

[<< Return to Main Page](#) | [Print](#)

From the pages of Plant Engineering Magazine

Plugged into bright ideas

**By Bob Vavra, Editor -- 3/1/2007**

If a light bulb goes on every time a plant manager gets a great idea on how to save energy, it's likely going to be a compact fluorescent light bulb. With reducing electricity costs a top-of-mind consideration, the curly bulbs are showing up in more businesses and homes.

When a spike in oil prices worldwide drove gasoline costs to more than \$3.00 a gallon, the cost of other fossil fuels, including heating oil and natural gas, rocketed higher as well. The financial benefits of productivity gains plant managers had worked so hard to achieve were wiped out.

Instead of just being aware of energy costs – and reacting to the sticker shock of energy bills when they arrive – the idea of actively managing energy costs is again gaining momentum. Those who have been nudging that idea forward for years are pleased the concept is getting another look.

"The greatest increase in plant efficiency comes when improvements and management of these systems is part of a formal energy management program that is focused on continuous improvement of energy performance," said Walt Tunnessen, industrial sector manager for the U.S. Environmental Protection Agency's ENERGY STAR program.

"Unfortunately, too many companies do not manage energy like they manage other aspects of their business. The biggest challenge, however, for energy managers is moving beyond plant utilities to addressing how to optimize energy use in manufacturing processes."

It is as simple as changing a light bulb – or as 2006 *PLANT ENGINEERING* Top Plant winner Square D did, changing every fluorescent bulb in their 266,000 square foot Lincoln, NE facility to T8 fixtures, saving \$61,000 in annual energy costs. In examining the possibilities, however, it's important to look at every utility in the plant – electricity and oil, natural gas and compressed air, heating and cooling.

In conjunction with *PLANT ENGINEERING*, last year Boston-based Consortium for Energy Efficiency conducted a study on where plant managers were changing to energy-efficiency equipment. While lighting and motors were the most frequently updated equipment, when it came to energy efficiency as a specific goal, compressed air systems and pumps were mentioned first.

**Sections:**

[Motors matter](#)  
[Compressed air challenges](#)  
[Battling with boilers](#)  
[Leading the way to change](#)

**Sidebars:**

[The Bottom Line...](#)  
[Energy on the agenda at Summit](#)  
[Energy resources on the Web](#)  
[Utilities have a stake in cutting energy costs](#)



**Motors matter**

"Over the last year, we have seen an increased

interest in how to control energy and also improve productivity. In a way, the two can go together," said John Malinowski, director of marketing for ac and dc motors, Baldor Motors and Drives, Fort Smith, AK. "When upgrading a motor from an older design to a premium motor, the motor design, enclosure and level of protection can be increased. For example, poultry processors are switching from older pre-EPAct washdown motors to newer all-stainless premium efficient designs with better bearing and winding protection.

"There are huge opportunities to save electricity by using an adjustable speed drive with variable torque loads such as pumps and fans," Malinowski added.

While capital costs are always an issue, Malinowski said the opportunity to save on energy is driving new ideas. "Old thinking is to look only at first cost instead of life cycle costs," he said. "A motor's purchase price is only about 2% of its life cycle cost – more than 97% of the cost is the electricity to operate the motor. A motor's annual electricity usage is often 10 to 15 times its purchase price.

"Upgrading motors alone can provide savings in the 3% to 10% range. That's not bad," said Malinowski. "Simply changing V-belts to the notched type can increase efficiency by up to 3% and pay for themselves in a few months. But the greatest opportunity for savings is by using adjustable speed drives on fans and pumps. These savings can be 30% to 50% or more. System redesigns allowing change from worm reducers to helical can provide large efficiency increases that allow use of a smaller motor."

### **Compressed air challenges**

Compressed air system management is sometimes an issue of determining the right unit for your needs today, said Bob Baker, energy audit and systems monitoring manager for Atlas Copco Compressors, Westfield, MA.

"One of the biggest mistakes in the purchase of an air compressor is not selecting the correct size," Baker said. "Over-sizing is a big offender of energy waste and poor compressor operation. Many consumers purchase equipment by horsepower or previous unit capacity CFM – 'Well I had a 200 hp (or 800 CFM) unit before, so I may as well buy another one that size to replace it.'"

Maintaining the compressed air system improperly is another place energy can be lost. "Air leaks is one of the largest offenders of energy waste in a compressed air system, and possibly one of the biggest mistakes made by an air compressor owner is ignoring these air leaks," Baker said. "Once an air leak survey is completed and a good attempt to fix these leaks is executed, then an air use (capacity/CFM) profile should be completed."

Once that analysis is done, said Baker, the decision about the right-sized product for the job is easier. "In some cases it is not always a VSD compressor," he noted. "Load cycle profiles are very important when choosing the compressor control system. When there is fluctuating demand, by all means a VSD is the right product. However, with a steady use of air, then a fixed speed, inlet controlled (load/no-load or other) system may be the correct choice."

### **Battling with boilers**

Steam is another area where efficiencies can be found – or more often, lost. “In the past energy bills were paid without much thought. An inefficient boiler was often not recognized as a result,” said Dan Willems, vice president of product development at Cleaver-Brooks, Milwaukee. “With energy costs on the rise and boilers making up nearly one-third of a U.S. manufacturer’s energy usage, energy bills are no longer paid without a search for ways to reduce this ever-increasing cost.”

The attention of boiler manufacturers shifted as a result of a change in customer attention. “Up until two years ago, most end-users were most concerned about emissions from their boilers. A few years ago, fuel costs began to rise, creating an urgent need for a change in focus,” said Willems. “Now, end-users look for ways to reduce fuel usage. This is primarily accomplished by increasing boiler efficiency. Today, efficiency and cost are the top two considerations.”

Making changes, Willems said, is not all about ripping out the entire system in search of more efficiency. “The greatest opportunity for energy savings is to consider all the areas where energy is lost throughout the process. This loss occurs through flue gases, radiation and convection and in the blowdown process,” he said. “End-users can retrofit their old boiler to bring its performance nearly up to par with today’s new systems. Retrofit options available today with the most energy saving potential fit into two categories: control system retrofits or heat recovery options.”

### **Leading the way to change**

The most critical issue in an energy management program, however, isn’t a boiler or a motor, a compressor or a light bulb. It’s in having a plan.

“For all manufacturers, we offer energy management guidance, programmatic resources, networking and tools designed to promote stronger energy programs,” Tunnessen said. “For selected manufacturing sectors, we convene ‘Industrial Focuses’ where we work collaboratively with companies in the industry to develop a sector-specific energy guide, create an energy performance benchmarking and rating tool called an Energy Performance Indicator (EPI) and facilitate the sharing of best practices.”

That sharing must begin at the plant floor level in manufacturing. “Over 90% of the decisions on motor selection are made at the plant level, even in large multi-facility organizations. Despite this, only 11% have written motor specs and 12% have written rewind practices according to the 2002 DOE study,” Malinowski said.

“Production floor personnel must be instructed on the proper use of these air system accessories,” Baker said. “Things this simple can improve greatly on energy conservation and power costs to the bottom line. Maybe the people close to the top line should also be educated on just how much air system energy really costs, when you get to the bottom, where the air is really used.

“Plant managers should educate themselves through some of the air system energy seminars that are out there. Once they have a better understanding of this serious issue, they will be more inclined to send some of their employees to these classes. They may even institute some production floor training on this subject at their own facilities.”

Training and empowerment at all levels of a plant are areas where the Department of Energy sees room for improvement. "Although more companies are now becoming concerned about energy, energy management often remains decentralized, reactive, project oriented, understaffed and unaccountable – particularly to the top levels of a corporation," Tunnessen said. "But as companies begin to develop more formal, proactive and strategic programs, they will realize there are a lot of opportunities for savings simply through better and more efficient operating practices and increasing accountability for energy use."

Baldor is one of many companies that are fervent supporters of the ENERGY STAR effort. "ENERGY STAR has been associated with residential and commercial energy efficiency. Over the last few years they have expanded into the industrial sector," Malinowski said. "Several focus industries are in their industrial program where they model a specific operation and create a software program to compare a plant's electricity, gas and water consumption to the model."

Clever Brooks is another partner in the EPA's efforts. "They offer tools and resources," said Willems. "These include checklists, assessment matrices, how-to-guides and other helpful information providing: energy management guidance, building and plant energy efficiency assessments, new building design assessments, building performance improvements and financial evaluation."

The solution, experts contend, is not in attacking any individual culprit in energy loss. "It is all about taking a look at the entire process when evaluating efficiency," said Willems.

Tunnessen said the Department of Energy is eager to help deliver on the promise of more energy efficiency. "We believe that enabling companies to rate their plants nationally on energy efficiency through EPA's National Performance Rating Systems will help companies within these sectors achieve a higher level of energy efficiency and management," he said.

## The Bottom Line...

- *Energy efficiency needs to be a formal process to succeed at the plant floor level, according to industry experts.*
- *Comprehensive energy plans look beyond fuel-based energy to include compressed air, boilers, air quality and pumps as part of understanding all energy costs in a plant.*
- *Plant managers need to understand the total energy costs of a piece of equipment and not simply its initial purchase price.*
- *There are numerous federal programs that assist manufacturers in developing a comprehensive energy plan.*
- *The most successful energy program in a plant begins with an energy audit.*

## Energy on the agenda at Summit

A panel discussion on energy efficiency and management will be one of the featured tracks at the Plant Engineering Manufacturing Summit on April 2-3 in Chicago.

Speakers will include John Malinowski of Baldor Motors and Drives, Bob Baker of Atlas Copco, Fred Schoenborn of FCS Consulting Services and John Blumenshine, VP of

Facilities, S&C Electric, a 2004 Top Plant award winner.

The discussion will focus on how to drive energy management through all parts of your plant in all the utilities you use.

To register for the Summit, go to [www.plantengineering.com/summit](http://www.plantengineering.com/summit).

## Energy resources on the Web

The U.S. Environmental Protection Agency's ENERGY STAR program is a great place to learn about energy efficiency programs. The general Website at [www.energystar.gov](http://www.energystar.gov) is the place to start.

At [www.plantengineering.com](http://www.plantengineering.com), this cover story is available for review, and it includes a series of white papers, case studies and specific information from ENERGY STAR and other sources. Other links include the complete transcript of the interview with Walt Tunnessen of the EPA.

Just click on the light bulb to pull up the live links to energy efficiency information.

## Utilities have a stake in cutting energy costs

Utilities all over the country are running programs that help their customers – businesses like yours – reduce energy consumption. It's become a major part of the economy, in fact. Last year, the funding for energy-efficiency programs exceeded \$2.6 billion.

The question a lot of people have is this: Why do utilities run energy-efficiency programs? Why does it make sense for them to spend time, effort and money for a project that reduces sales of their product?

Believe it or not, there are several good reasons why selling less energy is good business for utilities. Gene Rodrigues, director of energy efficiency at Southern California Edison (and board of directors chair for the Consortium for Energy Efficiency), did a great job of explaining this dichotomy at one of our conferences last September.

First, he said, every utility seeks to balance supply and demand. Historically, it was easy and financially advantageous to meet growing demand by building more power plants. "Today, in the energy-efficiency industry, we look at reducing demand first," Rodrigues said. "We're trying to provide the least cost reliable service."

The flip side of the coin to reducing demand is the avoidance of increasing supply. Building a power plant to meet increased demand is a highly expensive proposition that requires many years of advance planning – coupled with an uncertain forecast of actual usage (not to mention the ability to site a plant in anybody's backyard). Energy efficiency has now become the least expensive way to meet increased demand.

Secondly, it's in the utility's best interest to increase customer satisfaction. "You cannot survive in any business if your customers hate you," said Rodrigues. "The only times customers think about us is when rates go up or there are blackouts. We're trying to provide the best service we can. One way is to help customers save energy and money."

Then there are also the environmental issues, which are becoming more prominent every day. "In light of all the research about global warming and pollution, we have a responsibility to environmental stewardship," acknowledged Rodrigues.

And there's one more big reason why utilities need to reduce sales of electricity and gas.

In many cases, they are required to do so.

That's right. In many states, utilities are mandated by their regulators to not only run energy-saving programs but to prove they are doing a good job of it. Because energy-efficiency programs are largely funded by public dollars, program administrators need to be accountable – to their customers, shareholders, local politicians and all citizens in their service territory.

### **More than just talk**

They can't get away with lip service and a quick energy audit. Efficiency program implementers need to provide measures that produce tangible energy savings – and then prove it to their state regulators on an ongoing basis. That's why utilities have a vested interest in working with companies like yours.

"When the energy-efficiency program industry spends \$2.6 billion, it has to deliver the goods," Rodrigues said.

Helping you become more energy efficient – i.e., using less of their product – has value to utilities. In fact, your business can get paid to save energy and money.

This doesn't mean going without or going with less. It just means doing it better.

In states where energy-efficiency programs are mandated, utilities can provide the technical expertise and other support to get you started. Sometimes financial assistance – in the form of rebates, loans or tax credits – is available as well. It varies from region to region, and is not available everywhere.

Thus your local utility may turn out to be much more than a service provider. It could turn out to be your business partner – saving energy for both of you.

Energy-efficiency programs are currently running in 34 states and we encourage you to take advantage of this opportunity. Give your local utility a call or check out its Website. We're in this thing together.

*The Consortium for Energy Efficiency is a North American nonprofit corporation that brings together efficiency program administrators of the U.S. and Canada to harmonize their individual efforts and advance high efficiency for the benefit of all.*

[<< Return to Main Page](#) | [Print](#)

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