

# Energy Management Program Benefits

## Case Study

Effective energy management is essential to cost-effective plant operations, especially in large facilities with annual energy bills totaling many millions of dollars. Improving the way energy is used throughout the plant can lower production costs, reduce air emissions from fuel combustion, and enhance profitability. Optimizing energy use in a highly complex chemical plant, however, can be technically challenging. It requires efficient integration of many different energy sources and end-uses, proper sizing and maintenance of a wide array of energy conversion systems, and effective use of by-product energy.

Rohm and Haas Texas Inc., located in Deer Park, Texas, is Rohm and Haas Company's largest plant globally with an annual nameplate capacity exceeding 2 billion pounds. The plant is the company's primary source of monomers used in key Rohm and Haas products worldwide. Energy cost savings achieved at the plant are leveraged throughout Rohm and Haas' supply chain to provide value to customers. The plant is comprised of several production areas that operate with a high degree of autonomy as *plants within a plant* (PWWPs). Energy optimization among these PWWPs is complicated by their high levels of process energy and utility integration, production independence, and by-product energy generation.

In 1997, a review of the Deer Park cost structure identified energy use as a major opportunity. Recognizing that improved energy efficiency would simultaneously lower energy costs, reduce emissions, and support the company's emerging sustainable development initiative, the company created a formal Energy Management Program. The program is responsible for leveraging these energy-based opportunities to improve the company's competitive position.

## Benefits

- 23% reduction in energy intensity.
- Over \$18.5 million in cost savings.
- 440 tons of NO<sub>x</sub> emissions avoided annually.
- Reduction in greenhouse gas emissions (CO<sub>2</sub>) of roughly 67,000 tons per year.
- Supportive of Sustainable Development.

## The Energy Management Program Team

Deer Park's Energy Management Program Team includes PWP representation, broad engineering expertise (utility, power, project, electrical), and energy management skills. The team's mission is to identify, evaluate, develop, recommend, and champion a strategic energy program that delivers the lowest long-term production costs to the Deer Park plant. Through its activities, the team strives to facilitate a change in the plant culture and establish energy management as an ongoing and essential element of manufacturing and design excellence.

The Energy Management Program Team helps establish annual energy savings targets that are consistent with the business, then works with plant personnel to develop potential project ideas. The team meets with plant, PWP, and technical management personnel periodically to ensure proper program alignment and resources. Senior management is actively involved and fully supports the program, both of which are critical factors for success.



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## Energy Management Strategy

As a first step, the team developed tactical and strategic plans to deliver and sustain long-term energy improvements. The team's strategy emphasizes implementation of short-term projects that provide immediate cost savings,

generate positive feedback to support the program, and deliver energy changes consistent with the long-term strategic energy direction. The team's near-term goals promote energy efficiency projects with the quickest return on investment, while its long-term goals require a longer implementation period to achieve substantial benefits.

### Energy Management Program Strategic Goals

#### Near-Term Goals

- Recommend/champion energy-saving opportunities at the plant and process level.
- Develop, maintain, and communicate key metrics to track progress toward goals.
- Report progress to stakeholders to assure deliverables are aligned with business requirements.
- Decrease energy and utility budgeted usage each year to meet forecasted reductions.
- Maintain database of energy and utility cost improvement opportunities.

#### Long-Term Goals

- Develop and maintain sufficient knowledge of plant energy systems to enable proper technical and financial analyses of energy opportunities.
- Recommend a real-time, plant-wide energy management system with energy cost information and optimization information.
- Shift the plant utility cost distribution systems from a set percentage allocation to actual usage.
- Promote energy and utility efficiency initiatives in PWWPs.
  - Facilitate energy and utility education and training.
  - Provide a technical forum that addresses plant utility and energy issues.
  - Establish benchmarks where logical and feasible.

**Figure 1: Team Approach to Energy Project Selection and Implementation**



As shown in Figure 1, the team's comprehensive approach begins with brainstorming new ideas and follows each project through completion and verification. All new projects are entered into a database and tracked through implementation and completion. Projects are evaluated, sorted, and prioritized according to a set of technical, financial, and strategic criteria. Tactical projects, for example, are defined as short-term, stand-alone projects that can be quickly implemented. Strategic projects are dependent on other projects or require greater technical evaluation. Projects are further classified as procedural changes, upgrades or modifications to existing systems, or major capital projects. Critical success factors are based on past plant experience, energy seminars, and input from energy agencies and other companies.

Once projects have been completed and are operational, the results are documented to provide verification of energy and cost savings over time. To date, the team has identified over 150 projects and has seen more than 50 implemented since 1997.

## Energy Audit and Assessments

Deer Park's Energy Management Program relies heavily on energy audits and assessments to identify opportunities to improve energy efficiency. Both internal staff and external, independent auditors conduct these assessments, which target critical processes and unit operations that offer the greatest promise for energy improvements. The most recent activities performed under the direction of the Energy Management Program Team include a low-pressure steam audit, plant-wide pinch assessment, and a third steam system leak and trap survey. Many audits such as these have generated clear and expert recommendations for energy improvements at the Deer Park plant.

## Energy, Environmental, and Economic Benefits

Through its Energy Management Program, the Deer Park plant has significantly improved the energy efficiency of its production processes and equipment. Direct results include a substantial reduction in energy intensity (energy use per production volume), energy costs, and air emissions, as shown in Table 1. The results clearly prove the triple sustainability win (energy, environment, economics) possible with an effective energy management program.

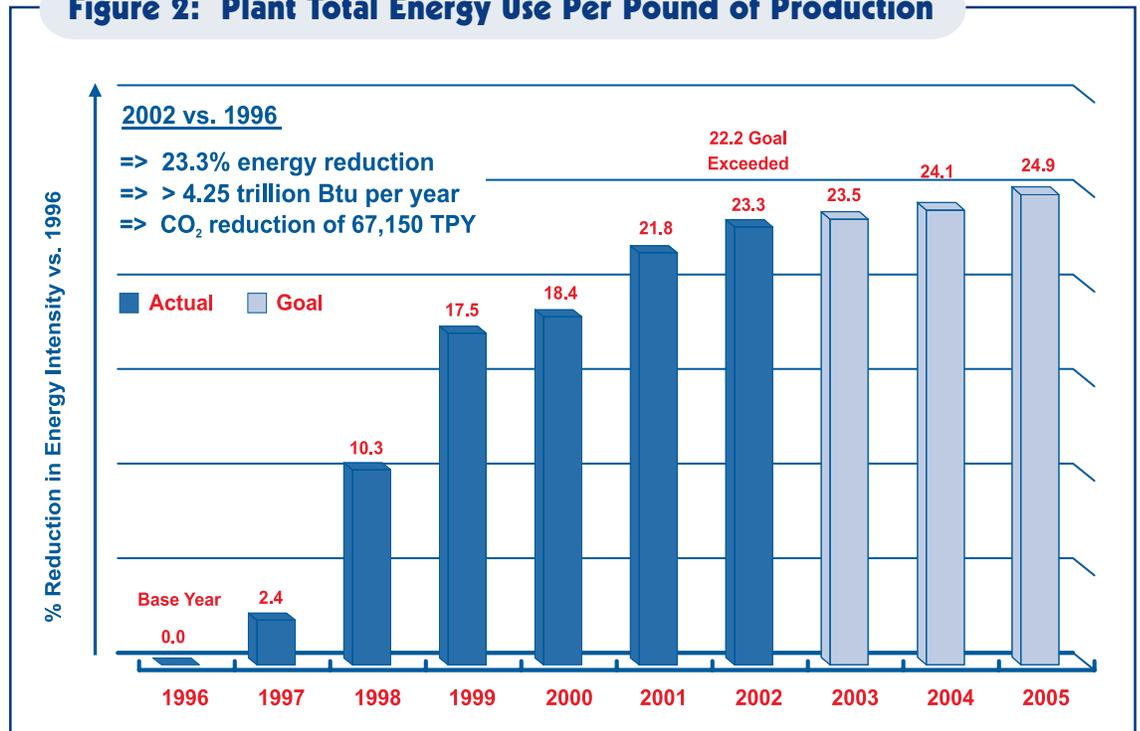
In addition, several of the energy-saving successes at the Deer Park plant can be replicated at other Rohm and Haas facilities. Since its inception, the program has reduced energy intensity by over 23%, as shown in Figure 2. To date, the program has saved the company over \$18.5 million annually in avoided energy costs.

Overall, a major achievement of the Energy Management Program has been to foster a corporate culture that values energy management as an indispensable element of manufacturing excellence. At the Deer Park plant, energy optimization is now factored into the plant's business strategy and manufacturing processes.

**Table 1. Energy and Cost Savings**

<b>Energy</b>	<ul style="list-style-type: none"> <li>Reduced energy intensity (consumption per pound of production) 23.3% since 1996; more than 4.25 trillion Btu saved in 2002 (typical energy use for about 42,000 U.S. homes).</li> <li>Achieved more than a 15% energy intensity reduction in the 2-year period from 1997 to 1999.</li> <li>Achievement of 2005 plant energy reduction goals (15% energy intensity reduction) by 1999.</li> <li>Reduced energy intensity over 4% in 2001, despite almost a 7% decrease in production.</li> </ul>
<b>Economics</b>	<ul style="list-style-type: none"> <li>2002's demand-side cost savings exceeded \$18.5 million.</li> <li>Avoided energy and utilities costs from program's supply-side activities of over \$10 million in 2002.</li> </ul>
<b>Environment</b>	<ul style="list-style-type: none"> <li>Avoided on-site NO<sub>x</sub> emissions of over 440 tons per year.</li> <li>Reduction in carbon dioxide (greenhouse gas) emissions by roughly 67,150 tons per year or about the same as removing 32,700 cars from the streets, roughly 1.8 cars for each Rohm and Haas employee worldwide.</li> </ul>

**Figure 2: Plant Total Energy Use Per Pound of Production**



## Key Elements of Success

The Energy Management Program at the Deer Park facility represents a forward-looking approach to energy efficiency by plant management and reflects successful teamwork.

Key elements to the success of this program include the following:

- An effective collaborative framework that involves appropriate plant personnel (at all levels) in project selection, evaluation, and decision-making.
- Involvement and financial support by senior management.
- Empowerment of plant personnel (financially and officially) to carry out the energy management mission.
- A highly effective core team to champion the Energy Management Program.

The Office of Energy Efficiency and Renewable Energy of the U.S. Department of Energy conducts technology showcases to encourage industry adoption of energy efficiency technologies and practices. Replication throughout industry can boost productivity and help achieve National goals for energy, the economy, and the environment.

For more information, please visit our Web site: [www.eere.energy.gov](http://www.eere.energy.gov)

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