

A Practical Approach to Plant-Wide Energy Management at a Large Petrochemical Manufacturing Facility

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Cedar Bayou Plant



Agenda

- Cedar Bayou Plant Overview
- Plant-wide Energy Team Formation
- Awareness Training
- Audit Process
- Execution Plans
- Success to date



Cedar Bayou Plant Background

- Located 28 miles east of downtown Houston on Interstate Highway 10
- The plant has been in operation since 1963.
- 6+ Billion Lbs/Yr produced for 8 product lines:
 - Olefins: Ethylene, Propylene, Heavy Olefins.
 - Polyethylene: LDPE, LLDPE, HDPE.
 - AO: NAO, PAO
- OSHA VPP Star Site since 1997
- EPA Achievement Track Status in 2002





Team Formation

- Drivers for plant-wide energy initiative
 - Energy cost were over ½ of facility's budget
 - Need to reduce costs to stay competitive
 - Benchmarking studies indicated room for improvement
- Team formed 1Q 2004 to improve individual unit energy performance and coordinate plant-wide energy issues
 - Team composed of management sponsor, team leader, engineering, plant operations, electrical department, and automated systems



Initial Team Strategy

- Draft Charter
 - Established team mission statement
 - Focus on usage not pricing
 - Weigh energy performance with other profitability factors
 - State current energy management situation
 - Review existing energy initiatives and programs
 - Develop team boundaries
 - Establish team's near- and long-term goals
 - Create team's deliverables for first year



Energy Awareness Training

- Shift by shift meeting with the operators, “the 24-hour energy managers”
- Describe drivers for initiating a plant-wide effort
- Increase awareness of each unit’s current energy performance and energy gaps
- Explained what percentage of total operating cost is energy
- Included breakdown of total energy cost by utility



Energy Awareness Training

(cont'd.)

- Created awareness of what typical costs were for everyday operation
 - Gave examples of annual costs for items such as a typical leaking steam trap, cost for a ¾" air bleed valve left open, the cost of a 50 hp motor
- Developed awareness of necessity to look at energy as an entire plant rather than just individual units
 - Established initial plant-wide team focus
 - Explained roles and responsibilities of each job function
- Described operator duties in energy management



Energy Assessment Process

- Audit teams formed for each operating area – operations, engineering, I&E, automated systems
- Evaluated each area using set of tools devised by plant energy team coordinator
 - Sources included DOE tools, CPC- internally-developed tools and checklists



Energy Assessment Process

(cont'd)

- Energy Metrics and Benchmarking Review
- Documented efforts of existing teams looking at energy
 - Avoid rework
 - Determine if there is overlap or gaps in efforts
 - Help assign roles and responsibilities

Energy Assessment Process

(Monitoring Status Tool)

Unit XXX	Current state			Future State			Action required to get to future state
What should be monitored?	How often?	By whom?	With what tool?	How often?	By whom?	With what tool?	
Boiler efficiency	monthly	ops engineer	calculation from yields	Same			None
	daily	operator	DCS	Same			Consider using morning meeting as "operational" issue time to review efficiency
steam letdown valves	daily	ops engineer	spreadsheet	Same			

- Brainstormed list of everything that a unit should monitor on a regular basis
- Created comparison of current monitoring practices vs. what SHOULD be occurring
- Developed action items to close gaps between current and future state



Other Assessment Topics

- Use of unit utility balances
 - Some had not been developed
 - No one clearly had the responsibility to review the balances and take action when they didn't reasonably close
- Utilization of advanced control
 - Explored possibilities for new advanced control
 - Reviewed process for validating advanced control models; make energy part of optimization
- Reviewed recommendation from previous DOE and vendor plant audits; drive implementation of recommendations not implemented



Other Assessment Topics

(cont'd)

- Developed a list of unit wastes & made recommendations
 - External utility leaks (steam, air, N₂, etc.)
 - Status of unit's steam trap monitoring process
 - Unnecessary 24-7 use of certain electrical equipment
 - Excess utility flows for certain process equipment (flares, flare purges, N₂ blanketing blowthrough, etc.)



Other Assessment Topics

(cont'd)

- Recommended action on several operating practices
 - Energy review of Standard Operating Procedures
 - Evaluation of energy savings from seasonal operation (cooling tower, steam tracing optimization)
- Equipment-specific assessment
 - Evaluation of energy best practices for various types of process equipment (boilers, furnaces, heat exchangers, pumps/compressors, instrumentation, etc.)
 - Recommended possible design and/or operational changes based on this review

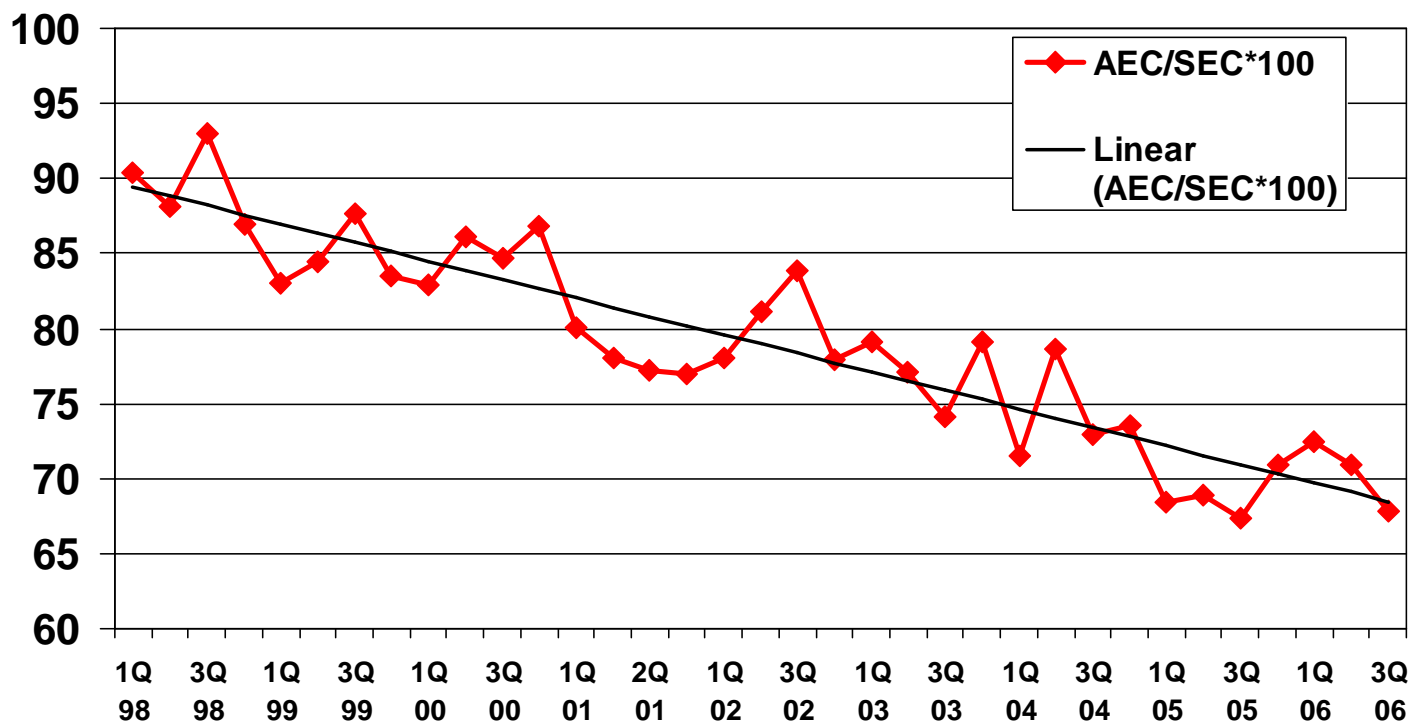


Prioritization and Execution

- Energy action items compete for human resources in a large manufacturing facility
- Developed process for prioritizing energy projects along with safety, environmental, production projects
 - Recognized that not all operating units had the same energy gaps
 - Need to appropriately assign resources to energy projects
- Prioritization process similar to PHA ranking matrix
 - Ranking considers both benefit and ease of implementation
 - Low hanging fruit rises to the top!
- Continuous improvement teams execute projects based on overall ranking

Energy Successes

Energy Intensity Index has improved overtime!





Energy Successes

(cont'd)

- A Cedar Bayou Polyethylene unit saved ~\$150,000 per year in steam usage by repairing external steam leaks
- An Alpha Olefins unit is saving over \$160,000 per year by changing its reactor wash procedure
- The Materials Handling area is saving \$30,000 per year by better utilizing its blenders and transfer blowers
- The utilities area has documented over \$200,000 in savings per year by more closely monitoring steam letdown valves vs. electrical motor usage



Challenges Facing the Plant-wide Effort

- Working issues within existing expense and capital budgets
- Competing for human resources with other facility issues and company growth
- Institutionalizing change poses challenges; the effort must be continuous.



Continuing Roles of Energy Team

- Resource for execution of energy projects and action items
- Body that serves to share best practices across the units at the plant
- Group to address plant-wide issues
- Group to serve as auditors of certain energy practices to help maintain efforts