Alcoa Teams with DOE to Reduce Energy Consumption

Benefits

- Identified more than $60 million in annual saving opportunities company wide
- Reduced operating costs by more than $15 million annually
- Reduced emissions of NO_X, SO_X and CO_2

Corporate Approach

Alcoa's energy conservation approach fits with its sustainable development strategy. Energy conservation helps Alcoa meet environmental, economic, and social responsibility goals for 2020. By 2006, Alcoa will achieve annual energy management and energy cost reductions of $100 million… and much more is possible.

Summary

As the world's leading producer of aluminum, Alcoa's long-term strategy for remaining competitive includes goals for using energy more efficiently. To accomplish this objective, Alcoa began working with the U.S. Department of Energy (DOE) in 1999 to identify opportunities for reducing energy consumption at its aluminum processing facilities. By performing plant-wide energy assessments, conducting employee training, and using DOE software tools and technical resources, Alcoa has successfully identified more than $60 million in savings opportunities, and has reduced its operating costs by more than $15 million.

Alcoa's consumption of non-potroom (smelting process for aluminum) fuel and energy as of the end of 2003 was $700 million per year. The company's strategic environmental plan calls for savings of $100 million per year through energy efficiency and environmental management. By 2006, Alcoa expects savings of $60 million by improving energy efficiency and $40 million from environmental management.

Corporate Background: Alcoa at a Glance

Alcoa, headquartered in Pittsburgh, Pennsylvania and New York, New York, is the world's leading producer of primary aluminum, fabricated aluminum, and alumina. The company is active in all major aspects of the industry, including technology development, mining, refining, smelting, fabricating, and recycling.

Alcoa's aluminum products and components are used worldwide in aircraft, automobiles, beverage cans, buildings, chemicals, sports and recreation, and a wide variety of industrial and consumer applications, including consumer brands such as Alcoa® wheels, Reynolds Wrap® aluminum foil, and Baco® household wraps. Among its other businesses are vinyl siding, packaging machinery, precision castings, closures, fiber optic cables, and electrical distribution systems for cars and trucks.

With more than 350 facilities, the company employs 120,000 "Alcoans" in 41 countries. The company produces products each year, totaling $21.5 billion in revenue. Alcoa makes a very sustainable product—almost 70% of the aluminum ever produced is still in use, equaling 480 million metric tons (529 million tons) of a total 690 million metric tons (761 million tons) manufactured since 1886. Alcoa has also made strides in worker safety. In 2003, it was more than six times safer to work at Alcoa than it was in 1991.

Approach to Energy Conservation

Alcoa takes an aggressive approach to its energy conservation program, in the same way it addresses environmental issues. The company formed an Energy Efficiency Network, made up of internal Alcoa experts, outside energy consultants, and selected vendors, and worked with DOE tools and resources to conduct energy assessments at locations worldwide identifying potential energy savings opportunities. Alcoa wants to use natural resources wisely and leave the neighborhoods where it operates better for having Alcoa in their communities.

Global Environment Goals

Alcoa has clear goals for measuring progress toward achieving the 2020 strategic plan for cleaner air, better use of land and water, and the protection of human health. Alcoa's plan calls for ultimately eliminating landfill waste, reaching zero discharge of process water, and achieving significant reductions in emissions. The company has set interim targets on the way to sustainability.

From base year 2000, Alcoa plans to reduce:

- Sulfur dioxide (SO_2) production by 60% by 2010
- Volatile organic compound emissions by 50% by 2008
- Nitrogen oxides (NO_X) emissions by 30% by 2007
- Mercury emissions by 80% by 2008
- Landfill waste by 50% by 2007
- Process water use and discharge by 60% by 2008.

Additionally, starting from base year 1990, the company is working to:

- Reduce greenhouse gas emissions 25% by 2010
- Implement effective environmental management systems, such as ISO 14001, at all locations by 2005
- Achieve zero environmental non-compliance incidents
- Save $100 million annually by 2006 by eliminating wasteful practices and designing facilities for sustainability
- Incorporate environmental targets and community relationship objectives into all Alcoa businesses' annual plans.

Alcoa is making progress in all these areas. The company's annual sustainability report and Web site at *www.Alcoa.com* provide updated information.

DOE and Alcoa Partnership

To help achieve its aggressive goals, Alcoa teamed with DOE in 1999 and began identifying energy reduction opportunities. Since then, Alcoa has successfully used DOE tools and resources to improve energy efficiency. For example, the company has conducted energy assessments at individual Alcoa plants, hosted training to educate Alcoa employees about energy conservation, showcased and demonstrated technologies, and worked with DOE to establish an Energy Efficiency Network within the company.

Plant-Wide Assessments

Alcoa has participated in several cost-shared and other DOE energy assessments. By identifying areas of potential improvement and implementing projects, these plants have achieved impressive energy and cost savings. Through replication, 35 other Alcoa facilities have also reaped the benefits.

Lafayette Plant — In 2000, the Alcoa Lafayette Operations facility in Lafayette, Indiana, was the site of a plant-wide energy assessment. The project identified annual savings of more than $1.9 million, with an estimated capital investment requirement of $2.3 million. So far, the Lafayette Operations has realized more than $1.5 million in annual savings after an investment of $1.8 million.

Bauxite Plant — In 2002, the Alcoa Arkansas Operations facility, in Bauxite, Arkansas, conducted a plant-wide energy assessment. The project identified annual savings of $1.07 million with an estimated capital investment requirement of $649,000. The majority of the savings were identified with the compressed air system. To achieve these results, the plant improved the system, which reduced air demand and improved electrical load management.

Plant City — In 2001, Alcoa's Plant City Operation, in Plant City, Florida, also conducted a plant-wide energy assessment. This project identified annual savings of $740,000, with an estimated capital investment requirement of $1.3 million. To date, the plant has realized $185,000 of these savings.

DOE Showcase in Salt Lake City

In 2001, Alcoa's Spanish Fork Operations, in Spanish Fork, Utah, agreed to be a sponsor of the DOE Showcase event in Salt Lake City, Utah. DOE funded various energy efficiency projects that identified $3.3 million in potential savings throughout Alcoa with a capital investment of $4.8 million. To date, Alcoa has realized $1 million of these savings from showcase activities.

Table 1: DOE/Alcoa Partnership Assessment Results

Assessment Location	Project	Cost	Identified Savings (Annual)	Savings Realized to Date
2000				
Lafayette, Indiana	Air Cooled Compressors	$75,000	$50,000	$50,000
Lafayette, Indiana	Just-in-Time Billet Heating	$10,000	$25,000	$25,000
Lafayette, Indiana	Melting Furnace Heat Recovery	$450,000	$400,000	*
Lafayette, Indiana	Melting Furnace Tuning	$36,000	$75,000	$75,000
Lafayette, Indiana	Pumping System Improvement in Ingot Cooling Water System	$10,000	$18,000	$18,000
Lafayette, Indiana	Direct-Fired Heating System to Replace Boilers	$1,800,000	$1,300,000	$1,300,000
Lafayette, Indiana	Pumping System Improvement in Extrusion Press Pumping System	$12,000	$80,000	*
2001				
Spanish Fork, Utah	Compressed Air Improvements	$25,000	$40,000	$40,000
Spanish Fork, Utah	Go to Pilot on Melter	$1,000	$75,000	$75,000
Spanish Fork, Utah	Vertical Floatation Melter - Chip Melting	$800,000	$450,000	*
Spanish Fork, Utah	Combined Power & Heat for Homogenization Furnace	$800,000	$710,000	*
Spanish Fork, Utah	Charging System Improvement for Melter	$400,000	$500,000	$500,000
Spanish Fork, Utah	Dross Press	$150,000	$125,000	$125,000
2002				
Plant City, Florida	Compressed Air Distribution System	$150,000	$130,000	$130,000
Plant City, Florida	Regenerative Burners on Melter	$500,000	$300,000	*
Plant City, Florida	Using Daylight to Reduce Lighting Costs	$5,000	$25,000	$20,000
Plant City, Florida	Variable Speed Drives on Paintline Water Pumps	$50,000	$35,000	$35,000
Plant City, Florida	Electro Magnetic Pumping (EMP) Technology of Melters	$600,000	$250,000	*
Cressona, Pennsylvania	Cooling Tower Pumping Project	$75,000	$100,000	$50,000
Elizabethton, Tennessee	Compressed Air Application Changes	$100,000	$120,000	$60,000
Cressona, Pennsylvania	Vertical Floatation Melter - Chip Melter	$1,200,000	$500,000	*
Halthorpe Baltimore, Maryland	Lighting Efficiency Project	$200,000	$125,000	$125,000
Bauxite, Arkansas	Compressed Air and Other System Improvements	$649,000	$1,070,000	$1,000,000
Halthorpe Baltimore, Maryland	DC Crane Power Supply	$50,000	$75,000	$75,000
	Totals	**$8,148,000**	**$6,578,000**	**$3,703,000**

* The project has not been initiated, thus no savings have been realized.

Table 1 highlights the assessments that have been completed as a result of a joint effort between Alcoa and DOE. In addition, beginning in mid-2002, Alcoa identified additional energy savings during assessments at other plant locations. These assessments were conducted through its own Energy Efficiency Network. Results of these assessments are discussed later in this case study.

Spanish Fork IAC Assessment — In conjunction with the Salt Lake City Showcase, Spanish Fork was the site of an assessment by Colorado State University's Industrial Assessment Center. The university-based team helped the plant identify annual savings of $740,000 with an estimated capital investment requirement of $576,000. To date, Spanish Fork has achieved savings of $740,000.

DOE Collaborative Targeted Assessments — Also in conjunction with the Salt Lake City Showcase, DOE performed Collaborative Targeted Assessments (CTA) at the following Alcoa plants to identify energy savings opportunities for specific operations:

- Cressona, Pennsylvania: conducted a pumping system assessment
- Plant City, Florida: conducted a process heating assessment
- Elizabethton, Tennessee: conducted a compressed air assessment.

Training — Alcoa has also helped its employees become more proficient in managing energy systems, by hosting DOE's BestPractices training sessions. A training seminar for the Alcoa Engineered Products Business Unit in Baltimore, Maryland, focused on compressed air, motors and pumping systems, and variable speed drives. The potential savings from 30 Alcoa employees attending the training is estimated at $165,000.

DOE-Developed Technology Demonstrations — Alcoa evaluated the following DOE-developed technologies as part of the DOE Salt Lake City Showcase:

- Air/Oxy-Fuel Burners: This is burner technology for aluminum melters. The energy savings are offset by the cost of oxygen. The potential benefit is improved productivity, and Alcoa will review the project as product demand changes.
- Vertical Floatation Melter: This is a scrap melting technology. The return on investment (ROI) for this technology was evaluated; however, it does not meet Alcoa requirements.
- Oscillating Combustion: This combustion technology reduces energy consumption and decreases emissions of nitrogen oxides. The technology is being evaluated for possible use at Alcoa Cressona Operations and is being compared to alternative technologies so that optimal combustion technology can be selected for this application.

Allied Partner Agreement

An Allied Partner agreement between the DOE's Industrial Technologies Program (ITP) and Alcoa was executed in 2001. This agreement represents a shared, voluntary commitment to promote industrial energy efficiency. Since this agreement was established, Alcoa has used and applied BestPractices programs and services throughout its extensive network of aluminum processing facilities.

Allied Partners are industrial associates, manufacturers, industrial service and equipment suppliers, utilities, and other organizations that voluntarily work with DOE. Partners seek to promote increased energy efficiency and productivity for industries that participate with ITP. The Allied Partner initiative began in 1995 under ITP's BestPractices, and today, more than 200 companies are Allied Partners.

ITP encourages energy-intensive industries to work together to create broad, industry-wide goals, identifies specific needs and priorities through industry-led roadmaps, and forms alliances to help achieve those goals. DOE's Allied Partner network exists ultimately to provide information and assistance to industrial manufacturers to improve the energy efficiency of their operations. Successful efforts of Allied Partners are publicized to promote their energy savings accomplishments.

Published Case Studies

To recognize Alcoa's success in identifying energy savings, DOE has published the following case studies:

- Corporate Energy Conservation Program for Alcoa North American Extrusions (Management Case Study)
- IAC Energy Assessment of Spanish Fork Plant (Assessment Case Study)
- Alcoa North American Extrusion Implements Energy Use Assessments at Multiple Facilities (Assessment Case Study)
- Power Factor Study Reduces Energy Costs at Aluminum Extrusion Plant (Technical Case Study)
- Plant-Wide Energy Assessment Finds Potential Savings at Aluminum Extrusion Facility (Assessment Case Study for Plant City, Florida)
- Alcoa Lafayette Operations Energy Efficiency Assessment (Assessment Case Study)

- Alcoa World Alumina: Plant-Wide Assessment at Arkansas Operations Reveals More then $900,000 in Potential Annual Savings (Assessment Case Study)

These case studies are available online at *www.eere.energy.gov/industry/bestpractices*, or order copies by calling the EERE Information Center at 1-877-337-3463.

Alcoa Energy Efficiency Network

Alcoa Energy Group had the task of managing the supply side of Alcoa's energy usage through the Alcoa Trustee Program. Alcoa Energy realized that Alcoa was missing a significant opportunity by not focusing on the demand side as well. Early in 2002, Alcoa formed a team with Alcoa Energy, Alcoa Engineered Products, and Alcoa Primary Metals to develop a comprehensive program that focuses on the demand side of Alcoa's energy usage. With lessons learned from Alcoa's involvement with DOE, guidance provided by Sara Dillich of DOE, the expertise of knowledgeable energy consultants, and benchmarking of other company programs (such as Ford, Johnson Controls, Kodak, and 3M), Alcoa created a company-wide Energy Efficiency Network. The Network includes tools and resources for identifying energy savings opportunities.

Alcoa's energy conservation program began with North American locations, but is expanding worldwide, broadening the knowledge base to grow the program.

Key Factors for the Network

Alcoa's Energy Efficiency Network includes several key components to help ensure its success and accessibility. These include:

- A roadmap for success
- A voluntary network that allows locations to request their own assessments
- Top-level commitment to energy efficiency improvements
- Good communication through an Intranet Web site
- An approach that is consistent with the company's Continuous Improvements ABS (Alcoa Business System) Principles
- A focus on DOE's BestPractices replication approach
- A program to train internal Alcoa energy efficiency experts
- Local commitment to energy projects
- A tracking system to report project results company wide
- Recognition of achievements.

How the Energy Efficiency Network Works

Individual Alcoa plants can access the Energy Efficiency Network following this approach:

- An Alcoa location requests an energy efficiency assessment.
- Alcoa Energy conducts a pre-assessment on location to determine the extent and resources needed for the assessment.
- Alcoa Energy and the plant jointly develop a specific plan and identify resources for the assessment. The plan includes training, if the location requests it.
- Internal and external (as needed) resources conduct a 2- to 5-day assessment of the location. The plant covers the costs for external resources, but Alcoa Energy's resources are free to the location.
- The plant reviews and approves assessment findings, and then the Alcoa Energy assessment team issues a final report.
- Energy projects are entered in the Intranet database. The plants update information as projects progress.
- Alcoa Energy top-level management provides recognition for excellence in several areas of energy conservation.
- Findings are communicated throughout Alcoa best practices, case studies, assessment findings, and actual results of completed projects.

Network Results as of 2003

In its first 18 months, the Alcoa's Energy Efficiency Network has helped the company achieve significant energy and cost savings, and has helped reduce emissions. As of the end of 2003, the Network reports:

- A total of 35 Alcoa facilities have received assessments
- Approximately 40 best practices were identified
- More than $60 million in savings opportunities have been identified. Of these potential savings:
  - Alcoa plants have committed $40 million to pursue the energy savings opportunities
  - 20% of the opportunities can achieve savings through "no-cost" projects
  - 80% of the opportunities could be realized through projects with less than 2-year paybacks
- More than $15 million has been captured to date

- An Intranet Web site was developed for easy access by all within Alcoa
- Biannual Energy Summits are being conducted by Alcoa Energy to provide updates on the program, recognize achievement, and present case studies and training.

In addition to saving energy, Alcoa has also reduced emissions of NO_X, SO_X, and carbon dioxide (CO_2), as shown in Table 2.

Table 2: Emission Reductions Through Alcoa's Energy Efficiency Network

Type of Emission	Emission reduction opportunities identified (metric tons per year)	Emission reductions achieved (metric tons per year)
NO_x	2,600	770
SO_x	5,600	1,600
CO_2	1,300,000	420,000

Energy Management: A Corporate Commitment

Alcoa finds many benefits to its corporate energy management approach. These include reduced energy use, energy costs, and emissions. In addition, the company-wide philosophy encourages employee involvement in process improvement, and boosts Alcoa's image locally, regionally, and globally.

Several elements combine to make the strategy work for Alcoa. They are:

- An energy policy endorsed by management and a plan to launch this effort.
- Employee and plant-level involvement as a foundation. Plants participate voluntarily and have sole responsibility for decision making to implement their own projects.
- Network participants who are energy champions at their sites. These energy champions take part in assessments. They buy in to the process, which leads to "ownership" and drives implementation of projects.
- Access to DOE resources and tools. Such assistance helps make the programs successful.
- Carefully selected consultants and vendors. They recognize that individual locations receive the credit for savings and opportunities and understand the goals and objectives of the Energy Efficiency Network.

In its search for stable, long-term energy supplies, Alcoa is committed to energy conservation and decreased reliance on fossil fuels. Where possible, Alcoa will increase use of natural, renewable energy sources to help lower CO_2 emissions and address global climate change.

Following Alcoa's example, other industrial companies can develop their own strategies to meet corporate goals, such as improving energy efficiency, cost efficiency, and productivity. In doing so, they can strengthen employee commitment and corporate identity and enhance environmental performance.

BestPractices is part of the Industrial Technologies Program Industries of the Future strategy, which helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together emerging technologies and best energy-management practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

BestPractices emphasizes plant systems, where significant efficiency improvements and savings can be achieved. Industry gains easy access to near-term and long-term solutions for improving the performance of motor, steam, compressed air, and process heating systems. In addition, the Industrial Assessment Centers provide comprehensive industrial energy evaluations to small- and medium-size manufacturers.

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:

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1-877-EERE-INF
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A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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