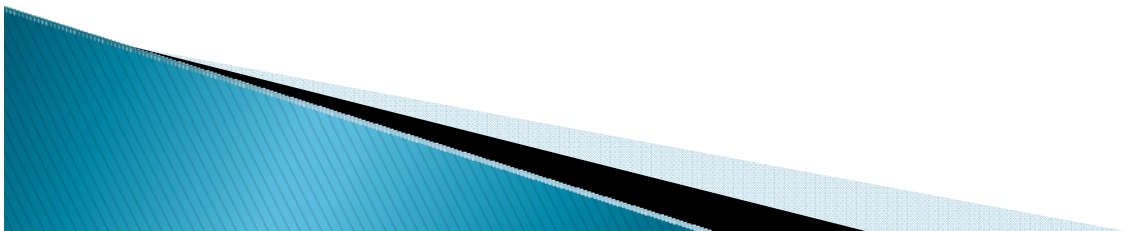
Four Tiered EM Model

Areas of Focus

Four Tiered Energy Management Model

Areas of Focus

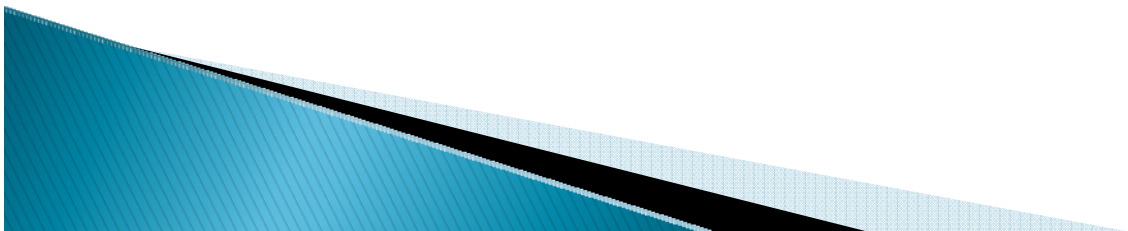
- ▶ Tier 1: A low to no capital project approach
 - Focus priority on major energy processes/users for opportunities
 - Conduct internal and external energy assessments (audits)
 - Easily identified and relatively simple to correct issues
 - Fix what is broke
 - Low capital with quick high economic returns (low hanging fruit)
 - Relatively low technology solutions
 - Installation of measurement devices (if not existing)
 - Heat and energy balances to match lost or rejected energy(heat) with processes that have a need for energy (heat)



Four Tiered Energy Management Model

Areas of Focus

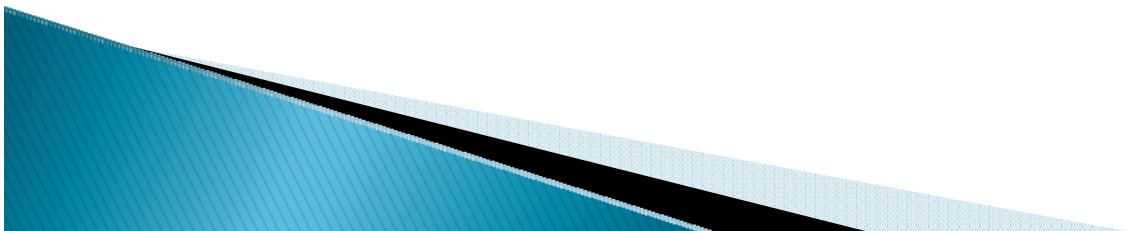
- ▶ Tier 2: Higher capital requirement project approach with possibly lower financial returns (focus on the more significant and difficult to fix energy efficiency improvements)
 - Higher technology level solutions and longer completion schedules
 - Formalized idea generation and screening process
 - Formalized project development and tracking process
 - Formalize energy consumption tracking with KEV's
 - Increased capital and resource costs with acceptable benefits
 - Improved control devices/systems where required
 - Verification of benefits (tracking/reporting process)



Four Tiered Energy Management Model

Areas of Focus

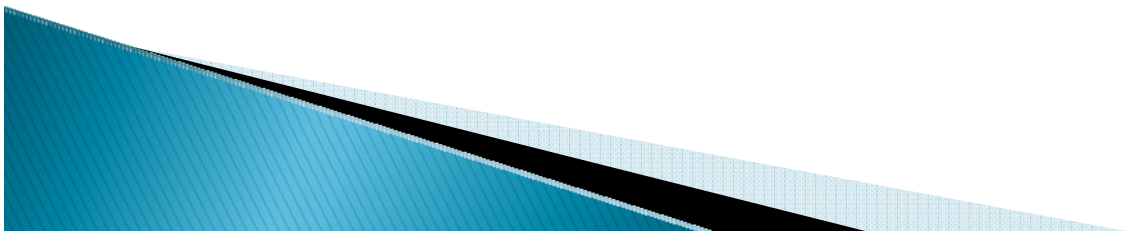
- ▶ Tier 3: Operating Discipline approach to EM (work force behavior changes)
 - Developing the energy efficiency culture
 - Improved work practices/procedures
 - Enhance employee awareness through involvement
 - Implement use of self generated “Best Practices” document
 - Employee/Operator training
 - Measurement and Gap Analysis (current KEV operating performance vs best demonstrated performance)
 - Outside experts or consultants for assistance in specific areas
 - Nick Spates (Modular Process Control, LLC) 404-240-0454
 - EM tied to site operational performance and compensation benefits



Four Tiered Energy Management Model

Areas of Focus

- ▶ Tier 4: Long term “Strategic Intent” with EM
 - Significant Corporate Management commitment/involvement
 - Benefits defined beyond pure economics
 - Corporate performance tied to EM program
 - High level technologies (alternate fuels, co-gen, wind power, geothermal power, etc.)
 - Re-invent the processes for energy efficiency
 - EM involvement in new plant designs before construction
 - Longer term continuous improvement process
 - Competitive advantage



Implementing the EM Program

Implementing the EM Program

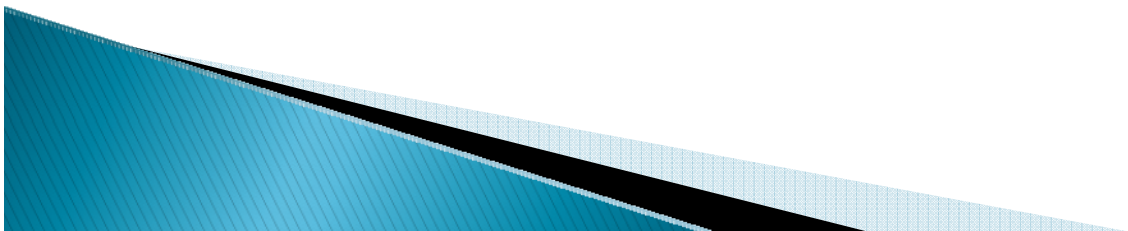
- ▶ Set energy efficiency improvement targets and expectations with top Management:
 - Set clear target reductions and other objectives
 - Define roles and responsibilities(organizational effectiveness)
 - Resource availability
 - Timing requirements
 - Capital availability/economic return requirements
- ▶ Develop formal cross functional site EM Team to implement overall EM site strategy to include Maintenance and Operational aspects for improvement (and others)
 - Designate dedicated team members including overall Site EM Coordinator
 - Site EM Coordinator/site management develop path and program agenda
 - Set review meeting frequency and format
 - Develop reporting requirements/frequency

Implementing the EM Program

- ▶ Develop an “idea generation process”
 - Conduct “brain storming” sessions
 - Process experts and non-experts combined
 - As many functional groups and management levels as possible
 - May conduct in two sessions (new ideas/assessment of the ideas)
 - Conduct energy consumption assessments (internal/external)
 - Review available data plus Material Balances, Energy Balances, Process Flow Sheets, Utility Flow Diagrams
 - Energy intensive processes/major energy users
 - Energy distribution systems
 - Major sources of heat/energy losses
 - All forms of energy
 - Plant energy consumption data and tracking info (KEV's)
 - Literature searches
 - Conferences, technical meetings, DOE publications
 - Employee involvement

Implementing the EM Program

- ▶ Develop an “idea or opportunity screening process”
 - Document all ideas
 - Energy pricing is very dynamic
 - Completed projects may enhance previously tabled ideas
 - New technology may present itself to bridge gaps
 - Define basic project or opportunity concept, benefits/economics
 - Establish idea priority for resource/capital allocation
 - Cost
 - Overall benefits
 - Technical difficulty
 - Probability of success (technology, regulatory, process difficulty)
 - Risk issues (process, safety, environmental)
 - Business impact (other than financial)

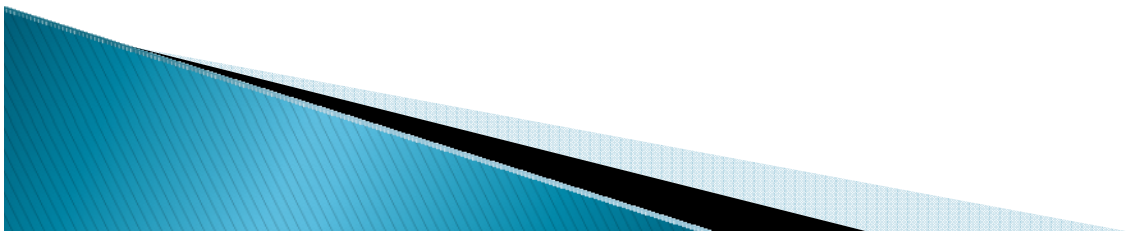


Implementing the EM Program

- ▶ Project scope development
 - Review alternative options and new technologies
 - Look for industry success stories and creative solutions
 - Literature search (Department of Energy publications)
 - EM and technical seminars
- ▶ Develop a EM project tracking and reporting system capable of verifying achieved results by project
 - Develop formal energy management reports
- ▶ Develop energy consumption measurement and trending (KEV's)
 - Current KEV's vs. best demonstrated performance (gap analysis)
- ▶ Enhance culture and improve employee awareness
 - Develop and implement improved work practices/procedures
 - Involve employees in idea generation process
 - Provide necessary employee training

Implementing the EM Program

- ▶ Develop and implement a comprehensive site EM Best Practices document
 - Conduct gap analysis between current practices and industry best practices
- ▶ Look at a site purchasing strategy for managing energy cost
- ▶ Look at new technologies to further reduce energy consumption
 - Alternate fuels/power options
 - Wind/Solar/Geothermal
 - Biomass (wood chips and others)

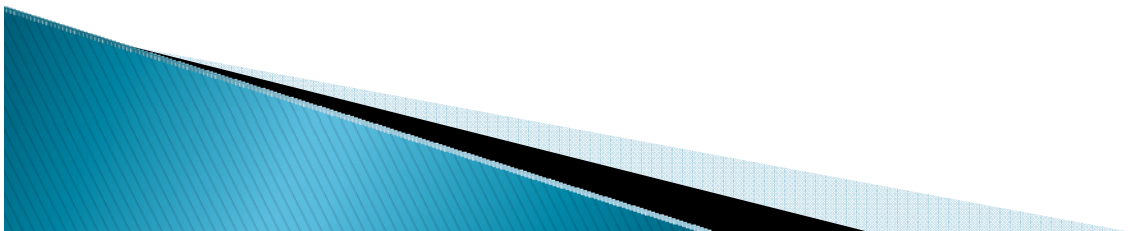


Most Effective EM Methods and Tools

Most Effective EM Methods and Tools

Summary

- ▶ Site process energy assessments or audits by both internal and external personnel
 - DOE conducts Process Heat or Steam System audits at no cost
 - www1.eere.energy.gov/industry/saveenergynow/
- ▶ Process brain storming sessions
 - Internal reviews of energy intensive processes
- ▶ Department of Energy (DOE) publications & software tools
 - www1.eere.energy.gov/industry/saveenergynow/
- ▶ American Chemistry Council Energy Efficiency Awards
 - [Examples of Energy Management Programs/improvement opportunities](#)



Most Effective EM Methods and Tools

Summary

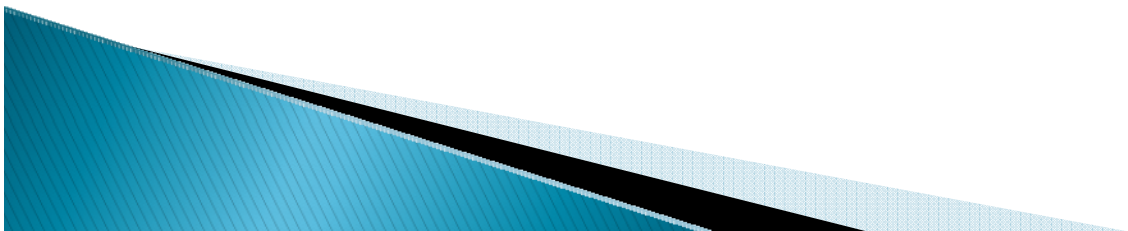
- ▶ Internal generated “Best Practices” document
 - Internal and external sources
 - DOE Best Practices publications
 - www1.eere.energy.gov/industry/informationcenter/
 - American Chemistry Council Energy Efficiency Awards
- ▶ Gap Analysis
 - Best Practices assessment of current versus industry
 - Process data current versus best demonstrated (KEV’s)
 - Site rejected energy(heat) versus process needs
- ▶ Quarterly Energy Management Reviews with Management
 - Maintains momentum
- ▶ Energy Management Tracking Reports
 - Project opportunities benefits and status
 - Program screening based on benefits
 - Energy utilization by major product (KEV’s)

Best Practices Example

Albemarle Best Practices Document

Sections

- ▶ Leadership
- ▶ People and Behavior
- ▶ Financial Management
- ▶ Supply Management
- ▶ Operations and Maintenance
- ▶ Plant and Equipment
- ▶ Monitoring and reporting
- ▶ Achievement



Albemarle Best Practices Example: Plant and Equipment Section (Steam Trap Maintenance Program)

- ▶ Steam Trap Survey: minimum once per year
- ▶ Steam Trap Data Base: every trap should be identified, located, numbered, tagged with stainless steel tag and documented in the Steam trap data base
- ▶ Testing: Steam traps should be tested by using ultra sonic leak detection equipment along with infrared thermometer
- ▶ Steam trap selection: confirm steam trap selection/installation with manufacturer for excessive failure applications
- ▶ Audits: Include steam traps in weekly site walk around internal audits and conduct manufacturer audits at least every two years.
- ▶ Receiver vents should be monitored by the operating units and checked daily

Thank you for your time!

