ENERGY MATTERS

Formerly Turning Point • March 1999

GPU Energy Helps Customer Reduce Noise Level and Save Energy

Butler Printing and Laminating, in Butler, New Jersey, installed a variable frequency drive (VFD) on the noisy exhaust fan of its incineration system, and the operation has become noticeably more tranquil. Not to mention, the quieter fan now uses about one-third less electricity, which Butler predicts will save $38,500 annually.

The fan on the RTO is more energy efficient after a VFD was installed.

Seeking a way to quiet its notoriously noisy fan and improve its efficiency, Butler teamed with GPU Energy, a New Jersey utility and a Motor Challenge Allied Partner. Technical and financial assistance came through GPU's Customer Flex Program. "Through programs like the Customer Flex one, we can help our industrial customers cut energy use and save money," explains Lou Holzberger of GPU Energy.

Butler, a commercial printing and coating facility, makes wall coverings, pool liners, and window shades. To handle production, the company operates seven

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DOE's 3rd Industrial Energy Efficiency Expo Highlights Government/ Industry Partnerships that Save Energy and Cut Pollution

On February 7-9, more than 100 exhibitors and 1,000 industry representatives attended DOE's Third Industrial Energy Efficiency Symposium and Exposition in Washington, D.C. Why? To celebrate major advances in industrial energy efficiency, increased competitiveness, and pollution prevention.

"[This] event shows how far we've come in recognizing how important partnerships are in improving energy efficiency, productivity and our nation's environment," said Secretary of Energy Bill Richardson. "I'm proud that one of our own initiatives—Industries of the Future—has played such a big part in supporting our country's most energy-intensive industries."

The "Industries of the Future" approach encourages the most energy-intensive industries—including the chemical, forest products, agriculture, steel, aluminum, metalcasting, glass, mining and petroleum industries—to set their own research and development priorities, and then cost-share projects with partners from both the public and private sectors. This strategy maximizes available research and development resources to meet the DOE goal of decreasing industrial energy use by 25 percent by 2010.

At the event, DOE signed new agreements with the glass and steel industries. These agreements signify all the partners' commitment to pooling public and private resources, as well as their commitment to the "Industries of the Future" process.

Dan Reicher, DOE Assistant Secretary for Energy Efficiency and Renewable Energy, presented the Industry Recognition Awards to formally acknowledge those who have played a significant role in the "Industries of the Future" process.

An Office of Industrial Technologies Bimonthly Publication Focusing on Energy Efficiency Opportunities for Today

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Issue Focus: Utility Financing and Services

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Compressed Air Challenge Supplement

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GPU Reduces Noise and Saves Energy

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customized web printing presses, and it changes coating mixes and modifies equipment as needed for a particular job. Frequent switching from one press to another means the machines have considerable downtime, and rarely do all seven presses operate simultaneously.

To comply with EPA's Clean Air Act, Butler uses a regenerative thermal oxidizer (RTO), which incinerates volatile organic compounds (VOCs) from printing solvents. The large fan, driven by a 250-hp motor, draws VOCs into the incinerator to be converted into carbon dioxide and water vapor. Before the upgrade, inlet vanes controlled airflow to the fan. The RTO's fan whirred non-stop at full speed, 18-20 hours per day—regardless of the number of presses in operation or the air volume.

GPU representatives analyzed the fan to determine baseline airflow and usage, then agreed with a VFD installation. Last summer, Butler installed the VFD and quickly saw—and heard—results. Now the fan varies from 40% to 80% of capacity, depending on the number of presses in operation. The upgrade has hushed the fan and has helped Butler save on energy use.

While not as quiet as a library, "the 50 to 60 decibel level is minor compared to how it was in here, " declares Pete Weber, Butler project engineer. "We've got a good unit, and so far it's running pretty well," he adds.

The project cost Butler about $21,000. However, because it met the Flex Program's energy and demand savings criteria, GPU rewarded Butler with a rebate of nearly $14,000, making the payback just over 2 months.

Steam Challenge Sets Initiatives for Year

The Steam Challenge Steering Committee met in Columbus, Ohio, on January 28 and 29 to discuss the goals of the program and the initiatives for the upcoming year. Participants were industrial users of steam, steam-related product suppliers, service providers, trade associations, and energy resource organizations. As highlights, John Hoh of the National Board of Boiler and Pressure Vessel Inspectors spoke on safety considerations in operating steam systems, concluding that efficiently operating systems are highly correlated with safe workplaces. Dan Dvorak of DuPont presented factors affecting the quest for energy efficiency in his company and suggested approaches for gaining broader support within the company.

Participants set goals in six focus areas for the upcoming year to increase awareness of the opportunities in steam systems and provide resources to capture these economic and environmental opportunities.

Training: Increase awareness of training opportunities rather than design new courses, and encourage people to take courses by making information about them more easily accessible. A list of training courses is being compiled along with indication of courses with true merit.

Technical: List the top technical references, based on the basic areas of steam generation, distribution, end use, and recovery. Following will be collection and review of additional tools and products.

Benchmarking and Best Practices: Pull together information on best practices including articles, tips, reprints, end user newsletters, third party reports, and others.

Marketing and Communications: Evaluate how different types of organizations should participate and be recognized. This is part of a multi-year outreach effort showing the value of steam system projects.

Business Management: Provide information to upper-level executives to motivate them to initiate energy efficiency programs plant-wide.

Program Evaluation: Establish the parameters and develop methods of parameter measurement for evaluation of program success. This information will be used to identify policies that could influence industrial steam system efficiency, supporting those which are favorable.

Guest Column

Turning to Utilities for Financing Energy Projects

By Paul L. Lemar, Jr., Resource Dynamics Corporation

With electric utility deregulation either underway or expected soon in almost every state in the U.S., most utilities are developing new approaches to working with their industrial customers. Previously, demand-side management offered utilities an easy way to help customers upgrade their plant equipment and improve energy efficiency. As utility rebates become a thing of the past, a number of utilities are creatively helping their industrial customers improve efficiency. More and more, utilities are turning to financing programs to assist their customers and maintain a role in plant energy projects. Some utilities have launched unregulated subsidiaries to deliver energy services or invest in customer facilities such as on-site electricity generation or chilled water plants. For these entities, financing is playing a crucial role—finding the money for a project can often mean go or no go.

Financing of energy equipment is a growing market. In 1997, 32% of all equipment purchased was financed with leasing, and 93% of all businesses have used leasing to purchase equipment. Energy equipment, however, is leased much less than 32% of the time. Leasing energy projects is on the rise, however, primarily with HVAC and power generation equipment. Controls, motors and drives, lighting, envelope improvements, and boilers are other types of energy equipment that are also being leased.

Usually, these utility financing programs are structured around the utility's finance partner. In many cases, a utility has allied itself with a large, national financial firm that offers high-level service and competitive rates. Another alternative, a leasing broker, is used by utilities to offer services not available from larger firms, such as financing from multiple sources. A third option, a "phone book" approach, requires that the utility treat each financing opportunity as a bid which it in turn submits to a number of sources, including local banks. The pros and cons of these approaches are as follows:

Approach	Pros	Cons
National finance partner	Can offer high level of service (even dedicated point of contact on-site) and may offer the most competitive rates.	Sometimes looks only for best deals, and may turn down deals that are financeable but involve riskier credits.
Lease broker	Service can be fairly responsive, and can "shop" deals around to a variety of sources. Usually results in higher approval rate on deals.	Service usually responsive but not dedicated as with national firm. In addition, rates may be a bit higher.
Phone book	Requires no real structure or commitment on the part of the utility.	Sources can become unresponsive or simply quote high rates.

What this means for the industrial customer is that the quality of the financing offered by the utility depends on who is the utility's partner. In some cases, utilities have offered financing themselves, although this trend is definitely on the downturn.

Financing options available depend largely on the size of the deal and who is the customer. In the past, the leasing community has focused on leasing equipment such as trucks, automobiles, and computers. Now, with interest rates low and financing companies becoming more aggressive, more and more leasing companies are willing to finance energy equipment. If the equipment is being installed as part of a performance contract which "guarantees" energy savings, this does not necessarily make the deal a "slam dunk" to finance. If the leasing contract is separate from the performance contract, there may not be any assurance that the customer will apply the savings to making the lease payment. In the end, it is usually the credit history of the customer that determines whether a lease is approved or not.

The package that a leasing company will put on the table depends on the size of the project and who needs the money. Smaller projects, under $75,000-$100,000, are usually treated as "application-only", which means that less paperwork is required and higher rates are involved. Deals over $100,000 are treated more as commercial leases, and a variety of options exist:

- Finance leases—these, also known as capital leases, require that the customer purchase the equipment at the end of the lease, usually for $1. The customer uses the depreciation of the asset as well as the interest portion of the payment as tax deductions.
- Operating leases—these are often referred to as "off-balance sheet" financing, and are not recorded as debt on the balance sheet. To qualify for such treatment, the lease must pass a number of tests, known as the FASB 13 (named after the Financial Accounting Standards Board Statement Number 13). Basically, the lease allows the customer to purchase the equipment, renew the lease, or return the equipment at the end of the lease. The entire lease payment is treated as a tax deduction.
- True leases—these offer the tax benefits of the operating lease without passing all of the FASB 13 rules. As such, the customer has the option to renew the lease, purchase the equipment, or return the equipment at lease end.

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Energy Service Company—Providing Value to a Large Industrial Facility

By Gary Koelbl,
Planergy Services, Inc.

What is an ESCO?

In simple terms, an Energy Services Company (ESCO) is a business that provides energy management services to an energy user. As new technologies emerged in the 1990s, ESCOs expanded their services from relatively simple lighting and HVAC retrofits in commercial office buildings, government facilities, and light industrial plants to more engineering-intensive projects for industrial complexes. Some ESCOs also offer package deals for fuels, steam, hot and chilled water, and electricity for large plants. An ESCO may be an independent company or it may be a subsidiary of a larger energy supplier; and, the key staff people include both financial and technical specialists.

Today, many ESCOs still focus on energy efficiency projects in the lighting and HVAC fields because they are relatively easy, many times the payback is short, and the technology is reliable. However, there are a few ESCOs that work with large industrial clients such as oil refineries, chemical plants, paper mills, and power plants. Projects in these facilities are more complex, but they do provide ample opportunities for significant energy savings. Unfortunately, plant resources, such as time, expertise, and capital to implement energy projects are not always available. For these users, production and reliability projects often take priority because product output drives profitability. Nonetheless, plant managers and operators should be aware that improved production and energy savings work hand in hand to multiply profitability. A strong commitment from both the client and ESCO will make the efforts rewarding.

Services benefit the end user

An ESCO provides a myriad of energy management services. The process usually starts with a plant-wide energy survey that includes payback analyses and recommendations. Usually, after the "first cut", a contract to provide energy savings, called the Energy Services Agreement (ESA), is signed by both parties. Following that, the ESCO will provide engineering expertise for more detailed efficiency studies and submit applications and reports to local utilities for subsidy programs, if available. For each selected energy savings measure, the equipment modification and vendor choice are agreed upon between the user and ESCO. When specific applications are identified and approved, the ESCO will provide, usually at no cost to the user, the metering devices for the Monitoring and Verification (M&V) procedures. Then, the ESCO engineer will help coordinate the equipment baseline studies and reports. A key factor in the energy management program is the continual measurement of savings, so the baseline should cover the full range of operation prior to installing the energy savings measure. The baseline (old) minus the "new" power readings equal the energy reduction. The other ingredient for a savings analysis is run time. Trend charts or operation logs are used to establish the "hours-per-year" profiles. Combining energy reduction data and hours run time gives the kWh savings.

Usually, the ESA has a stipulated term, say 5 years, during which time the savings are "shared" between the user and the ESCO; and, this is how the ESCO gets paid for its services. This is not an additional expense to the user because the sharing is taken out of expense payments that would normally have gone to the energy supplier. After the ESA term expires, all savings go to the user.

If the industrial user does not have a budget for energy savings projects, the ESCO may arrange "Pay-for-Performance" project financing. The ESCO will pay for some or all of the project costs, including equipment and installation. Then, an "agreed-to" portion of the monthly energy savings is paid to the ESCO to cover its costs and profit margin. The dollar amount and term of the arrangement will depend largely on the economics and payback period. Today, most industrial users require a one-year maximum simple payback, whereas ESCO project financing can extend that up to 5 years. This is not financing in the normal sense because there is no stated interest rate and no fixed monthly payment, but the sharing amount is set in the ESA. Pay-for-Performance financing offers a major benefit to the user because he pays only for the measured savings. The financial risk associated with the project performance is borne by the ESCO. The user's obligation is to run the plant as he normally would within the parameters established for the energy savings measure.

With energy saving projects, additional benefits available to the user include improved equipment reliability and better process control. Equipment retrofits usually provide state-of-the-art design modifications for easier maintenance as well as better efficiency. In a real sense, the ESCO can provide a focus for a large plant to really accomplish some energy saving projects that may otherwise go unnoticed.

Case Studies

Planergy Services, Inc, Richmond, California, is an industrial ESCO with projects in several refineries, gas and liquid pipelines, paper mills, and other industrial plants. It has incentive-based contracts with PG&E for Northern California, Texas Utilities for central and west Texas, and Houston Light and Power for Houston, Texas. These utilities will pay incentives, over and above energy bill savings, to

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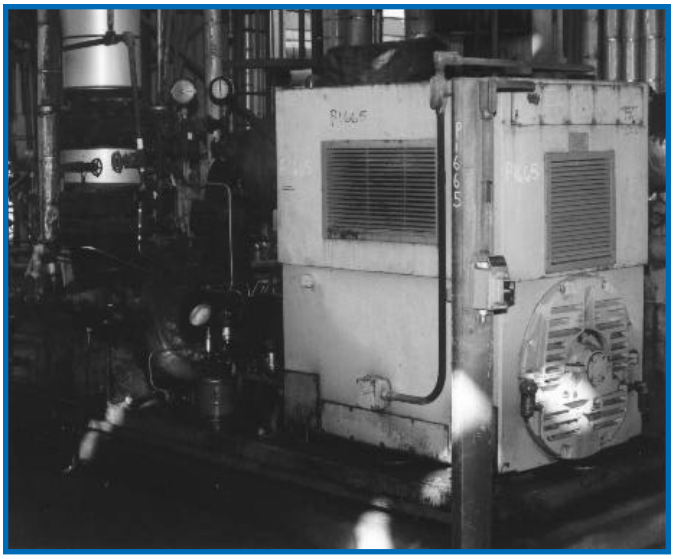

700-hp transfer pump on which one VSD was installed.

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users in their respective service areas who install energy savings measures and monitor and report the savings through Planergy. The case studies will focus on projects at two refineries in the San Francisco Bay Area.

Chevron, Richmond, CA

In 1993, the Richmond refinery converted its Vacuum Gas Oil plant to a Diesel Hydrotreater plant, decreasing the feed rate by some 60%. Lower flow rates caused many of the pumps to operate well below their best efficiency points and that resulted in dramatically decreased equipment reliability and availability. Chevron reliability personnel evaluated several proposals to improve the situation, but return-on-investment hurdles, budget, and manpower priorities precluded any immediate action. Two years later, Planergy approached Chevron as a potential candidate for the PG&E Energy Partners program. When the Chevron Energy Coordinator and others learned they could get pump rerates and variable speed drives at no cost, they immediately started the process to upgrade the plant equipment.

With a $1.2 million investment from Planergy, Chevron installed two variable speed drives (VSDs), rerated a multi-stage pump and a power recovery turbine, and changed the operating procedures on two reactor charge pumps. The result for Chevron is over $750,000 per year energy savings, and significantly improved reliability and availability.

In more detail, one VSD was installed on a 2250-hp "DHT" first-stage charge pump and the other on a 700-hp transfer pump. Energy savings came from reducing power losses through flow control valves. The internal elements for the 2250-hp second-stage charge pump and an associated 400-hp power recovery turbine were completely redesigned to improve their efficiencies from 50% to 70%. Although installed for many years, the power recovery turbine had been idle because it was not properly matched to the system. In the ISO-MAX unit, the procedure change allowed operators to use the back-up 4000-hp pump 90% of the time and use the 5500-hp pump only when needed. Thus, they operate the most efficient pump based on plant feed rate. These measures demonstrate a variety of methods available to improve energy efficiency and equipment reliability.

Follow-on projects at Richmond include a Fluid Cat Cracker controls improvement project to save about 1 MW; rerating the steam turbines in No.1 Power Plant for 4 MW; 5 additional power recovery turbines for 17 million kWh per year; and some other pump modifications for 5 million kWh per year.

Equilon, Martinez Refining Company

Equilon management has recognized the importance of energy savings and has established a budget to support their energy projects. Equally important, they have formed a committee to promote energy savings within the refinery. Their energy program started with a refinery-wide survey of pumps and fans using electric motors over 100 hp. The survey included a one-hour interview with reliability and operations personnel for each of six zones. Planergy engineers assisted with the survey, and with collecting the equipment specifications and trend usage data. After the sorting was done, about 30 applications were looked at in more detail. More than half were pump retrofits and the rest were VSDs on pumps and fans. For an estimated one-million-dollar investment, the expected annual savings are $680,000.

Some unique applications under consideration at Equilon include adding stages to a pump to allow a 2-pump instead of 3-pump operation, and installing a flow-straightening device called a Cheng Rotational Vane to reduce flow turbulence and increase pipe system efficiency.

Guest Column

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However, the lease is recorded as debt on the balance sheet. The entire lease payment is treated as a tax deduction.

Within the $75,000-100,000 range, a customer may be able to arrange for an application-only lease or apply for a commercial lease. Usually, the cut-off varies by lender.

As an option to internally-financed projects or their usual source of financing, industrial customers should consult their local utility to see if a financing program exists for their use. It never hurts to have more options, and it may be that the utility and their finance partner will aggressively seek lower rates, thereby putting a better lease on the table.

Send comments/questions to pll@rdcnet.com; (703) 356-1300 (phone); (703) 356-2230 (fax).

Performance Optimization Tips

Understanding the Changing Needs of Your Systems

By Don Casada, Motor Challenge Program, Oak Ridge National Laboratory

Note: This article, focusing on understanding the changing picture of system operations, is the second of a series dealing with potential pitfalls in field measurements of motor systems. The first appeared in the November 1998 issue of Turning Point.

Wherever you're reading this, take a look at the electrically-operated equipment around you. How many of those devices are currently operating? How many are constant loads? Here in my home office, I see a clock, portable heater, desoldering iron, oscilloscope, test loop pump, the computer on which these words are being composed, and probably 20 other devices, including the lights that let me see all this stuff. Some are presently energized and run about 99.9% of the time (the clock); others aren't, and operate less than 0.1% of the time (the desoldering iron). Although the patterns are certainly different than residential, industrial systems likewise see varying loads.

A cornerstone of any process or system optimization effort involves developing a thorough understanding of how demand varies with time and creating a system that can respond both efficiently and effectively. We wouldn't expect grocery stores to set cash register clerk schedules based on the checkout queue at 7 a.m. on Sunday (although experience at times suggests that could be the case). Likewise, a single snapshot in time of an energy consuming system usually won't suffice in optimizing its operation.

Figure 1 is an example of a load profile for a pumping system. Although the flow requirements vary by more than a factor of five, it can readily be seen that nearly 90% of the time, the flow requirements are between 0.5 to 1.5 thousand gpm. Clearly, any energy optimization process would primarily consider this load range. The information conveyed in Fig. 1 can be arranged in any number of fashions; the key point is to clearly reveal the distribution of load conditions.

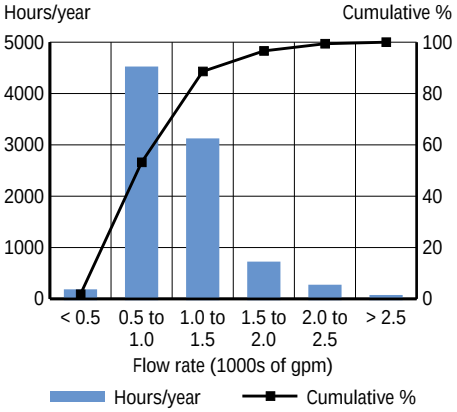

Figure 1. Annual flow rate requirements distribution.

How does one develop such a profile? A permanent monitoring and logging program could provide the requisite data, and may be both feasible and desirable for large (hundreds of hp) systems, but it is often not practical for small and intermediate size systems. Are there alternative methods that can be used to establish a reasonably accurate profile for small and intermediate size systems without the expense and complication of a comprehensive monitoring and automated data logging program? The answer, in many cases, is yes. Let's use a chilled water system (Fig. 2) to illustrate. Assume that our present focus is on the tower water pumping portion of the system (which removes heat from the chillers), and that there is no existing electronic data logging for the system.

A good first step in any situation is to apply a little common sense (an increasingly less common commodity), and consider whether the processes supported by the system are, in fact, likely to change with time[1]. In this case, it is reasonable to expect that the loads on the chilled water system would vary significantly with the time of year and to a lesser extent, the time of day and week; therefore, variation in tower water pump operation would be expected. To understand pump operational efficiencies, the numbers of pumps running, flow rate, head, and motor input power across the course of the year are needed. Existing pressure and flow instrumentation, supplemented by motor power or current monitors could be used in conjunction with a temporarily installed electronic data logging system to accumulate data over the course of several months. Should we set up the system and let it start acquiring data for us? Maybe, but consider some alternative courses of action first:

1. Interview operators. Or more precisely, shoot the bull with them. Get to know what drives them and makes their life difficult. Most operators are quite willing to share their opinions about the "idiot that designed this system," and what they have to do to make it work. Let operators know why you're asking, and make it clear that you're looking to them for advice. If you can help address their problems in conjunction with any energy-saving action, your chance for success will be greatly improved.

Any energy reduction action that makes life more difficult for operators may very well, over the long haul, result in greater energy consumption, since the operator's principal focus is to keep things running; and energy costs are usually well down on the priority list. On the other hand, any action that makes their life easier will encourage a relationship that can help in identifying other energy-saving opportunities.

Operators can help develop estimates that, although less precise than logs, can often provide a fairly accurate picture of operational patterns. More importantly, operator "interviews" can shed a great deal of light on reasons for the existing conditions that careful data logging would entirely miss. For example, an operator

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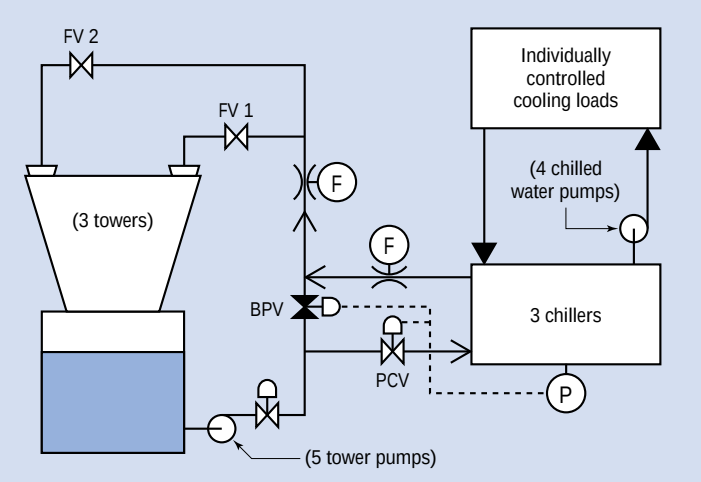

Figure 2. Chilled water system with heat rejected to a tower water system.

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might note that up until a couple of years ago, one pump in winter and two pumps in summer worked fine in removing heat from Chiller A. But recently, three pumps have been required during the summertime, and even with the additional pump running, chiller condenser pressure is 2 psig greater in the summer than it was previously. Information such as this should immediately raise a flag and spur questions about what has caused the degradation. Any number of factors could be involved, such as a malfunctioning bypass valve or condenser pressure control, pump degradation, or scale buildup on the condenser heat exchanger tubes, any of which is deleterious to energy-efficient operation.

On the other hand, if the operator states that the same number of pumps are run year-round, a different flag should be raised, since our common sense suggests that load variation would be expected to result in variation in supporting pump operation.

2. Find and review manual operator logs, if available. If logs don't include all the desired information, request that the operator logs be supplemented to include the missing parameters. This can be valuable in two senses—the needed data will be acquired and it will give you and the operators a chance to discuss why the information is important to system optimization.

3. Develop a separate manual log maintained by non-operations personnel on an energy reduction team[2]. An advantage to this is that it provides a mechanism to ensure that desk jockeys get out into the field. In many instances, simply being around operating equipment and the folks who operate it will help flag problem areas that are independent of the data being logged.

4. If initial review and discussions indicate that relatively narrow regions dominate the load profile (as in Fig. 1), concentrate more refined data collection efforts on those regions. It may be possible to get comprehensive, accurate data that represents 80-90% of the load duration with only two or three sets of test data instead of a much more massive accumulation via manual or electronic logs.

Things change. The establishment of a load vs. time profile is a critical part of the optimization effort. It is sometimes a tedious job, but it can often be simplified. Accurate data are, of course, important. But communications, particularly with operations staff, can significantly reduce the detailed monitoring effort needed to develop at least an approximate system profile. Equally importantly, these discussions can reveal opportunities that would have never been recognized with a more precise, objective, but silent electronic data log.

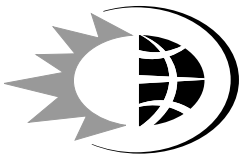
Comments/questions welcome by e-mail: a85@ornl.gov.

[1]Generally speaking, the proper sequence for optimizing any system is to start at the end goal of the system and work backwards. In this case, the tower water pumps should only be considered after addressing the loads, the chilled water, and the chillers.

[2]It should be clear from this article that the author believes that any energy reduction effort should include a strong operations presence, so it is not suggested that operators can be bypassed in the data collection process. Rather, this recommendation is based on the observation that engineer's computers produce much better results when the fingers pressing the keyboard and moving the mouse have dirt, grease, and burn marks on them.

The Northwest Energy Efficiency Alliance—Helping Industrial Customers Improve Efficiency

The Alliance—collaboratively funded by the public utilities and investor-owned utilities serving Washington, Oregon, Idaho, and Montana—sponsors cost-effective, energy efficiency projects in the region to help protect the environment and lower electricity costs for Northwest electric utility customers. The Alliance uses a tool called market transformation to achieve the savings. After examining a market and determining what barriers are preventing energy-efficient products and services from being offered there, the Alliance, in collaboration with experts in that particular field, devises and implements a strategy to remove those barriers.



NORTHWEST ENERGY EFFICIENCY ALLIANCE

The Northwest Energy Efficiency Alliance recently initiated two projects that it expects will lower electricity costs for Northwest industrial customers as well as improve productivity. The first, Sav-Air, is an innovative measurement and reporting system for industrial compressed air systems. Compressed air, a commonly used industrial commodity, is almost never measured. Sav-Air is intended to help identify inefficiencies in existing systems and spur cost-effective improvements that also increase the efficiencies of industrial processes.

Sav-Air's services include a preliminary system audit and installation of metering equipment. Once the system is evaluated, upgrade recommendations will be made and monitoring will continue to verify savings. The Alliance estimates that savings of up to 25% could be achieved at industrial sites through the improved systems.

The second project is an industrial motors program called DrivePower that is working to improve the average fleet efficiency of Northwest motors. The goal of DrivePower is two-fold. First, the project will work with reconditioning shops to improve the quality of motor reconditioning techniques. Shops that meet certain performance standards will be given a preferred service provider status. Recommended preferred providers will be marketed to industrial companies that have a need for motor reconditioning.

Second, the project will work with industrial companies on the efficiencies that can be gained through comprehensive motor system management. Research shows that currently many firms think of motors and their components as discrete items without much thought to the efficiency of the system or the implications of decisions on purchasing new equipment or reconditioning older equipment. Very few look at the entire system as an opportunity to derive additional "profit" through reduced operating costs, lowered maintenance, reduced unplanned outage, better control, etc.

DrivePower plans to establish a circuit rider program that will work with industrial customers to take advantage of these additional benefits of looking at ways to improve the entire motor system.

For more information about the Alliance or Alliance projects, visit their Web site at www.nwalliance.org or call Shawn Wolfersperger at (800) 411-0834 ext. 235.

Coming Events

Understanding Pump Systems/PSAT Workshops

The following sessions present the fundamental of optimizing industrial and municipal pump systems. The workshops will present case studies and will focus on the Pump System Assessment Tool (PSAT).

- March 25 in Taunton, MA
- June 6 in Milwaukee, WI
- June 20 in Chicago, IL
- August 29 in San Diego, CA

Call Anna Maksimova at (360) 754-1097, ext. 100 for more information.

ASD Workshops

These workshops address the fundamentals of ASDs and demonstrate the ASDMaster Software.

- April 1 in Columbia, SC
- June 1-2 in Reading, PA
- June 10 in Springdale, AK

Call Anna Maksimova at (360) 754-1097, ext. 100 for more information.

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Information Clearinghouse

Do you have questions about using energy-efficient electric motor systems? Call the OIT Challenge Programs Information Clearinghouse for answers, Monday through Friday 9:00 a.m. to 8:00 p.m. (EST).

HOTLINE: (800) 862-2086

Fax: (360) 586-8303, or access our homepage at www.motor.doe.gov

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Compressed Air Challenge™ Sponsors Introduce New Training Workshops

By Floyd Barwig,
Compressed Air Challenge™
Advisory Board Chair

On behalf of the sponsors of the Compressed Air Challenge™, it brings me great pleasure to announce *Fundamentals of Compressed Air Systems*—a new training on compressed air systems. This 1-day training is now available nationwide, with workshops being offered in most major cities (see insert). What makes this training unique is the way it was developed, its focus on system efficiency, and how it is being offered across the country. The target audience is plant engineers and maintenance supervisors, but anyone interested in learning more about a systems approach is welcome to attend.

Fundamentals is the result of a remarkable 2.5-year voluntary collaboration of the best minds in the compressed air business—users of compressed air, system consultants, equipment manufacturers and distributors, state and federal government, an association of plant engineers, energy efficiency organizations, and utilities. I have never been involved in anything quite like this effort, which has brought together so many different groups that share the common goal of improving the performance of industrial compressed air systems.

Raising awareness within U.S. industry is what the Compressed Air Challenge™ is all about. That is, awareness about the benefits of applying a "best practices" approach to the management of industrial compressed air systems. The U.S. Department of Energy estimates that these systems use 90 billion kWh per year. In most plants, 20%-50% of the energy used to power these systems can be saved while maintaining the same level of productivity. This is an overlooked opportunity to reduce costs, improve system reliability, and increase production capacity.

The *Fundamentals* training takes a comprehensive look at the compressed air system, its various components and operational practices, and then assists participants in laying out seven steps to take in order to identify and take advantage of missed opportunities. Participants will learn how to:

- calculate energy costs of compressed air
- improve compressed air system reliability
- establish a baseline
- match system supply to actual production requirements
- find leaks
- attain better control of the compressed air system

Each workshop is brought to you by several organizations involved in developing the curriculum. They are taught by two expert instructors drawn from a pool of 25 highly qualified and carefully selected individuals. Every effort has been taken to develop and present a curriculum that is technically accurate and product neutral. As a package, the training is an interactive learning experience for both the student and instructor. The focus is on giving participants information that they can take back to the plant and immediately put to use.

To learn more about the Compressed Air Challenge™ and how to participate, please contact the Web site at www.knowpressure.org, or call (800) 862-2086 for a registration form for a training workshop near you.

Fundamentals of Compressed Air Systems Seven Step Action Plan

The Fundamentals of Compressed Air Systems training program is designed to prepare the participant to develop and follow a seven-step action plan. The purpose of the action plan is to produce results—lower operating costs and greater reliability.

Action Plan

1. Develop a basic block diagram.
2. Measure your baseline (kW, pressures, and leak load) and determine costs, with tools available.
3. Work with your compressed air system specialist to implement an appropriate compressor control strategy.
4. Once controls are adjusted, re-measure to get more accurate readings of kW, pressures, and to determine leak load. Re-calculate energy use and controls.
5. Walk through to check for obvious preventive maintenance items and other opportunities to reduce costs and improve performance.
6. Identify and fix leaks and correct inappropriate uses—know costs, and re-measure as above.
7. Evaluate Steps 1-6 and begin implementation of an awareness and continuous improvement program, and report results to management.

Working to Improve Compressed Air System Effectiveness

Compressed air systems are used to perform a variety of functions in businesses and industries throughout the United States. Though sometimes overlooked, a properly designed and maintained compressed air system can play a big part in making a business successful. The Compressed Air & Gas Institute (CAGI), a non-profit trade association of manufacturers of components of compressed air systems, has been working to improve the performance of compressed air systems and equipment in the United States for over 80 years. End users can rely on the expertise within CAGI and the standards and educational material produced by the institute to properly select equipment, improve equipment reliability, and enhance productivity.

CAGI is a sponsor of the Compressed Air Challenge™ and has played a leading role in providing technical support. CAGI also is a DOE Motor Challenge Allied Partner.

Tools and Resources to Help You Improve Efficiency

CAGI members work to improve the effectiveness of compressed air systems and to increase the satisfaction of users of compressed air systems with those systems. The institute has developed many publications that address compressed air systems and system components, including compressors, filters, tools, and dryers. Among these publications is the *Compressed Air & Gas Handbook*. The handbook provides a wealth of information about compressed air systems and compressed air equipment that will answer most questions posed by end users. A companion video series is being developed to provide information about compressed air systems in an easily understood manner.

In addition to educational publications, CAGI has developed a number of standards to help end users specify the equipment that will provide the performance that they need. CAGI standards deal with all aspects of compressed air systems, including methods for testing and rating the performance of various types of filters, dryers, and compressors; compressor noise emission test standards; and pneumatic tool safety codes. The standards are intended to aid end users in the selection of equipment, and purchasers are advised to specify and buy equipment that has been tested to CAGI standards.

The following CAGI projects also address compressed air system effectiveness and efficiency:

- a common means of reporting performance through standardized data sheets that will allow purchasers to more easily compare products. Data sheets for rotary screw compressors and two types of compressed air dryers have been developed and will be implemented this year. Data sheets for other types of compressors, filters, and blowers are forthcoming.
- a searchable database will become active this fall. The database will be accessible via the Internet and will contain the information found on the standard data sheets.
- development with DOE of an educational video on compressor selection. The video will complement the series of videos that the institute has been producing to address proper selection, installation, and maintenance of compressed air systems and components.
- co-hosting the *Fundamentals of Compressed Air Systems* training sessions that are being conducted by the Compressed Air Challenge™ this spring.
- continued active participation in the work of the Compressed Air Challenge™, including promotion of training sessions and development of a more advanced training curriculum.

CAGI in collaboration with the Compressed Air Challenge™, the Motor Challenge Program, and other organizations plays a part in improving the competitiveness of U.S. businesses by enhancing the performance of compressed air systems, a critical but sometimes overlooked factor in the success of many businesses.

For more information about the Compressed Air & Gas Institute, visit the CAGI Web site at www.cagi.org.

Ford Plant Cuts Costs by Optimizing Performance of its Compressed Air System

Through a partnership with Detroit Edison, Ford Motor Land Services embarked on a project to improve the efficiency of the compressed air system at its Woodhaven Plant. Over the last year, Ford has implemented a number of cost effective actions at the plant that are resulting in improved compressed air system performance and cost savings.

The 2.7 million-square-foot Woodhaven Stamping Plant, located in Woodhaven, Michigan, processes approximately 1,600 tons of steel per day into body panels for Ford vehicles.

With a project team comprised of plant management and skilled trade personnel, Ford Motor Land Services and Detroit Edison energy managers designed and implemented a plan to reduce the plant's high leakage rate and the $1.8 million in electricity costs attributable to the compressed air system. Empowering and involving two experienced hourly machine repairmen, Scott Brooks and Mike Rounsifer, was key behind this effort. Their personal commitment and passion to reduce compressed air consumption has made this effort a success.

After just 6 months of effort, the plant has reduced their average standard-cubic-feet-per-minute (scfm) flow by approximately 18% (from 25,000 scfm to 20,500 scfm) and cut electricity costs by approximately $400,000 per year. One 800-hp reciprocating compressor was taken completely off line and remaining in-service compressors are consuming slightly less energy.

Actions Implemented in the Second Half of 1998:

The Woodhaven plant undertook the following actions in its efforts to improve compressed air system performance.

- Assembled an Air Leak Detection/Correction team. Two machine repairmen were assigned to identify and correct significant leaks. Management support was gained for this activity by presenting a cost-benefit analysis. Leak correction activities occur primarily during the July and December plant shutdown, during lunch breaks, and unscheduled downtime. This effort is credited with reducing air consumption approximately 2,500 SCFM (4,000,000 kWh).*
- Replaced leaking seals on the stamping press die automation valves, reducing approximately 1000 SCFM (1,600,000 kWh).*
- Lowered air header pressure approximately 5 psig, resulting in electrical savings of 2,300,000 kWh.*
- Replaced existing flow measuring orifice plates with low loss venturis to measure discharge flow from two of the largest air compressors. Replaced orifice plate in main system header with an averaging pitot tube.
- Developed posters and banners to publicize the leak detection/correction effort with the production staff. This year's budget includes funding to train the production staff on the cost of air and electricity and to continue to build awareness.
- Began shutdown of small (30 hp each) dedicated satellite air compressors. These satellite compressors were installed to supply 110 psig compressed air to some of the stamping press robots. After testing, the team demonstrated that five out of seven of these compressors could be shutdown. Supply air for these robots was returned to the plant's lower pressure (70 psig) main air header. The need for the two remaining satellite compressors is still under evaluation. The projected energy and maintenance savings for this project is $55,000 annually.

Ford Motor Land Services' 2.7 million-square-foot Woodhaven Plant.

After just 6 months of effort, the plant has reduced their average standard-cubic-feet-per-minute (scfm) flow by approximately 18% (from 25,000 scfm to 20,500 scfm) and cut electricity costs by approximately $400,000 per year.

"We are very happy with the results we have achieved so far from the improvements we made to our compressed air system. We want to continue to operate as efficiently and cost effectively as possible, so we have planned several efficiency measures for this year," explains Joe Ghislain of Ford Motor Land Services. Actions being evaluated for 1999 include refurbishing blanker die automation valves, replacing leaking counter balance pressure regulating valves, replacing air driven vacuum pumps with electric vacuum pumps, correcting improper use of compressed air, compressed air and electrical departmental billing, adding a part-time electrician to the Air Leak Detection/Correction Team, and installing energy-efficient compressed air dryers and motors, among other actions.

*Based on

1. 12 months of operation
2. Compressor hp average = 4.25 SCFM (kW = 5.4 SCFM)
3. Electrical Power Cost: 0.0435 $/kWh

Helping Plant/Facilities Engineers Make the Best Use of Compressed Air Systems

By J. Bruce Medaris, CPE, Executive Director, AFE

The level of knowledge among plant and facilities engineers regarding compressed air systems varies widely from 'expert' to none. The vast majority have very little knowledge of the high cost of this *fourth utility,* or what they can do to dramatically improve their operating efficiency. The Association for Facilities Engineering (AFE) entered into the Compressed Air Challenge™ to help change this situation. The Challenge was conceived to educate industry about best practices in compressed air systems, through which substantial energy savings could be realized.

AFE enthusiastically joined the Compressed Air Challenge™ under the auspices of the AFE Foundation, a not-for-profit organization representing about 9,000 plant and facilities engineers throughout the country and abroad. It was, and is, the intention of the AFE Foundation to assure that the people responsible for the physical plant were educated as to the actions they could take to make better, more efficient use of their compressed air systems. AFE is dedicated to the proposition that the plant/facilities engineer is the linchpin connecting upper management to the realities of operating and maintaining the physical plant. They are the people who are charged with operating and maintaining their plants as efficiently as possible within the mission and goals of the company.

The Compressed Air Challenge™ is seen as a means of delivering the required level of knowledge on best practices for compressed air systems in a standardized format and content to all who need it.

AFE holds a seat on the Compressed Air Challenge™ Project Development Committee in the interest of obtaining the best possible compressed air training content and quality for the engineers they represent. In addition, AFE is looking forward to a process of certification in compressed air systems as a means of providing a standard of reference for dealings between and among those involved in compressed air audits of plants, distributors, and plant personnel. (AFE currently certifies plant engineers and plant maintenance managers.)

Conducting the compressed air training is a sensible decision for both financial and technological reasons, but for AFE, the Challenge presents an opportunity to immerse its members in an environment committed to education, in keeping with the AFE mission: *"To Learn, Lead, and Influence."*

The Compressor Distributors Association and the Compressed Air Challenge™

The formation of the Compressed Air Challenge™ spurred the creation of the Compressor Distributors Association by bringing together several independent compressor distributor associations. Distributors for Atlas Copco, CompAir LeROI, Gardner Denver, Quincy and Sullair pooled their resources and formed the Association.

Manufacturers' distributor organizations from across the nation represent the largest resource pool available to help form and implement the Compressed Air Challenge™ goals. The several hundred privately-owned compressor distributorships, along with their sales force, are the backbone of the compressor industry. They represent the compressor industry to the vast majority of compressed air users.

The service departments of local compressor distributors have technicians available to adjust controls and verify proper performance of the components in a normal compressed air system. In most cases, their sales force are the individuals who will advise the users on supply equipment, system design, and proper uses for an energy-efficient system.

As the Compressed Air Challenge™ begins its first rollout training sessions, it is the local distributors who are filling the classrooms and eagerly learning the concepts developed. These same people are the ones who will be filling future classrooms with the industry users, their customers, in order to further these energy saving guidelines. The involvement and support of the Compressor Distributors Association is and will be crucial in the marketing, training and implementation of the Compressed Air Challenge™. The Compressor Distributors Association embraces the concepts and future thinking of the Compressed Air Challenge™ and is pleased to be playing a part in its success.

DOE Supports Systems Approach to Compressed Air

Improvements to major fluid systems (pumps, fans, and air compressors) represent up to 62% of potential savings for manufacturing plants, as reported in DOE's *U.S. Industrial Electric Motor System Market Opportunities Assessment.* The greatest efficiency opportunities are found in taking a systems approach—evaluating all aspects from input power to the work performed by the system. DOE's Office of Industrial Technologies (DOE/OIT) began working with the industrial compressed air market in 1995 to identify possible joint projects to encourage a systems approach to compressed air.

The Compressed Air Challenge™, initiated in 1997 by DOE/OIT, the American Council for an Energy-Efficient Economy, and the Energy Center of Wisconsin, is in keeping with DOE/OIT's mission of partnering with industry, and other government and non-governmental organizations. The purpose is to significantly improve the resource efficiency and competitiveness of the materials and process industries.

DOE/OIT has partnered with the Compressed Air Challenge™ to develop the publication *Improving Compressed Air System Performance: A Sourcebook for Industry.* The Sourcebook is available for $19.95 by calling (800) 862-2086.

As a sponsor of the Compressed Air Challenge™, DOE is excited to be participating in a national rollout of the *Fundamentals of Compressed Air Systems Training* this spring. A listing of the training sites is enclosed. Call (800) 862-2086 for a registration form. Please register early, as demand is expected to be high.

Compressed Air Challenge™: Fundamentals of Compressed Air Systems Training

Arizona		
Phoenix	6/17/99	Mesa Pavilion Hilton
California		
Los Angeles	4/15/99	Radisson Hotel
San Diego	6/11/99	Town & Country Resort & Conference
Colorado		
Denver	5/6/99	Doubletree Hotel
Connecticut		
Hartford	5/26/99	Northeast Utilities
Florida		
Jacksonville	5/4/99	Holiday Inn Airport
Tampa	6/22/99	Ramada Airport Inn & Conference Center
Georgia		
Atlanta	6/4/99	Wyndam Garden Buckhead
Idaho		
Boise	5/18/99	Doubletree Hotel Downtown
Illinois		
Rockford	4/9/99	Holiday Inn Rockford
Peoria	4/13/99	Pere Marquette
Chicago	4/20 and 4/21/99	ComEd Technical Training
Iowa		
Cedar Rapids	6/7/99	Kirkwood Community College
Des Moines	6/8/99	Des Moines Area Community College
Iowa/Illinois		
Quad Cities	5/25/99	Eastern Iowa Community College
Kansas		
Kansas City	6/15/99	Best Western Inn and Conference Center
Maryland		
Baltimore	5/21/99	Sheraton
Massachusetts		
Worchester	4/13/99	Ramada Inn Worchester
Boston	6/4/99	Four Points Sheraton
Michigan		
Detroit	6/3/99	Hyatt Regency Dearborn
Minnesota		
Minneapolis	4/28/99	Doubletree Hotel Minneapolis Airport at the Mall
Missouri		
St. Louis	4/15/99	Edwardsville, Southern Illinois University Facility
Montana		
Missoula	4/28/99	Holiday Inn Missoula
New Jersey		
Woodbridge	5/25/99	Sheraton Hotel at Woodbridge Place
New York		
Buffalo	5/18/99	Buffalo Marriott
Syracuse/Albany	6/8/99	Radisson Plaza Syracuse
New York City	6/11/99	LaGuardia Sheraton
Oklahoma		
Oklahoma City	6/22/99	Biltmore Hotel
Ohio		
Cleveland	5/4/99	Cleveland East Marriott
Oregon		
Portland	5/18/99	Oregon Institute of Technology
Pennsylvania		
Allentown	5/12/99	Days Inn & Conference Center
Philadelphia	6/4/99	Holiday Inn Valley Forge
Pittsburgh	6/8/99	Holiday Inn Pittsburgh Airport
York/Lancaster	6/10/99	Holiday Inn Visitor's Center
Rhode Island		
Providence	5/11/99	Holiday Inn Downtown
South Carolina		
Greenville	6/11/99	Hilton Towers Greenville
Tennessee		
Knoxville	5/13/99	Hilton Knoxville Airport
Nashville	5/28/99	Renaissance Marriott Nashville
Texas		
Dallas	5/28/99	Dallas Marriott Quorum
San Antonio	6/14/99	Doubletree San Antonio
Utah		
Salt Lake City	5/26/99	Hilton Salt Lake City
Virginia		
Richmond	6/11/99	Hilton Richmond Airport
Washington		
Spokane	5/11/99	Cavanaugh's River Inn Spokane
Seattle	6/9/99	Radisson Hotel Seattle Airport
Wisconsin		
Eau Claire	5/11/99	Quality Inn
Green Bay	5/18/99	Comfort Suites
Janesville	5/24/99	Ramada Inn
Madison	5/25/99	Dane Co. Expo Center
Waukesha	6/9/99	Country Inn

For more information or a registration form, call (800) 862-2086

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