

# **Energy Efficiency Toolkit For Manufacturers**

**Eight Proven Ways to Reduce Your Costs**

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## INTRODUCTION

Energy prices are on the rise again and supply restraints are showing up in many parts of the country. How manufacturers respond to tighter energy markets will increasingly affect their business performance and profitability.

Fortunately, energy efficiency comes naturally to manufacturers because it is an application of total quality management that eliminates waste in the production process. Technological advances and the application of total quality management in the workplace have spurred an extraordinary growth in manufacturing productivity over the past decade.

This energy-efficiency toolkit, published by the National Association of Manufacturers and its research and education arm, The Manufacturing Institute, was created to help make saving energy a part of manufacturers' and employees' daily routine. NAM members recently shared their energy-saving secrets, as part of a survey NAM and the institute conducted in spring 2000. More than 400 manufacturers participated in the survey, which revealed that 85 percent have made energy-efficiency improvements over the past five years. Simple measures that reduce energy use by just 10 percent can shave as much as \$18 billion off energy-consumption costs.

The toolkit features eight energy-efficiency success stories, as well as a guide to dozens of public and private resources that can help your company reduce energy waste and increase productivity.

This toolkit is for you and your employees, suppliers and customers; as well as the local media and government officials. I encourage you to distribute it among these groups. We are also placing this publication on our Web site so a wide audience can access the information easily. Empowering everyone with whom you work will lead to the exchange of great ideas for saving your company energy, decreasing waste and boosting your bottom line.

Jerry J. Jasinowski  
Vice Chairman, The Manufacturing Institute  
President, National Association of Manufacturers

For the complete, on-line version of this toolkit,  
visit The Manufacturing Institute Web site at [www.nam.org/institute](http://www.nam.org/institute)

## Acknowledgements

Many people helped develop this brochure, and The Manufacturing Institute and the NAM are grateful for all their contributions.

First and foremost, we would like to thank over 400 companies that participated in the spring 2000 survey of manufacturers on energy efficiency. It is their experience in saving energy and reducing their costs that forms the basis of this report.

We are especially grateful to the companies who supplied the information in each of the best practices sidebars: Samsonite Corp., The Timken Company, G. H. Stenner & Co., Hyde Manufacturing Co., Pitney Bowes Inc., G&S Titanium, Merck & Co. and Pfizer Inc. Their success stories clearly illustrate what steps they took to save energy and how they communicated it to their employees and communities.

Thanks to Mark Whinton, NAM's vice president for resources, environment and regulation; and to Barb Haig, president of Barbara Haig Communications. Both of them helped develop the content and organization of the survey and provided invaluable advice each step of the way.

Bill Paul, a professional writer and journalist in Westfield, N.J. conducted the company interviews and wrote most of this report. He developed this publication in close association with Mike Army and Steve Olson at the Leonardo Academy in Madison, Wis. All three have an impressive understanding of energy use and energy markets; their insight was critical.

We also want to thank Kevin Sullivan and Noah Sloss at the NAM for the layout and design and Ingrid Davitt for the final edits. Bill Canis, executive director of the institute, supervised the entire project, including editorial direction and coordination with other departments.

*Energy Efficiency in Manufacturing*  
**Survey Results**

**Overview.** In spring 2000, The Manufacturing Institute conducted a survey of manufacturers to gain insight on their energy efficiency practices. Manufacturing accounts for more than 40 percent of all energy use in the United States and was responsible for 30 percent of U.S. economic growth in the 1990s. Understanding what manufacturers are doing in the area of energy efficiency is an important prerequisite for holding meaningful public policy discussions on America's economic future.

This report summarizes the findings of The Manufacturing Institute survey of more than 400 manufacturers.

Over the past five years, a vast majority of U.S. manufacturers have improved the energy efficiency of their U.S.-based plants and offices. Even though the relative price of energy increased only slightly during this period, large and small users alike chose to make improvements in a number of broad areas, namely lighting; heating, ventilating and air-conditioning systems (HVAC); and plant motors and machinery.

Not surprisingly, manufacturers' primary motivation was the desire to save money. That aside, manufacturers acted more out of a voluntary commitment to a better environment than because of any regulatory requirements. While nearly 60 percent foresee electricity restructuring saving them up to 20 percent on their utility bills, a significant number would consider taking additional voluntary steps, such as developing an energy-efficiency information campaign for employees.

**Reasons for Efficiency Investments.** This survey of NAM members – the first in a decade – was undertaken by the NAM and the institute to help Congress, the media and the general public better understand current trends of manufacturers in energy efficiency. Approximately 85 percent of respondents answered “yes” when asked, “Has your company undertaken energy-efficiency actions in the past five years?” Of that 85 percent, approximately four out of five said the “most important” reason why they had improved their facilities' energy efficiency was to “save money.” Specifically –

- about three-fourths made lighting-efficiency improvements in some or all of their plants, while nearly half did so in some or all of their offices;
- more than half made HVAC improvements in both their plants and offices;
- more than half improved the efficiency of motors and machinery in some or all of their plants;
- nearly 4 in 10 trained facility managers in energy-efficient practices; and
- approximately 1 in 3 benchmarked against baseline energy use.

Small users of energy were almost as likely to have made productivity-enhancing efficiency improvements as large users. For example, among respondents who reported annual energy costs

between \$25,000 and \$50,000 a year, more than 55 percent said they had made HVAC improvements in at least some of their offices.

**Helping the Environment.** Nearly 40 percent ranked “voluntarily helping the environment” as their second most important reason for improving the energy efficiency of their U.S. facilities. Environmental emissions regulations ranked as a distant third, followed by, “improving community relations” and “requested by customers.”

**Additional Voluntary Environmental Steps.** Energy efficiency is just one of a number of voluntary pro-environmental activities engaged in by U.S. manufacturers. More than three-fourths reported that they reduce, reuse and recycle non-regulated materials. More than 40 percent said they voluntarily reduce emissions and discharges beyond regulatory requirements. Additional voluntary steps to improve energy efficiency they would consider taking:

- nearly 40 percent said they would consider developing an employee energy-efficiency information campaign (10 percent already have one);
- more than 30 percent said they would consider promoting car pooling and mass transit (13 percent do so now); and
- more than 25 percent said they would consider using alternative fuel sources for their corporate fleets of vehicles (less than 4 percent currently do).

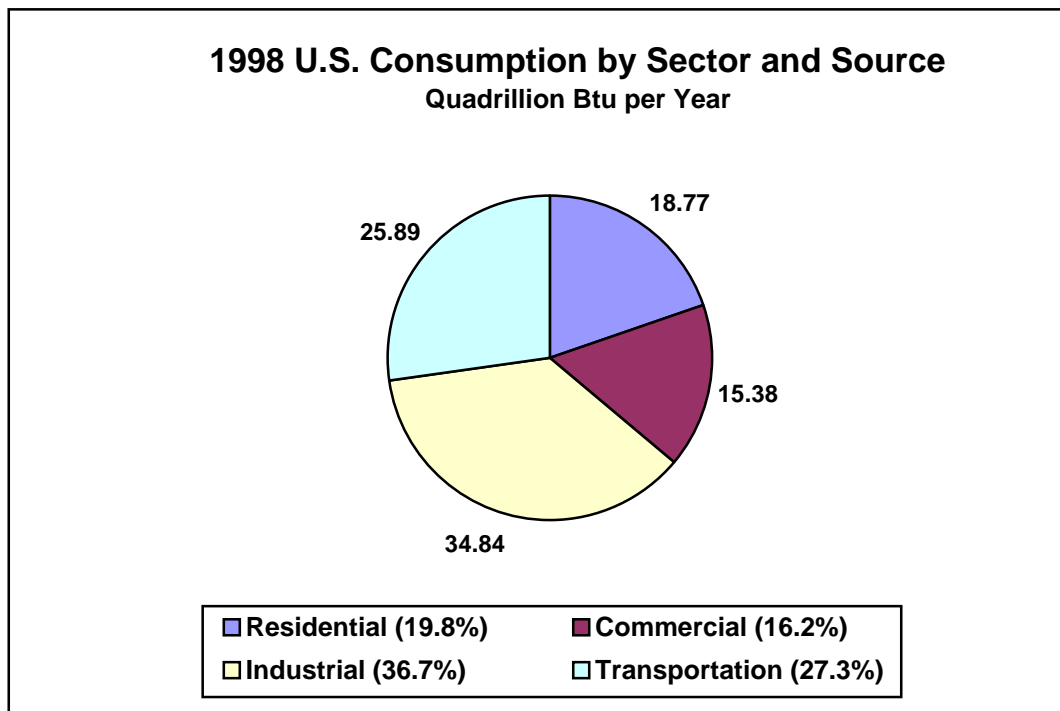
**Involving Employees in Efficiency.** Interest in developing employee energy-efficiency information campaigns was strong among both small and large energy users. Nearly 40 percent of respondents with annual energy costs between \$25,000 and \$50,000 said they were interested in starting such a campaign, compared with the roughly 52 percent with annual energy costs of \$20 million or more.

**Government Programs.** While U.S. manufacturers are keen on voluntarily improving energy efficiency, most have chosen not to participate in voluntary government energy-efficiency programs and organizations. More than half of respondents reported they are “not involved” in such programs. Of those who are involved, most said they participate in state or local programs, not in programs directly run by the U.S. Department of Energy or by the U.S. Environmental Protection Agency.

## Manufacturing Energy Use

### Manufacturers Rely On Energy More Than Any Other Sector

No segment of American society has as much to gain from energy efficiency as the manufacturing sector, as the chart below illustrates. Manufacturers are affected directly by the energy cost of making products (industrial); maintaining office operations (commercial); receiving raw materials and delivering finished goods (transportation) and employees' household energy costs (residential), which have an indirect impact on a manufacturer's wage scales.



Source: U.S. Department of Energy

## Manufacturing Sector Energy Consumption by End Use

The energy used by a manufacturer to make goods – in process heating and machine drive — dwarfs all other direct-end uses combined, as Table 1 shows. Manufacturers should probably concentrate first on making energy-efficiency improvements in these two areas. Of nearly equal importance, however, is indirect end use (primarily boiler fuel). Other direct-end improvements (such as HVAC and lighting) should probably be combined into one all-encompassing efficiency-improvement project, in order to maximize cost-effectiveness.

**Table 1: Manufacturing Sector Inputs for Heat, Power, and Electricity Generation by End Use, 1994**

| <b>Industrial Sector End Use Category</b>           | <b>Trillion Btu</b> | <b>Percent of Total Direct End Use</b> |
|---|---------------------|--|
| Indirect End Use (Primarily Boiler Fuel)            | 3,669               |  |
| Direct End Use:                                     | 6,739               |  |
| Process Heating                                     | 3,466               | 51.4%                                  |
| Machine Drive                                       | 1,489               | 22.1%                                  |
| Facility Heating, Ventilation, and Air Conditioning | 588                 | 8.7%                                   |
| Conventional Electricity Generation                 | 351                 | 5.2%                                   |
| Electrochemical Processes                           | 271                 | 4.0%                                   |
| Facility Lighting                                   | 185                 | 2.7%                                   |
| Process Cooling and Refrigeration                   | 161                 | 2.4%                                   |
| Other Direct End Uses                               | 228                 | 3.4%                                   |
| End Use Not Reported                                | 279                 |  |
| Grand Total   | 10,687              |  |

Source: Prepared by the Leonardo Academy from U.S. DOE/EIA data, Annual Energy View 1998, published July 1999.

Note: HVAC excludes steam and hot water.



## **The Eight Best Practices For Improved Energy Efficiency**

- 1. Increase the Efficiency of All Motors and Motor-Driven Systems.**
- 2. Improve Building Lighting**
- 3. Upgrade Heating, Ventilating and Cooling Systems**
- 4. Capture the Benefits of Utility Competition**
- 5. Empower Your to Employees to Do More**
- 6. Use Water Reduction Equipment and Practices**
- 7. Explore Energy Savings Through Increased Use of the Internet**
- 8. Implement Comprehensive Facility Energy and Environmental Management**

### **1. Increase the Efficiency of All Motors and Motor-Driven Systems.**

The higher a motor's efficiency, the lower its operating costs. The more motors a manufacturer upgrades, the more energy-efficient the manufacturing process will be. And the more energy efficient a manufacturer is, the lower the total operating costs and the more competitive in the marketplace.

**KEY TO SUCCESS:** Regular maintenance keeps motors running efficiently and identifies problems before a breakdown. Know ahead of time where to find high-efficiency replacement motors, so that you can minimize "downtime" when existing motors break down.

### **2. Improve Building Lighting**

Installing high-efficiency lighting systems and using day lighting will not only lower your lighting costs, it will also improve lighting quality. Think of day lighting has "free" light that may also improve worker performance, just as it's been shown to improve students' academic performance. The sleeper bonus here is increased productivity.

**KEY TO SUCCESS:** Combining a lighting improvement project with other energy-efficiency projects will keep costs down.

### **3. Upgrade Heating, Ventilating and Cooling Systems**

Higher-efficiency HVAC equipment and more effective computer control of how and when that equipment is used can substantially lower your HVAC costs. Even simple steps, such as reducing HVAC output on weekends and at night, can make a big difference in overall plant and office energy-use that can only add to a manufacturer's competitiveness.

**KEY TO SUCCESS:** If you upgraded your HVAC systems 10 years ago or more, new technology makes it cost-effective to do so again.

### **4. Capture the Benefits of Utility Competition**

Whether or not your state has yet deregulated its electric and natural gas industries, you can use your local utility, or an independent energy services company (ESCO), to lower energy costs through innovative procurement and demand-side management programs\*. Utility companies know that they are (or soon will be) competing for every commercial and industrial customer, a situation manufacturers can take advantage of by asking for free energy audits and bill-tracking software – both of which give you a clearer picture of how energy is being used. If power reliability is a concern, ask about installing on-site power-generation equipment.

**KEY TO SUCCESS:** Energy-management systems measure energy use and monitor peaks and valleys putting manufacturers in a better position to control use, avoid high rates and negotiate with utilities. Closely tracking your energy bills will pay for itself just from the billing errors you uncover. If possible, find the utility that wants to partner with you to reduce costs. Develop a fuel-management strategy to profit from price volatility in fuels.

(end of page footnote for #4):

\* The U.S. government is already learning how to use local utilities to cut energy costs. When one of the biggest energy users in the world – the U.S. Defense Department – was ordered by the President to cut energy costs and significantly reduce greenhouse gas emissions, it turned to an outside energy-efficiency team from Pepco Energy Services Inc., a wholly owned, separately managed subsidiary of Potomac Electric Power Co. Working with engineering firm Viron Energy Services, Pepco Energy Services developed a comprehensive, multi-year, energy-efficiency improvement program for hundreds of DOD buildings on five military installations. The plan features: lighting retrofits and replacements; cooling-system retrofits and replacements; air-handling unit replacements and retrofits; central-heating plant upgrades (new gas-fired boilers); central-cooling plant upgrades (a new absorption chiller and chilled-water distribution line); plus extensive water and wastewater-conservation measures. The plan is expected to result in an annual energy savings of up to 17 percent. It is further intended to meet the President's overall objective of a 30 percent reduction in greenhouse gas emission by federal agencies. The program has already generated widespread publicity. Perhaps best of all: all of these capital improvements are being financed by the Pepco/Viron team, eliminating any cost to taxpayers - an option that every private manufacturer can also pursue.

## **5. Empower Your Employees to Do More**

Energy efficiency both directly and indirectly adds to manufacturers' bottom line – directly by cutting a company's utility bills. It gets there indirectly if manufacturers communicate what they've done (and plan to do) to save energy. Keeping employees informed about what's going on will enable and empower them to seek additional savings that will further reduce your costs. Your marketing employees can also make use of your energy efficiency in positioning the company with customers. In addition, the more employees know about your energy savings, the more likely they will tell their friends in the community. Keeping the media up to date on your efforts will generate positive publicity that may translate into new business, as well as maintain good relations with government officials.

**KEY TO SUCCESS:** Keep your employees, customers and communities posted on your improvements through internal and external newsletters, mailings and press releases.

## **6. Use Water Reduction Equipment and Practices**

Saving water leads to energy savings too. With water on the verge of becoming a scarce commodity in parts of the United States, manufacturers can expect to see their water and sewerage bills climb steadily in coming years. Installing new water-reduction equipment, as well as altering manufacturing processes so that less water is used and wastewater is captured and re-used, will help keep your water bills in check and, at the same time, sends a readily understood message to the media and the public that the manufacturer is concerned about the environment.

**KEY TO SUCCESS:** Install closed-loop systems that will enable water to be used over and over. Identify how water is used in your facilities: where, how, how much and for what purpose. The reduction opportunities will jump out at you.

### **7. Explore Energy Savings Through Increased Use of the Internet**

Because it is an effective communication tool, the Internet has the potential to help manufacturers save energy in a variety of ways. An Internet-based, energy-management system can provide more precise control of energy use throughout a plant or office. Such a system may be especially useful for multi-site manufacturers seeking to consolidate energy procurement across several states or regions. You can also save energy by allowing more employees to telecommute. Transportation energy also may be saved by utilizing the Internet for videoconferencing.

**KEY TO SUCCESS:** Focus on those areas in your workplace where the Internet could help reduce energy use effectively and efficiently (e.g. videoconferencing) and secure the necessary software and resources to implement the Internet-based change.

### **8. Implement Comprehensive Facility Energy and Environmental Management**

To maximize the energy savings and its overall benefits to your company, implement a comprehensive facility energy and environmental-management program that addresses all seven actions above in an integrated fashion. You can accomplish this by doing it all internally, outsourcing it all or by combining internal and external resources.

**KEY TO SUCCESS:** Keep score on your energy use, emission and waste. Establish a commitment from the CEO or COO to develop a corporate energy plan. Designate an overall energy manager who will have responsibility for comprehensive energy improvements and will set specific targets to achieve your efficiency goals.

(These sidebars will be printed on the same page as the Best Practice which it accompanies; a plant floor picture will be used with each sidebar, as in the Facts book.)

Samsonite Corp.

Denver-based Samsonite Corp. is one of the world's largest manufacturers and distributors of luggage and markets its products primarily under the Samsonite®, American Tourister®, and Lark® brand names.

As part of a motor-efficiency improvement program, the company installed nine high-efficiency, variable-frequency-drive motors on injection-molding machines it uses to make luggage. The cost was \$200,000 – nearly half of which was paid by the local utility, Public Service Company of Colorado, a subsidiary of New Century Energies Inc., as part of its Custom, Industrial Process Efficiency Solutions program. The new motors reduced energy use by 50 percent, saving Samsonite approximately \$92,000 worth of electricity over a year's time. The new motors have generated an additional annual savings of nearly \$40,000, stemming from reduced expenditures for emergency maintenance, oil, absorbents, mold repairs and waste disposal. The simple payback on this project was a mere eight months: the amount of electricity needed to produce a piece of luggage was reduced by a healthy 10 percent. In addition to these motor improvements, Samsonite has also installed efficient lighting; added highly efficient swap coolers when it expanded its air-conditioning system; communicated its improvements through the Cleaner and Greener<sup>sm</sup> program; and reduced water use with an innovative humidity controlled irrigation system. These actions have dramatically trimmed Samsonite's energy bill by \$275,000 a year. Kermit Hodge, Director of Environment, Health and Safety at Samsonite, says, "These projects just make good business sense, they're no brainers. I don't know why anyone would have trouble selling these projects to their management."

### The Timken Company

The Timken Company is a leading international manufacturer of highly engineered bearings and alloy steels. Timken employs about 21,000 people worldwide and reported 1999 sales of more than \$2.5 billion. One of Timken's global business units is Timken Aerospace, located in Lebanon, N.H. Timken Aerospace manufactures ball and roller bearings and employs 700 people. Steve Davis, manager of mechanical services for Timken Aerospace, learned about the new high efficiency T5 florescent lights while participating in a 1998 energy efficiency workshop, sponsored by the New Hampshire Governor's Office of Energy and Community Services. With the technical and financial assistance of state energy officials and the company's local power supplier, Steve Davis developed and implemented a lighting improvement project that is saving his company more than \$100,000 a year in lighting costs – plus another \$40,000 a year in HVAC expenditures. He replaced existing metal halide fixtures with new, high-intensity, fluorescent fixtures that cut energy consumption roughly in half. The new lighting, which uses a thinner (T5) fluorescent lamp, also improves lighting quality and takes less time to become fully lit.

The project, which required replacing about 550 major fixtures and another 1,000 or so smaller fixtures in offices and support areas, cost about \$370,000, of which the utility, Granite State Electric Co., paid a little more than \$100,000 under its demand-side management (DSM) program. The project paid for itself in less than two years. All told, Timken Aerospace cut its energy consumption by nearly 1.5 million kilowatt hours annually and its power load by about 190 kilowatts.

An added benefit of this public-private partnership was that, by reducing electrical energy use, Timken was able to do its part in cutting air pollution from fossil-fuel power plant emissions. By

saving 1,480,000 kilowatt hours of electricity annually, Timken is reducing sulfur oxide emissions by 8.88 tons annually; and nitrogen oxide emissions by 3.7 tons.

#### G. H. Stenner & Co.

As part of a recent construction program, G. H. Stenner & Co., a Jacksonville, Fla.-based manufacturer of chemical metering pumps, replaced two old air-conditioning units with five new energy-efficient units. In addition to helping cut energy costs by about 18 percent a year, the new units have improved worker productivity by creating more favorable operating conditions, says Steve Hayes, manager of purchasing and materials. The new units provide "zoned" cooling, meaning that more cool air goes where it's needed most – on the hot-running machines – rather than on the workers. "We used to have workers who'd be freezing," says Hayes. Since the new equipment was installed, "our people are working harder because they can see this was done for them" In addition to installing more efficient air-conditioning units, Stenner upgraded its chillers and installed new computer-controlled machinery for its 7,000 square-foot manufacturing facility. The total cost was about \$35,000, with a four to five year anticipated pay-back period. While Hayes strongly recommends that manufacturers upgrade their HVAC equipment, he suggests that such a project be done when an expansion or other construction project is already disrupting a manufacturer's normal working environment.

#### Hyde Manufacturing Co.

"At first it sounded too good to be true," says Louis Koslowski, manager of plant engineering for Southbridge, Mass.-based Hyde Manufacturing Co. After five major energy-efficiency improvement projects in 15 years – the last in 1999 – all coordinated by Hyde's local electric utility, Koslowski says manufacturers would be unwise not to try to partner with their local power firm. Over the years, Hyde Manufacturing has gotten rebates and other cash incentives totaling roughly \$200,000 for installing new lighting (in both plants and offices), variable-speed-drive motors and a water chiller, plus upgrading a vacuum furnace and a water-filtration system. These various projects not only have helped keep Hyde's \$750,000-a-year energy costs under control, they also have helped lower water expenditures. The key, says Koslowski, is to "get the utility involved right at the beginning." In Hyde's case, he says, the utility, Massachusetts Electric Co., "figured everything out for us and, after determining we qualified under set guidelines, wrote a check that generally covered close to 50 percent of the up-front costs". With more than 300 employees, Hyde Manufacturing makes putty knives, scrapers and other machine tools.

#### Pitney Bowes Inc.

Pitney Bowes Inc., the Connecticut-based \$4.4 billion global provider of informed mail and messaging management, succeeds in communicating and promoting its corporate environmental efforts, both internally and externally. Employees regularly get a corporate environmental newspaper that's full of energy-saving tips and advice. When employees go to the lunchroom or open their paychecks, they may be greeted by messages that encourage them to save energy by

turning off their desktop computers. The company notifies every employee via e-mail whenever there's a potential power crisis, urging workers to help out by pulling down shades and taking other voluntary steps. Externally, the company recently became a founding sponsor of Greenbiz.com, an online environmental resource center that helps corporations "align environmental responsibility with business success." Pitney Bowes also uses direct media outlets, such as the Connecticut Business and Industry Association, plus indirect outlets like Business Wire, to distribute environmentally oriented press releases. When the company has a special event, such as the installation of a cogeneration unit, it airs the event on TV and other local media. "We're always trying to raise awareness," says Michael Gilbert, senior corporate environmental engineer. Awareness is a key ingredient of the company's Managing Energy Wisely Program which, since 1997, has trimmed corporate energy consumption 15 percent on a weather normalized basis -- enough BTUs of energy to power 40 households.

### G&S Titanium

Worcester, Ohio-based G&S Titanium Inc. is a small, 50-employee firm that processes titanium for manufacturers of springs, tanks and other products. As part of its manufacturing process, G&S runs the titanium through a descaling salt bath, in which salt that's been heated to the point where it's a liquid is used to remove the oxide scales from the metal. Electrodes keep the salt hot, while water keeps each electrode's power-delivery components cool.

Instead of simply using grid-supplied electricity to cool that water, G&S installed a rooftop heat exchanger that uses natural air currents. It's all part of a closed-loop system that paid for itself in less than one year and is saving the company \$5,000 worth of electricity annually. G&S next plans to capture the steam generated by the boiling of its wastewater, and use that steam to power the boiling system, effectively making that piece of equipment energy efficient. This system could save the company as much as \$13,000 a year in natural gas costs. In addition to saving energy, G&S has made other changes that are saving the firm hundreds of thousands of gallons of water per year. For example, to save water, it switched to dirty water rinse tanks from clean water tanks that had to be frequently refilled. It uses a high-pressure washing system and a water misting system to clean the rinsed titanium.

### Merck & Co., Inc.

Merck & Co. Inc., a New Jersey-based global pharmaceuticals research and development firm, intends to take the energy-efficiency lessons learned at two pilot projects at Merck plants located in New Jersey and Pennsylvania. Via the Internet, the company hopes to spread the efficiency information and the development of these practices with all other Merck facilities around the world including 31 plant locations in 18 different countries. Merck's goal is to create a best practices information site, which will be continuously updated as new and better energy-efficiency practices are implemented, and is readily accessible by all of Merck's 62,000 employees. Merck plans to have this company-wide effort up and running within two years.

## Pfizer Inc

The Pfizer Global Research facility, located in Groton, Conn., has a campus of about 20 buildings encompassing more than 4 million square feet. The facility is mainly laboratory spaces used for pharmaceutical research, but includes vivariums, offices and a cafeteria. Pfizer sought to reduce operating costs, replace failed and antiquated equipment, and reduce campus-wide cooling loads; and also needed to implement comprehensive energy-system improvements without distracting its own staff from the company's core business. To achieve these goals, Pfizer entered into a performance contract with Johnson Controls, Inc. This energy-service company designed a comprehensive upgrade, including identifying viable efficiency opportunities and operations and maintenance savings. Johnson Controls also guaranteed the energy savings from these upgrades would pay for the projects. This outsourcing arrangement includes turnkey operations such as providing construction management, economic analyses, project design, implementation, employee training and savings verification.

Through this comprehensive approach, Johnson Controls has already identified more than \$1.1 million in annual justifiable energy savings, without sacrificing environmental comfort, quality, or safety. More than \$8.8 million in energy efficiency retrofits have been approved, and many have been installed. The projected energy savings from the approved upgrades are \$1,183,000 per year.

## Resources for Making Your Facilities More Energy Efficient

There are many resources available to help manufacturers increase energy efficiency.

For the complete, on-line version of this toolkit visit the Manufacturing Institute Web site [www.nam.org/institute](http://www.nam.org/institute). You can link directly to these resources by using the on-line version.

### General Resources

#### Leonardo Academy

Web site: <http://www.leonardoacademy.org/efficiencyresources/industry.htm>

Phone: (608)255-0255

Fax: (608)255-7202

A non-profit organization will help you find the resources you need (for information, tools and getting it done) to increase the energy efficiency of your facility.

#### The Manufacturing Extension Partnership (MEP)

Web site: [www.mep.nist.gov/](http://www.mep.nist.gov/)

Phone: (1-800)MEP-4MFG (800-637-4634)

A nationwide network of not-for-profit Centers in more than 400 locations nationwide, whose sole purpose is to provide small and medium-sized manufacturers with the help they need to succeed in a wide range of areas. Most MEP centers are equipped to advise manufacturers on energy efficiency, providing links to local resources and expertise. To reach your nearest MEP center, call the number listed above.

#### U.S. Department of Energy, Office of Industrial Technology

Web site: [www.doe.gov/eere/oit/](http://www.doe.gov/eere/oit/)

Has many programs and resources on energy-efficiency improvement.

#### Edison Electric Institute

Web site: [www.eei.org/esg/other/solutions/](http://www.eei.org/esg/other/solutions/)

The institute's Web pages have a wide range of recommendations for building and equipment efficiency.

### Outsourcing Efficiency Improvements

If you want to outsource your project from beginning to end, consider using an energy-savings performance contractor. These contractors are willing to develop, implement and guarantee the performance of energy-efficiency improvement projects. Many companies, including equipment manufacturers, utilities, engineering firms and others, have formed units that provide energy-savings performance contracting services to help their clients save energy.



The Western Regional Coalition (WRC)

Web site: [www.wrcperform.org](http://www.wrcperform.org)

A coalition of representatives of energy-service companies (ESCOs), facility owners, finance companies and state energy offices. Its Web site includes a guide to using energy service companies and a listing of which ESCOs serve each state.

National Association of Energy Service Companies (NAESCO)

Web site: [www.naesco.org](http://www.naesco.org)

NAESCO promotes the delivery of energy efficiency and other energy services by ESCOs. Their site includes information on NAESCO services and activities.

## Specific Resources

### 1. To increase the efficiency of all motors and motor-driven systems

a. Use high efficiency motors:

- \* Specify high-efficiency motors for replacement motors and in new equipment.
- \* Upgrade large existing motors.

The key to success is to have your plans in place for using high-efficiency replacement motors and arrange for availability of high-efficiency motors so they are available when needed fast.

U.S. Department of Energy's Office of Industrial Technologies (OIT)

Web site: [www.oit.doe.gov/bestpractices](http://www.oit.doe.gov/bestpractices)

This site offers you the tools to improve your plant's energy efficiency, enhance its environmental performance, and increase its productivity. OIT will work with you to improve your systems—motors, steam, compressed air, combined heat and power, process heat—plant wide. You can also obtain free, readily available software such as the U.S. DOE's MotorMaster (see below) to begin to track your motor-driven systems. When equipment needs to be replaced, use software to pick the most efficient available equipment within your cost range.

MotorMaster+ 3.0

An energy-efficient motor selection and management tool, MotorMaster+ 3.0 software includes a catalog of over 20,000 AC motors. Version 3.0 features motor inventory management tools, maintenance log tracking, efficiency analysis, savings evaluation, energy accounting, and environmental reporting capabilities. Downloadable software list from [www.oit.doe.gov/bestpractices/software\\_databases/software.shtml](http://www.oit.doe.gov/bestpractices/software_databases/software.shtml).

b. Improve efficiency of your motor-driven systems:

- \* compressed air;
- \* fluid pumping; and

\* fans

Software from [www.oit.doe.gov/bestpractices/software\\_databases/software.shtml](http://www.oit.doe.gov/bestpractices/software_databases/software.shtml)

- **Pump System Assessment Tool (PSAT)**  
The Pump System Assessment Tool helps industrial users assess the efficiency of pumping-system operations. PSAT uses achievable pump-performance data from Hydraulic Institute standards and motor performance data from the MotorMaster+ database to calculate potential energy and associated cost savings. It can be downloaded from the bestpractices Web site.
- **Decision Tools for Industry CD**  
The Decision Tools for Industry CD contains both the MotorMaster+ 3.0 (MM+ 3.0) and Pump System Assessment Tool software packages described above. In addition, it includes MM+ 3.0 training. The training walks you through the fundamentals and the advanced features of MM+3.0, providing examples for using the software to make motor purchase decisions. It can be ordered from the bestpractices Web site.

Electric Power Research Institute (EPRI)

Web site: [www.epri-peac.com/asdmaster](http://www.epri-peac.com/asdmaster)

ASDMaster: Adjustable Speed Drive Evaluation (Methodology and Application Software)

This Windows software program helps you, as a plant or operations professional, determine the economic feasibility of an ASD application, predict how much electrical energy may be saved by using an Adjustable Speed Drive (ASD) and search a database of standard drives. The package includes two 3½ inch diskettes, user's manual, and user's guide. It can be ordered from EPRI (pnelsen@epriasdo.com) or from Bonneville Power Administration (sdfairley@bpa.gov).

The Industrial Center

Web site: [www.industrialcenter.org](http://www.industrialcenter.org)

Promotes the utilization of new gas-fueled technologies that increase manufacturing productivity and competitiveness. The non-profit Industrial Center is based on the establishment of market-driven consortia of energy companies, equipment vendors, and industrial end-users that finance technology demonstrations and produce market entry support materials.

## 2. To upgrade lighting systems

- \* Install high-efficiency lighting to maintain or improve lighting quality.
- \* Include use of daylighting in facility upgrades and in new facilities.

Conduct an energy audit - Contact an energy service company, if you want help.

International Association for Energy Efficient Lighting

Web site: [www.iaeel.org](http://www.iaeel.org)

An information resource for high-quality, energy-efficient lighting. Here you can read all IAEEEL Newsletter issues, visit the Lighting Crossroads resource index and check out Lighting and Energy Meetings & Events.

U.S. EPA Energy Star Buildings and Green Lights Partnerships

Web site: [www.epa.gov/buildings/esbhome/](http://www.epa.gov/buildings/esbhome/)

ENERGY STAR Buildings<sup>SM</sup> is a voluntary partnership between companies and the U.S. Environmental Protection Agency (EPA) to promote energy efficiency in buildings.

Look for Energy Star labeled products

Web site: <http://www.energystar.gov/products>

Phone: 1 (800) STAR-YES

This web site includes product lists for lighting and store locators.

Lighting Research Center

Web site: [www.lrc.rpi.edu](http://www.lrc.rpi.edu)

The Center maintains the National Lighting Product Information Program (NLPIP), a source of manufacturer-specific performance information on efficient lighting products.

### **3. To upgrade heating, ventilating, cooling systems and improve your building shell:**

U.S. EPA Energy Star labeled products

Web site: [www.energystar.gov/products](http://www.energystar.gov/products)

Phone: 1 (800) STAR-YES

This web site includes product lists and store locators.

Downloadable Software from the U.S. Department of Energy

[www.oit.doe.gov/bestpractices/software\\_databases/software.shtml](http://www.oit.doe.gov/bestpractices/software_databases/software.shtml)

BestPractices, an initiative of the Department of Energy's Office of Industrial Technologies, offers software tools to improve your plant's energy efficiency, enhance its environmental performance, and increase its productivity. One free product that can be downloaded is 3E Plus, which can help you determine whether boiler systems can be optimized through the insulation of boiler steam lines. (3E Plus is also available directly from NAIMA; see below).

Building energy software list: [www.eren.doe.gov/buildings/tools\\_directory/](http://www.eren.doe.gov/buildings/tools_directory/)

Describes 202 energy-related software tools for buildings, with an emphasis on using renewable energy and achieving energy efficiency in buildings.

North American Insulation Manufacturers Association (NAIMA)

Web site: [www.naima.org](http://www.naima.org)

Phone: (703)684-0084

NAIMA has developed a computer program – 3E Plus – that calculates how much money can be saved and greenhouse gas prevented by insulating pipes, boilers, storage vessels and ducts. The calculations are based on energy, labor and insulation costs. Many insulation upgrades can have paybacks in less than one year. The 3E Plus program is simple enough to be used by your own plant manager or you can have a certified appraisal done by a trained technician.

For a list of certified appraisers: [www.insulation.org](http://www.insulation.org)

To download the free 3E Plus program: [www.pipeinsulation.org](http://www.pipeinsulation.org)

Efficient Windows Collaborative (EWC)

Web site: [www.efficientwindows.org](http://www.efficientwindows.org)

Provides information on the benefits of energy-efficient windows, descriptions of how they work, and recommendations for their selection and use. Developed with the support of the U.S. Department of Energy's Windows and Glazings Program and the participation of industry members.

American Gas Cooling Center (AGCC)

Web site: [www.agcc.org](http://www.agcc.org)

Develops natural gas air conditioning, refrigeration, and dehumidification markets. Their site includes information on products, education and events.

#### **4. To capture benefits of utility competition:**

- Use energy and utility bill tracking software to track your company's energy consumption and savings.
- There are a number of commercial software products available – See Leonardo Academy Web Site for a current list of providers:  
<http://www.leonardoacademy.org/efficiencyresources/energytracking.htm>
- Competitively procure your energy requirements --any of the energy service companies can help you with this. To find one see the outsourcing section at the beginning of the Resources listings.
- Build energy efficiency into your strategy for reducing utility costs and uncertainty of supply. Energy service companies can also help you with this process.

#### **5. To communicate your company's energy efficiency and environmental achievements to your customers:**

##### *Certification Programs*

The Cleaner and Greener<sup>sm</sup> Certification Program.

Web site: [www.cleanerandgreener.org](http://www.cleanerandgreener.org)

Phone: (608) 280-0256

Whole company certification that helps businesses communicate their energy efficiency and environmental achievements to their customers.

## ISO 9000

ISO 9000 standards are management-system standards developed by the International Organization for Standardization (ISO) that state requirements for what an organization must do to manage the processes influencing quality. The standardized definition of "quality" in ISO 9000 addresses all those features of a product (or service) which are required by the customer. "Quality management" in ISO 9000 means what management processes does the organization have in place to ensure that its products conform to the customer's requirements.

## ISO 14000

Like ISO 9000, ISO 14000 standards are management-system standards developed by the International Organization for Standardization (ISO) that state requirements for what an organization must do to manage the processes influencing the impact of the organization's activities on the environment (ISO 14000). "Environmental management" in ISO 14000 means what management processes does the organization have in place to minimize harmful effects on the environment caused by its activities.

### *Recognition Programs*

#### U.S. EPA Energy Star

Web site: [www.energystar.gov](http://www.energystar.gov)

Phone: (1-800) STAR-YES

In return for committing to upgrade their buildings to become more energy efficient, ENERGY STAR Buildings<sup>SM</sup> Partners receive access to services, information, tools, and resources from EPA. Click on [www.epa.gov/buildings/esbhome/benefits/benefits.html](http://www.epa.gov/buildings/esbhome/benefits/benefits.html) to see for yourself how these partnership benefits add even more value to energy-efficiency improvements.

#### Climate Wise

Web site: [www.epa.gov/climatewise](http://www.epa.gov/climatewise)

An EPA and DOE recognition program for industry.

#### Climate Challenge

Web site: [www.eren.doe.gov/climatechallenge](http://www.eren.doe.gov/climatechallenge)

A DOE recognition program for utilities.

## **6. To implement water use reduction equipment and practices:**

Reducing water use decreases the energy needed to pump water from drawing it from its source to its disposal. Reducing hot-water use reduces the energy needed for heating water as well.

#### WATERGY

Web site: [www.eren.doe.gov/buildings/tools\\_directory/software/watergy.htm](http://www.eren.doe.gov/buildings/tools_directory/software/watergy.htm)

A simple spreadsheet model that screens sites for potential water conservation opportunities and illustrates the energy savings that result from water conservation activities.

### **7. To explore energy savings through increased internet use:**

Metro Atlanta Telecommuting Advisory Council (MATAC)

Website: [www.matac.org/rocket.htm](http://www.matac.org/rocket.htm)

Lists eight techniques for companies to use in developing a successful telecommuting programs.

#### TELEWORK

Oregon Office of Energy, Telework Resources

625 Marion Street NE

Salem, OR 97310

Phone: (503) 378-4040

Fax: (503) 373-7806

A complete guide for setting up a telecommuting program at your business.

### **8. To implement comprehensive facility energy and environmental management:**

For information on how to implement comprehensive facility energy and environmental management, consult the information resources listed above for general information, outsourcing, and for each of the eight specific areas of action.

The U.S. Green Buildings Council

Web site: [www.usgbc.org/](http://www.usgbc.org/)

The council is a non-profit organization that encourages the design and construction of environmentally-friendly and energy-efficient buildings. Members have access to a clearinghouse of the best green building-related information on emerging trends, policies, and products. These include product databases, case studies, staff papers, directories, and other resources. The council sponsors the LEED Green Building Rating System™. It is a voluntary, consensus-based, market-driven building rating system based on existing, proven technology. It evaluates environmental performance from a "whole building" perspective over a building's life cycle, providing a definitive standard for what constitutes a "green building". A number of resources are available on the Web site, including LEED Green Building Rating System™ software.