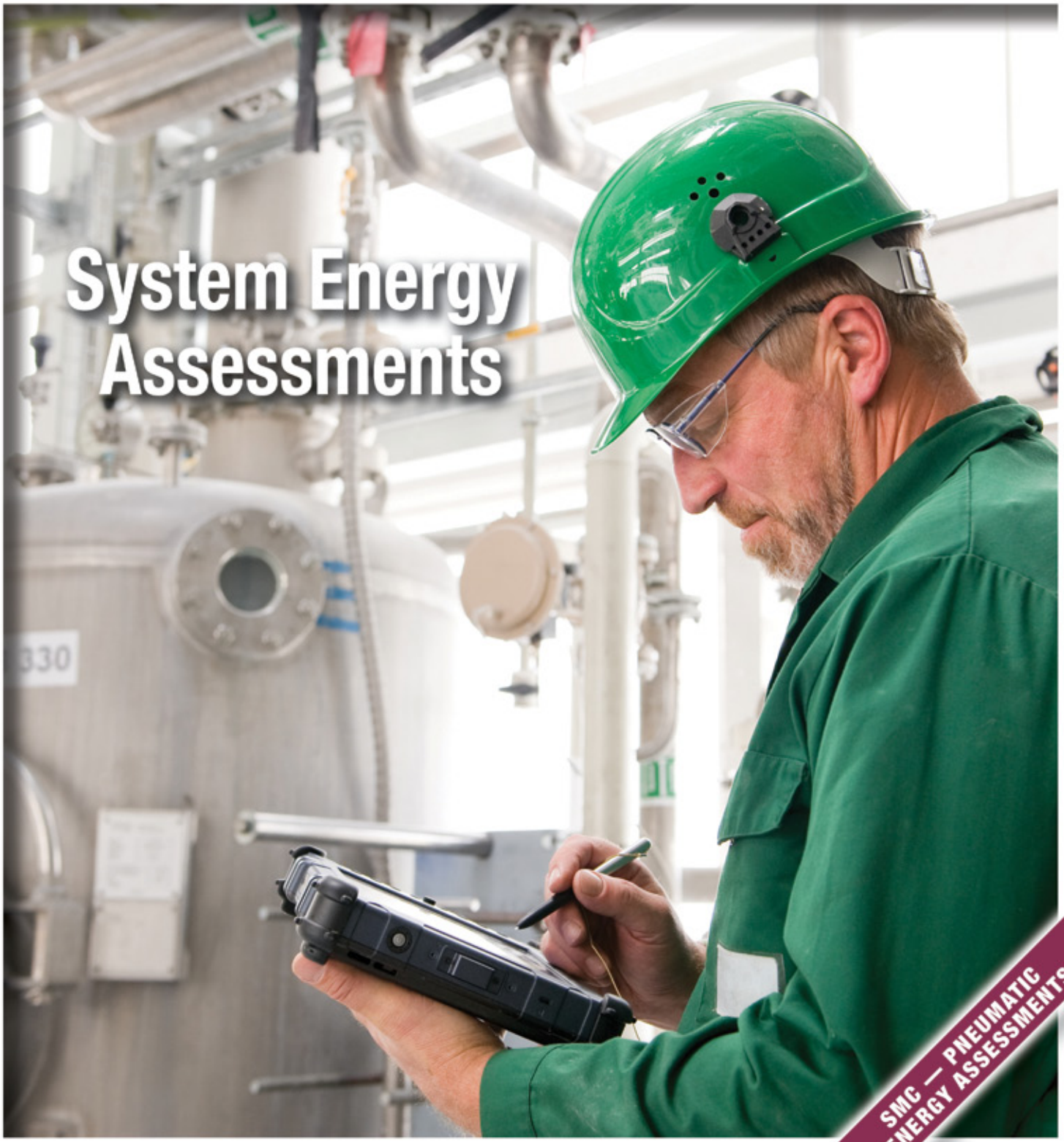
Auditing 101 | Manitoba Hydro Energy Incentives | Blower Audit

August 2010

COMPRESSED AIR BEST PRACTICES®



System Energy Assessments

SMC — PNEUMATIC ENERGY ASSESSMENTS

Atlas Copco Compressors: The Air Auditing Specialists.

Puzzled by rising energy costs?

Atlas Copco has a full range of compressed air auditing services available - from simple system diagnostics all the way to ultrasonic leak detection. These services are available for any compressed air system.

A compressed air audit from Atlas Copco will:

- Show your compressor's energy usage.
- Highlight areas where savings could be made.
- Provide you with a payback analysis on any new investments.
- Provide you with a professional audit report.

Text: Audit and your Zip Code to 79274
Call Us: 866-688-9611
Log On: www.atlascopco.us/mboxusa

Sustainable Productivity

Atlas Copco

HITACHI
Inspire the Next

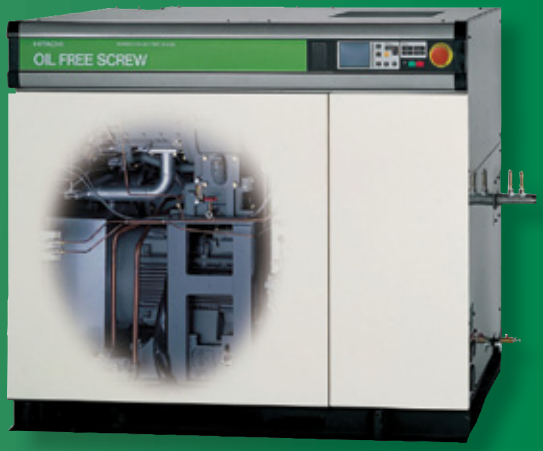
DSP Series Oil-Free Air Compressors

(15-240 kw/20-300 hp)

Class Zero

No Inlet Valve Design
(Patented)

Stainless Rotors with
PTFE-Free Coatings
(Patented)



Hi-Precooler
(Patented)

Oil Mist Remover
(Patented)

Hitachi MFG High
Efficiency Motor
and Inverter

Motorized Isolation Valve
(Exclusive)

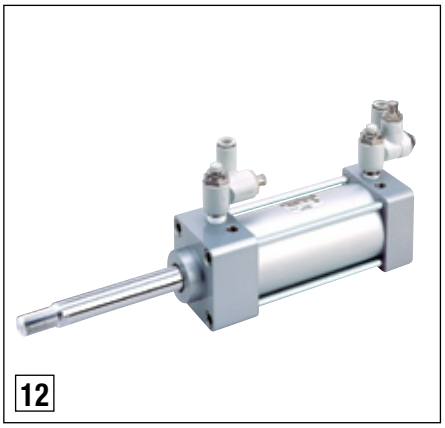
"Hitachi DSP Oil-Free Compressors are designed with market leading technologies for increased customer satisfaction. Innovations of Compression, Air Quality, Protection of Process, Longevity of Design, and Efficiency of Application all combine to provide an unparalleled sum of value for the discriminating air user."

HITACHI AMERICA, LTD. AIR TECHNOLOGY GROUP
5808-Q Long Creek Park Drive, Suite Q; Charlotte, NC 28269
Tel: 704.494.3008 ext 28 www.hitachi-america.us/airtech; airtechinfo@hal.hitachi.com
Hitachi Industrial Equipment Systems Co., Ltd.

100th ANNIVERSARY
Celebrating 100 years of the Hitachi Group

HITACHI
Inspire the Next

SUSTAINABLE MANUFACTURING FEATURES


12

18

COLUMNS


24

FROM THE EDITOR

System Assessments

In our mission to help industry reduce energy costs, compressed air, pneumatics and blower and vacuum systems are all focuses of this publication. When everything goes right, energy-efficiency projects are a true win/win — both for profits and for the environment. When something goes wrong, however, there is only a "win" for one of the parties involved. As the "system assessment/energy audit" market matures, it is critical that the focus remain on delivering the promised numbers to the holders of capital.

Compressed air system assessments can vary widely in how they are done and what is recommended. Normally, the more time invested in the system assessment, the better it will be. In this edition, we feature two articles discussing the different levels of compressed air assessments. The first, Compressed Air Auditing 101 by Mr. Bob Baker, outlines three different levels of audits. The second, Compressed Air System Analysis developed by the Compressed Air Challenge®, breaks them into two different levels. We recommend that all compressed air system owners familiarize themselves with the different levels of system assessments.

In a facility, pneumatic circuits in machinery are often amongst the largest consumers of compressed air. Over the years, I have come to understand that here resides one of the largest opportunities to reduce energy consumption and machinery productivity. Mike Nagy, Energy Conservation Leader at SMC, provides us with an article in this edition illustrating how he and his team conduct "pneumatic retrofits" on OEM machinery to reduce compressed air flow and pressure requirements. In my opinion, this is one of the largest energy efficiency opportunities in our segment. To this end, our publication has recently applied to become a member of the NFPA (National Fluid Power Association).

We continue to emphasize the importance of utility companies being involved with energy incentive programs. They provide needed capital to improve ROI and, more importantly, can provide capital holders in industry with third-party assurances that the ROI projects are indeed valid. As we continue to interview Energy Incentive Program Managers, I'm struck by the disparity between them as to what projects receive the dollars. As a general rule, the younger programs spend the money on simpler projects, like lighting retrofits, while the more mature and developed programs spend the funds on industrial processes, like compressed air and boilers. Described in this month's interview, one of the most developed programs in North America, Manitoba Hydro's Performance Optimization Program, invests 87% of its funds in compressed air systems!

We hope you enjoy this edition. Thank you for your support, and for investing in Compressed Air Best Practices®. BP

ROD SMITH
Editor
rod@airbestpractices.com

WHICH INDUSTRIES USE THE MOST KWH PER YEAR?

NAICS CODE(S)	DESCRIPTION	MILLION KWH*
311	Food	73,440
312	Beverage and Tobacco	8,858
313, 314	Textile Mills and Textile Product Mills	25,124
315, 316	Apparel and Leather Products	2,426
321	Wood Products	26,723
322	Paper	72,518
323	Printing and Related Support	13,079
324	Petroleum and Coal Products	40,134
325	Chemicals	151,595
326	Plastics and Rubber Products	53,404
327	Non-Metallic Mineral Products (Glass-Cement)	42,976
331	Primary Metals	134,325
332	Fabricated Metal Products	41,965
333	Machinery	32,394
334	Computer and Electronic Products	27,509
335	Electrical Equipment, Appliances and Components	12,867
336	Transportation Equipment	57,169
337	Furniture and Related Products	9,264
339	Miscellaneous	9,677
Total USA	Industry	835,467

Source: Department of Energy. First Use of Energy for All Purposes in Industry. Report revision from October 2009.

** "Net Electricity" is obtained by summing purchases, transfers in and generation from noncombustible renewable resources, minus quantities sold and transferred out. It does not include electricity inputs from onsite cogeneration or generation from combustible fuels, because that energy has already been included as generating fuel (for example, coal).*

SUSTAINABLE MANUFACTURING NEWS

EPA Energy Star and DOE SAVE ENERGY NOW

SOURCED FROM THE WEB

Energy Star Helps Auto Plants Improve Energy Efficiency

The United States Environmental Protection Agency's Energy Star program has helped improve the energy efficiency of the auto manufacturing industry, which has cut fossil fuel use by 12% and reduced greenhouse gases by more than 700,000 tons of carbon dioxide, according to a recent report by the Nicholas Institute for Environmental Policy Solutions at Duke University. The emissions reductions, which help to fight climate change,equal the emissions from the electricity use of more than 80,000 homes for a year.

The report, Assessing Improvement in the Energy Efficiency of U.S. Auto Assembly Plants, affirms EPA's energy management strategy, particularly the importance of performance measurement and recognition for top performance. The report also demonstrates that the gap between top performing plants and others has closed and the performance of the industry as a whole has improved.

Central to this energy management approach is the Energy Star Energy Performance Indicator (EPI) for auto assembly plants, which enables industry to benchmark plant energy performance against peers and over time. Energy Star EPIs exist or are under development for more than 20 other industries. Across these industries, EPA has recognized nearly 60 manufacturing plants with the Energy Star label, representing savings of more than $500 million and more than 6 million metric tons of carbon dioxide equivalent annually.

The U.S. industrial sector accounts for more than 30% of energy use in the United States. If the energy efficiency of industrial facilities improved by 10%, EPA estimates that Americans would save nearly $20 billion and reduce greenhouse gas emissions equal to the emissions from the electricity use of more than 22 million homes for a year. Hundreds of industrial companies across more than a dozen manufacturing industries are working with EPA's Energy Star program to develop strong energy management programs, earn the Energy Star for their plants and achieve breakthrough improvements in energy efficiency.

Read the report: http://www.nicholas.duke.edu/institute/Duke_EE_WP_10-01.pdf

For more information about Energy Star's work with the auto manufacturing industry: http://www.energystar.gov/industry

Source: www.energystar.gov

DOE Save Energy Now Energy Assessments

DOE's Industrial Technologies Program (ITP) Save Energy Now energy assessments have been redesigned and improved. The new assessment process will focus on significantly increasing the implementation of identified savings opportunities — "MMBtus/year in the Ground" — while at the same time ensuring that there is significant cost/benefit for the federal funds used for the assessments. The new assessments will provide greater value to industrial plants and better leverage the investment.

The enhanced Save Energy Now energy assessments will support two types of companies and plants:

- Companies/plants who have made the **Save Energy Now LEADER** voluntary commitment to reduce their energy intensity by 25% over a 10-year time period
- Companies/plants who have not made the **Save Energy Now LEADER** commitment, but do have a high level of annual energy use and significant potential for implementing energy efficiency improvements

Types of Assessments

The largest, most energy-intensive plants in the United States can apply to receive a 3-day system assessment from a DOE **Energy Expert** who will use DOE's **software tools** to analyze energy use and help find ways to improve efficiency.

Small- and medium-sized plants can apply to receive a 1-day assessment from one of DOE's university-based **Industrial Assessment Centers**. To be eligible for an IAC assessment, a manufacturing plant typically meets these criteria:

- Within Standard Industrial Codes (SIC) 20-39
- Within 150 miles of a host campus
- Gross annual sales below $100 million
- Fewer than 500 employees at the plant site
- Annual energy bills more than $100,000 and less than $2 million
- No professional in-house staff to perform the assessment

For additional information, contact the EERE Information Center online or call 1-877-337-3463.

Source: www1.eere.energy.gov/industry/saveenergynow

SUSTAINABLE MANUFACTURING NEWS

EPA Energy Star and DOE SAVE ENERGY NOW

You can replicate PWA savings by learning about and implementing the cost- and energy-saving projects identified in these case studies. Frequently, projects can be replicated across many industries. Find out which projects could benefit your company!

DOE SAVE ENERGY NOW Plant-Wide Assessment Case Studies and Summaries

Plant-wide assessments (PWA) investigate overall energy use in industrial facilities and identify energy- and cost-saving opportunities for best practices in energy management for industry, including the adoption of new, energy-efficient technologies and process and equipment improvements. The U.S. Department of Energy cost-shares such assessments, usually through an annual competitive process. Read more about that process on the **Best Practices Solicitations web page**.

A case study is published for each completed PWA. Read the case studies below and find out how the companies have conducted plant-wide assessments and identified measures for energy and cost savings, often also finding ways to improve productivity and reduce environmental impacts. And now, for some companies, we provide short summaries that emphasize the PWA's bottom-line benefits. These documents are designed for corporate decision-makers whose time is limited.

You can replicate PWA savings by learning about and implementing the cost- and energy-saving projects identified in these case studies. Frequently, projects can be replicated across many industries. Find out which projects could benefit your company!

Aluminum

- Alcoa Lafayette Operations Energy Efficiency Assessment
- Alcoa: Plant-Wide Energy Assessment Finds Potential Savings at Aluminum Extrusion Facility
- Alcoa World Alumina: Plant-Wide Assessment at Arkansas Operations Reveals More than $900,000 in Potential Annual Savings
- Commonwealth Aluminum: Manufacturer Conducts Plant-Wide Energy Assessments at Two Aluminum Sheet Production Operations
- Pechiney Rolled Products: Plant-Wide Energy Assessment Identifies Opportunities to Optimize Aluminum Casting and Rolling Operations

Chemicals

- 3M: Hutchinson Plant Focuses on Heat Recovery and Cogeneration during Plant-Wide Energy-Efficiency Assessment
- Akzo Nobel Morris Plant Implements a Site-Wide Energy Efficiency Plan, *PWA Summary: $1.2 Million in Savings Identified in Akzo Nobel Assessment*
- Bayer Polymers: Plant Identifies Numerous Projects Following Plant-Wide Energy-Efficiency Assessment
- Dow Chemical Company: By-Product Synergy Process Provides Opportunities to Improve Resource Utilization, Conserve Energy and Save Money
- Formosa Plastics Corporation: Plant-Wide Assessment of Texas Plant Identifies Opportunities for Improving Process Efficiency and Reducing Energy Costs

- Neville Chemical Company: Management Pursues Five Projects Following Plant-Wide Energy-Efficiency Assessment
- Rohm and Haas: Chemical Plant Uses Pinch Analysis to Quantify Energy and Cost Savings Opportunities at Deer Park, Texas
- Rohm and Haas: Company Uses Knoxville Plant Assessment Results to Develop Best Practices Guidelines and Benchmark for Its Other Sites
- Solutia: Massachusetts Chemical Manufacturer Uses SECURE Methodology to Identify Potential Reductions in Utility and Process Energy Consumption
- W. R. Grace: Plant Uses Six Sigma Methodology and Traditional Heat Balance Analysis to Identify Energy Conservation Opportunities at Curtis Bay Works

Forest Products

- Appleton Papers Plant-Wide Energy Assessment Saves Energy and Reduces Waste, *PWA Summary: $3.5 Million in Savings Identified in Appleton Assessment*
- Augusta Newsprint: Paper Mill Pursues Five Projects Following Plant-Wide Energy Efficiency Assessment, *PWA Summary: $1.6 Million in Savings Identified in Augusta Newsprint Assessment*
- Blue Heron Paper Company: Oregon Mill Uses Model-Based Energy Assessment to Identify Energy and Cost Savings Opportunities

SUSTAINABLE MANUFACTURING NEWS

EPA Energy Star and DOE SAVE ENERGY NOW

- Boise Cascade Mill Energy Assessment, *PWA Summary: $707,000 in Savings Identified in Boise Cascade Assessment*
- Caraustar Industries Energy Assessment, *PWA Summary: $1.2 Million in Savings Identified in Caraustar Assessment*
- Georgia-Pacific Palatka Plant Uses Thermal Pinch Analysis and Evaluates Water Reduction in Plant-Wide Energy Assessment, *PWA Summary: $2.9 Million in Savings Identified in Georgia-Pacific Assessment*
- Georgia-Pacific: Crossett Mill Identifies Heat Recovery Projects and Operational Improvements that May Save $6 Million Annually
- Inland Paperboard and Packaging, Rome Linerboard Mill Energy Assessment, *PWA Summary: $9.5 Million in Savings Identified through Inland Assessment*
- Weyerhaeuser Company: Longview Mill Conducts Energy and Water Assessment that Finds Potential for $3.1 Million in Annual Savings

Glass

- Corning Inc.: Proposed Changes at Glass Plant Indicate $26 Million in Potential Savings
- Anchor Glass Container Corporation Plant-Wide Energy Assessment Saves Electricity and Expenditures, *PWA Summary: $1.6 Million in Savings Identified in Anchor Assessment*

Metal Casting

- AMCAST Industrial Corporation Energy Assessment, *PWA Summary: $3.6 Million in Savings Identified in AMCAST Assessment*
- Ford Cleveland: Inside-Out Analysis Identifies Energy and Cost Savings Opportunities at Metal Casting Plant

Mining

- Alcoa World Alumina: Plant-Wide Assessment at Arkansas Operations Reveals More than $900,000 in Potential Annual Savings
- Coeur Rochester, Inc.: Plant-Wide Assessment of Nevada Silver Mine Finds Opportunities to Improve Process Control and Reduce Energy Consumption
- Kennecott Utah Copper Corporation Facility Utilizes Energy Assessments to Identify $930,000 in Potential Annual Savings

Petroleum

- Chevron: Refinery Identifies $4.4 Million in Annual Savings by Using Process Simulation Models to Perform Energy-Efficiency Assessment
- Martinez Refinery Completes Plant-Wide Energy Assessment (Equilon), *PWA Summary: $52 Million in Savings Identified in Equilon Assessment*
- Paramount Petroleum: Plant-Wide Energy-Efficiency Assessment Identifies Three Projects, *PWA Summary: $4.1 Million in Savings Identified in Paramount Petroleum Assessment*
- Valero: Houston Refinery Uses Plant-Wide Assessment to Develop an Energy Optimization and Management System

Steel

- Jernberg Industries, Inc.: Forging Facility Uses Plant-Wide Energy Assessment to Aid Conversion to Lean Manufacturing
- Full PWA Report: An Assessment of Energy, Waste and Productivity Improvements for North Star Steel Iowa
- North Star Steel Company: Iowa Mini-Mill Conducts Plant-Wide Energy Assessment Using a Total Assessment Audit
- Weirton Steel: Mill Identifies $1.4 Million in Annual Savings Following Plant-Wide Energy-Efficiency Assessment

Supporting Industries

- Metaldyne: Plant-Wide Assessment in Royal Oak Finds Opportunities to Improve Manufacturing Efficiency, Reduce Energy Use and Achieve Significant Cost Savings

Other

- IAC Energy Assessment of Spanish Fork Plant (Alcoa)
- Metlab Plant-Wide Assessment
- Utica Corporation Plant-Wide Energy Assessment Report Final Summary BP

Source: www1.eere.energy.gov/industry/saveenergynow

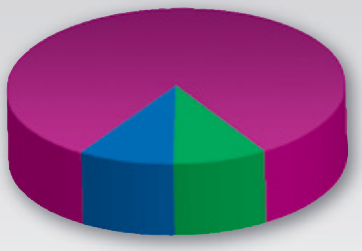
Think of Sullair's TS20 as the CFL of air compressors.

If every American home replaced just one incandescent bulb with a compact fluorescent light bulb (CFL), we would save enough energy to light more than 3 million homes for a year, about $700 million in annual energy costs, and prevent 9 billion pounds of greenhouse gas emissions per year, equivalent to the emissions of about 800,000 cars. (Source: Energy Star)

Over a ten-year period, electricity will represent 82% of a compressed air system's operating cost. The Sullair TS20 derives its energy savings from our proven two stage tandem air-end and spiral valve technology. At today's power cost of $.08/kWh, the TS20 compressor can save $14,373 per 1,000 cfm over a single-stage compressor operating for 8,000 hours at 100 psig. Per US DOE statistics, on average that is enough energy savings to pay for the power to light more than 7,000 typical residential CFL bulbs a year!

Like the CFL, the Sullair TS20 is unparalleled for energy efficiency. At full load, the compressor saves up to 13% of electrical energy and often provides a two-year payback in savings when compared to single-stage compressors. With variable capacity control, featuring spiral valve technology, the TS20 can achieve further operating efficiencies of up to 30% during part load operation. Further part load and full load energy savings are achieved with optional Variable Speed Drive (VSD). This truly is the ultimate in energy saving compressors and in reducing greenhouse gas emissions.

COMPRESSOR LIFE CYCLE COSTS



According to Best Practices for Compressed Air Systems, Compressed Air Challenge, Second Edition, 2007, energy costs now represent 82% of the total operating expenses. Energy savings from Sullair's Two Stage Compressors can significantly reduce life cycle costs.

SULLAIR®
Always air. Always there.™

For more information on how Sullair's Two-Stage Rotary Screw Air Compressors can reduce your operating cost, please contact your local Sullair distributor. Call Sullair at **(219) 879-5451,** or visit us on the web at **www.sullairinfo.com**.

ENERGY STAR PARTNER

THE SYSTEM ASSESSMENT OF THE MONTH

Pneumatic System Assessments Save Energy

BY MIKE NAGY, ENERGY CONSERVATION MANAGER, SMC CORPORATION OF AMERICA

The View From the Bottom

When it comes to conserving energy in compressed air, nothing is sexier than a big, old oil-free 300 horsepower variable speed drive air compressor, coupled with a heat of compression dryer, tied to an energy management system with all the trimmings. If you're like me, it's hard not to let out a manly grunt after reading that sentence! Conversely, pneumatics are at the bottom of the compressed air food chain. And yes, I admit it; big compressors that react efficiently to your plant's demand by pulling power in a near linear way are cool. The real question is, though, is it the **right** solution for your plant?

Most companies who evaluate compressed air systems do so from the compressor room out. These companies assess compressor control, storage and piping system ability to react to the plant's current demand. What if the purchase of that new compressor was unnecessary? Could changes in the pneumatic system have an impact significant enough to alter the way you consume air? What if these changes were large enough to turn off a compressor? That would mean the velocity of your compressed air would slow. It would also mean that piping and storage upgrades you believe to be required might, in fact, not be. Most importantly, your future compressed air demand may match your current compressor control system perfectly.

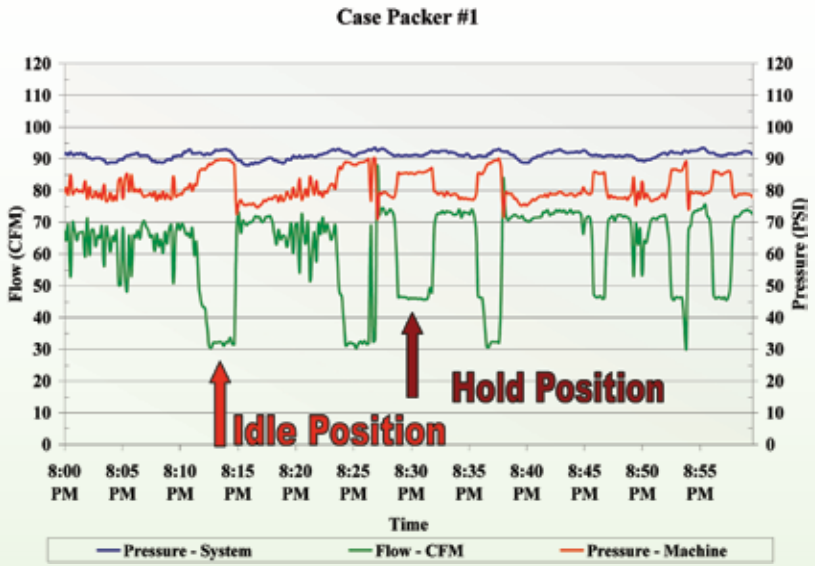
About a year ago, a customer approached SMC regarding their compressed air consumption at the point of use. This customer was on the verge of purchasing a large, upgraded compressed air system when SMC was asked to do a machine analysis on two of their case packers. The maintenance planner had gathered some significant data on lost production and downtime as a result of compressed air related issues, and wanted us to take a closer look.

Digital Pressure Monitor

Our assessment focused on point-of-use inefficiency, including:

- ✔ Intermittent demand
- ✔ Leaks
- ✔ Environmental impact, including compressed air quality
- ✔ Point-of-use excessive pressure
- ✔ Machine design, including actuator, valve and tubing size
- ✔ Inappropriate usage

The flow study that follows is a small part of the flow and pressure study, taken on case packer one.



Leaks typically account for 10–20% of compressed air usage.

Statistics			
	MIN.	AVG.	MAX.
Flow (CFM)	30.35	61.15	86.55
System — Pressure (psi)	88.10	91.19	93.52
Machine — Pressure (psi)	71.27	81.01	90.10

As a part of the machine analysis, we consulted with the OEM regarding the specified settings for this case packer. According to the OEM, the case packer was designed to operate at 60 psi, and should consume approximately 30 cfm at full production. The OEM stated that this particular case packer was designed to operate at zero flow during the idle and hold positions. During our installation, we recorded the pressure at the case packer and in the main header.

Artificial Demand

Artificial demand can be identified and defined as any period of time when a machine remains pressurized when compressed air is not required. As a result, any unnecessary user, such as leaks or purge, will continually be

THE SYSTEM ASSESSMENT OF THE MONTH

Pneumatic System Assessments Save Energy

Leaks cause increased pressure drop, which ultimately leads to operators increasing supply pressures to compensate. Additionally, leaks contribute to a machine's overall intermittent usage. Each time compressed air is supplied when not required, leaks act as a continual energy drain.

Locking Regulator

Valve-Mounted Compact Cylinder

supplied, thus increasing the cost of operation. Our flow study illustrated six distinct periods where the machine remains in an idle or hold state. These periods consumed between 30–45 cfm, and lasted approximately two to three minutes each time.

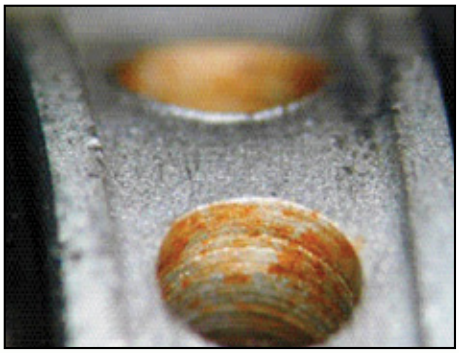
Leaks

Leaks typically account for 10–20% of compressed air usage. During our analysis, we used an ultrasonic leak detector to search the case packers for compressed air leaks. We were able to locate and tag a total of 24 cfm in leaks — this is 39% of the current average flow for case packer number one. It is extremely important to note the affects that compressed air leaks have at the point-of-use. Leaks cause increased pressure drop, which ultimately leads to operators increasing supply pressures to compensate. Additionally, leaks contribute to a machine's overall intermittent usage. Each time compressed air is supplied when not required, leaks act as a continual energy drain.

$$\textbf{24 cfm} = \frac{6 \text{ bhp} * .746 * 8{,}760 \text{ hours} * \$.075 \text{ kW}}{90\% \text{ avg. motor efficiency}} = \textbf{\$3,267} \text{ annually}$$

There are periods both in the hold and idle state where the flow exceeds the 24 cfm leak load tagged. This additional demand may be leaking valves or cylinders where the leaking only occurs on the extend stroke.

Environmental Impact, including Compressed Air Quality



Part of our analysis involved communicating with the machine's operators and maintenance personnel regarding the case packers' current state of operation. We learned many things about the case packers' history and performance. One area of concern expressed by both the operator and maintenance was the life span of the valves.

Upon tear down of this valve, the spool and sleeve assembly was found stuck in the "OFF" position, indicating that the solenoid could not generate enough force to shift the spool to its "ON" position.

Examination of the spool and sleeve assembly showed signs of a rusty tacky substance (later identified as food-grade oil). This contamination was also found on the spool and was impacted on the end of the spool. The spool was removed from the sleeve, requiring 2.83 lbs. of force.

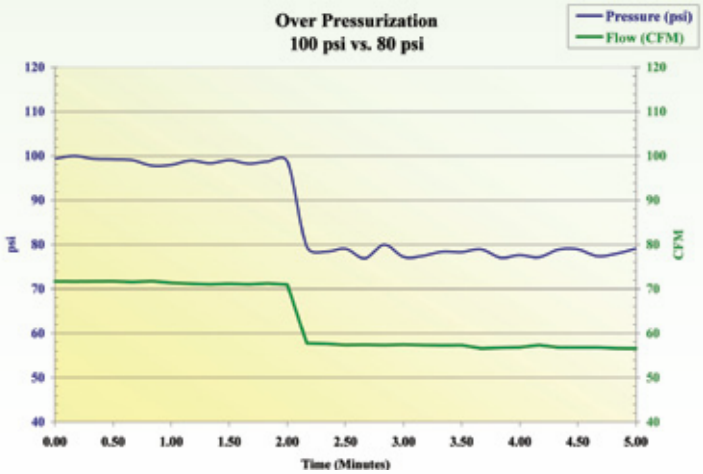
This valve required a high-wattage coil for shifting force. This high-wattage coil, combined with food-grade oil, resulted in varnishing of the valve, which hindered its ability to shift, and thus resulted in valve failures. Additionally, most of the actuators installed on the equipment came lubed for life, and now required additional lubrication. However, once foreign oil is introduced in mass to the actuators, the lube for life is effectively washed out and the actuators begin to prematurely wear, resulting in leaks.

Point-of-Use Excessive Pressure

Turning pressure up beyond what the OEM recommends will never help a process, it will only cost the facility additional money. Assuming that all 25 case packers operate in a similar fashion to two that we tested, excessive pressure on these machines is costing the customer a total of **$20,425** annually for all 25 case packers.

As can be seen in the chart to the right, flow and pressure function in a very linear fashion. As the supply pressure is decreased, we see that flow decreases in a similar fashion. It is noted as a general rule of thumb that for every 2 psi of pressure reduced, 1% of the required brake horsepower (bhp) is conserved. When this is extrapolated over an entire facility, the savings can be quite significant. Using the current average flow of case packer number one (61 cfm), reducing the pressure from 85 psi to 65 psi will conserve 1.5 bhp:

$$\frac{1.5 \text{ bhp} * .746 * 8{,}760 \text{ hours} * \$.075 \text{ kW}}{90\% \text{ avg. motor efficiency}} = \$817 \text{ per machine}$$



Statistics 100 psi			
	AVERAGE	MINIMUM	MAXIMUM
psi	98.82	97.78	100.00
CFM	71.40	70.96	71.78

Statistics 80 psi			
	AVERAGE	MINIMUM	MAXIMUM
psi	78.24	76.89	80.00
CFM	57.10	56.59	57.75

THE SYSTEM ASSESSMENT OF THE MONTH

Pneumatic System Assessments Save Energy

Machine Design, including Actuator, Valve and Tubing Size

As cylinders extend and retract, they require air to be delivered through the valve and tubing at a given pressure and volume to create the required force. Over-sizing or over- extending tubing adds volume that needs to be filled each time the cylinder actuates. What is the cost of over-sized tubing? Below, we have an example using four key cylinders that had excessive tubing size. The rest of the case packer cylinders had the appropriate size tubing for the application. This example shows the flow required using ⅜" inch tubing versus the flow required using ¼" tubing. It should be noted that these cylinders did operate at a reduced pressure relative to the rest of the case packer.

Current Installation		
Operating Pressure	50	psig
Bore	3	inches
Stroke	3.41	inches
# of Cylinders	4	
Line Length	96	inches
⅜" Tubing I.D.	0.25	inches
Rate: Cycle Time	1.5	seconds for one cycle
cfm Required	24	—
Annual Cost of Operation	$3,267	—

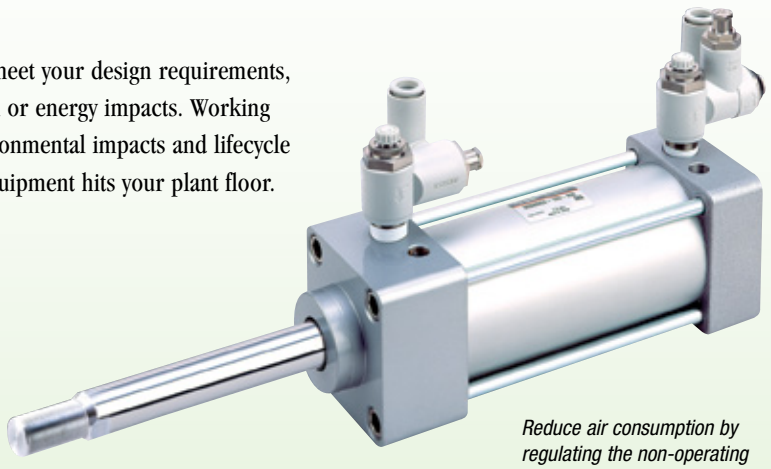
Improved Installation		
Operating Pressure	50	psig
Bore	3	inches
Stroke	3.41	inches
# of Cylinders	4	
Line Length	96	inches
¼" Tubing I.D.	0.16	inches
Rate: Cycle Time	1.5	seconds for one cycle
cfm Required	19.86	—
Annual Cost of Operation	$2,704	—

By reducing tubing size, a savings of 4.14 cfm, or a 14% flow reduction, from the case packers design flow (30 cfm) can be realized. This 4.14 cfm reduction equals $563 per year for each of the 25 case packers. Assuming each of these case packers has a life span of 15 years, that is a total savings of **$211,125**.

An Additional Note on OEM Design

One area that drew our attention in this machine analysis was the potential for the OEM who built this equipment to design it in a way that would ensure these issues did not become a problem. Intermittent demand could easily have been addressed with a two- position solenoid valve that would stop costly leaks and purge from being realized in the idle and hold positions. Leaks would have been significantly reduced if filtration designed to prevent food-grade oil from entering the equipment had been specified. Long runs of oversize tubing running from the valve to the actuator could have been shortened and sized correctly to reduce the flow required on each actuator stroke. Point-of-use excessive pressure could have been controlled by the installation of a locking regulator, which prevents operators from unnecessarily over-pressurizing equipment.

OEMs are great at building equipment to meet your design requirements, but they rarely consider the environmental or energy impacts. Working with your machine builder to ensure environmental impacts and lifecycle costs should be considered **before** the equipment hits your plant floor.



Reduce air consumption by regulating the non-operating return-stroke side

OEMs are great at building equipment to meet your design requirements, but they rarely consider the environmental or energy impacts. Working with your machine builder to ensure environmental impacts and lifecycle costs should be considered before the equipment hits your plant floor.

In conclusion, this study shows there are significant savings opportunities as a result of a high leak load, intermittent demand, tubing size reduction and point-of-use excessive pressure. Each case packer can reduce demand by a minimum of 34 cfm, which equals **$4,629** in annual savings. Assuming each case packer has the same inefficiencies as the two we tested (which seemed clear), there is a total **$115,723** in compressed air energy savings to be garnered.

In this case, our customer did not need a compressor upgrade to operate efficiently. In fact, they now have two extra compressors, and the compressors they currently operate run efficiently at near full capacity. Additionally, because the case packers did require the highest pressure in the plant (85 psi), moving the pressure from 85 psi to 60 psi on the case packers allowed the plant to lower their overall plant pressure from 92–85 psi, resulting in additional savings.

Before you buy that new super-deluxe energy efficient compressor, take a closer look at how you currently consume compressed air. While pneumatic improvements are at the bottom of the compressed air food chain, they are low-cost/high-return options, and require minimal ongoing maintenance. Once point-of-use improvements are realized, then evaluate your compressor controls. You may find that you need a smaller variable speed drive than you originally anticipated. It may turn out that you have several extra air compressors, and that your existing units react efficiently to your plant's demand, saving your facility significant capital. BP

For more information, contact Mike Nagy, Energy Conservation Manager, SMC Corporation of America, email: mnagy@smcusa.com, www.smcusa.com.

THE SYSTEM ASSESSMENT

Compressed Air Auditing 101

BY BOB BAKER, SENIOR MARKETING SPECIALIST, ATLAS COPCO COMPRESSORS

Since the cost of energy has dramatically increased during the past few years, it seems that energy audit companies have opened shop on more city street corners than coffee shops in Seattle.

In addition to the mass numbers and abundant varieties of these energy savings promoters, there have been an equal number of energy audit articles written for the engineering magazines. And to one's wonderful delight, most of the articles (thanks to the due diligence and back-up research of the publishers) have been an excellent resource on how to save energy in your four billion-square-foot manufacturing facility.

Big energy audits usually save big energy, but they also cost big bucks. Where does this leave the little guy, and how do these magazine articles come into play? Well, the little guy usually operates a 15–75 horsepower air compressor, and if he (or she) reads these articles, many of them will gain the appropriate knowledge to cash in on similar energy saving opportunities.

The fact is that energy audits, like companies, come in all shapes and sizes. The Compressed Air Challenge® web site, **http://www.compressedairchallenge.org/**, is another great resource for anyone interested in saving energy. Check out the "Library" section for specific compressed air energy saving tips. A key element when considering an audit is that it should be performed when the systems are running normally and there is no need for any downtime.

Three Basic Types of Audit

Walk the Line

This is the simplest of all procedures, and can be characterized by the fact that no hardware is involved. A walk-the-line audit involves a visual check, done inside and outside of the compressor room. Atlas Copco has a comprehensive 10-point check list for its walk-the-line appointments, inspecting things such as filters, piping structure and condensate drains. Many of the issues that compromise a compressed air system's performance are often as rudimentary as identifying and sealing leaks and decreasing pressure drops through reconfigured piping and system analysis to ensure that the facility has the right compressor for the job. A walk-the-line audit is also a great opportunity to learn more about available alternatives, like

A walk-the-line audit involves a visual check, done inside and outside of the compressor room.

Variable Speed Drive compressors, and how they might match a facility's fluctuating energy demands.

These no-cost compressed air system health checks are often available from compressor manufacturers at no charge. The primary objective is to optimize the performance of a facility's compressed air system to help the operator save money through more cost-effective and efficient operations.

Demands on a compressed air system vary to reflect every corresponding change to a manufacturing or process adjustment within the facility. A walk-the-line energy audit can help provide a brief assessment of the current productivity levels and suggest changes to maximize efficiency or provide in-depth analysis of various components, depending on the manufacturer's primary objectives. Any one or several of Atlas Copco's top ten tips to maximize efficiency could be employed to address weaknesses in the compressed air system. Results also can be prioritized to show how potential savings match up with the necessary expenditures.

Data Logging

Along with a visual check like that from a walk-the-line audit, this type of audit involves data logging of the current (amps). By using a standard formula (one that includes power factor), the kW can be calculated to a reasonably accurate value and graphs illustrating demand can be included.

The following examples are from a less comprehensive audit, but provide good examples of what is available and what can be achieved through data logging. The audit needs to start somewhere — so why not start in the compressor room, where the compressed air originates? The minimum duration of a data logging audit should be seven days, so it always includes a weekend.

Another key consideration when choosing an audit partner is to ask about the potential rebates available from the local utility companies. People who are close to the subject and do this every day know these facts (as all programs are a little different) and these savings can really add up.

A block diagram of the supply side will help identify what is in the compressor room, if it is a sufficient scope of supply and if it is set up correctly. You should also do a walk-through of the plant floor and observe the compressed air piping layout, the machinery or pneumatic tools that will be consuming the compressed air and look for any possible inappropriate uses, such as open hose nozzles or using expensive compressed air for personal cooling (as opposed to a small fan).

The example below is an actual customer in a small New England town that used a 20 hp air compressor system. The air compressor is a load/no-load controlled product and has a CT loop (current transformer) data logger attached to an incoming motor lead. This allows data logging of the current (amps) and by using a standard formula (one that includes power factor) the kW can be calculated to a reasonably accurate value.

However, it is still very important to take a baseline reading of amps and voltage before you start the audit, including the full load values and the unloaded values, which will help determine and confirm the accuracy (and integrity) of the final report values. Also, make sure that the production line is operating normally during the audit duration. The seven-day audit will be the guideline for a normal week of production and will be used for an annual energy cost calculation.

THE SYSTEM ASSESSMENT

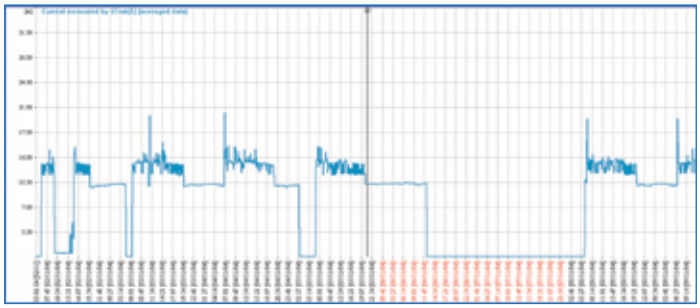
Compressed Air Auditing 101

AirScan is a flexible, diagnostic package for compressed air systems that enables customers to select any level of air audit required for their particular system.

What is additionally important is that we can easily record a load/no-load compressed air outlet profile and determine if the unit is correctly sized or if it is at least close to its maximum capable cfm output.

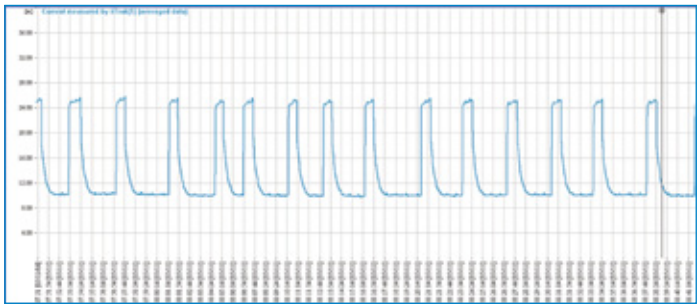
Referencing the above installation and the recorded profiles below (Fig-1, -2, -3), we can see that this unit is quite oversized for the application. We find many installations are like this, mostly due to the diminishing economy and reduction in manufacturing's use of compressed air.

Fig-1



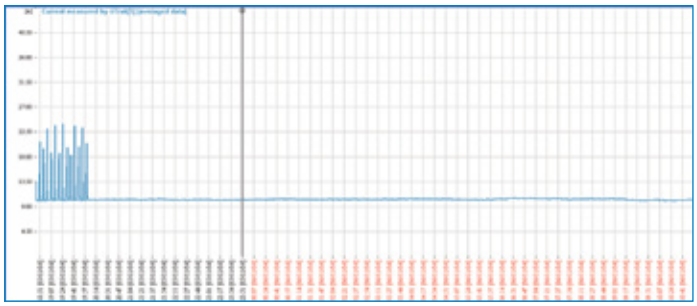
This is a profile of the complete week, where the amps are recorded at one-second intervals for the seven days. The software indicates a day-to-day profile (in black numbers) and the weekend profile is also shown (in red numbers).

Fig-2



As we delve further into the profile, we can see that this unit is cycling frequently. One reason for this is that the unit is oversized for the application. The compressor is running fully loaded for very short periods and running unloaded (idling) for very long periods.

Fig-3



When we review the weekend data (the red numbers), we can see a very steady use of air.

Although the customer does not work on the weekend, we asked them to leave the air compressor in auto-start mode during a period with no production. When no one in production is using compressed air, this can be identified as compressed air leaks. Once this is known, a more accurate leak detection audit can be performed. We would not include the weekend profile when calculating demand, but this gives us a great indication of the artificial demand (leaks).

The point of offering these smaller audits is to detect energy waste and capture a compressed air profile of the supply side — the compressor room. By analyzing the supply side, we can then promote the need to evaluate the issues on the demand side. The initial set up and process is very simple, but what is most important is that it allows us the opportunity and proof that further analysis may be required.

The Savings?

Sure the units and energy losses are smaller, but there are literally millions of smaller air compressors in the field. Again, even "smaller company" compressor owners can save money, and a $1,000 savings is big bucks to them!

AirScan (Full Audits)

A variety of options are available with the AirScan audit, ranging from full system audits to specific measurements, such as leak detection, power and flow rate, etc. AirScan is a flexible, diagnostic package for compressed air systems that enables customers to select any level of air audit required for their particular system.

Options for the AirScan audit include:

Air measurement: an accurate account of your plant's compressed air demand over a seven-day cycle, identifying energy costs and potential savings. Again, flow rates can be tested without interrupting service.

Air leak detection and control: history has shown that leaks typically account for 20% of the system demand. Consider that figure when examining utility costs across a month, a year or the life of the compressor.

Air quality audit: measures the quality of the air, including an assessment of any water or oil in the compressed air, and draws comparisons to your specific needs at any point in the system. Dirty air not only means frequent and costly filter cartridge changes, but it also threatens production quality and can lead to work interruptions or stoppages.

THE SYSTEM ASSESSMENT

Compressed Air Auditing 101

Maintenance review: assesses current service schedules and programs for effectiveness in the equipment, including compressors, filters, dryers and ancillaries.

Monitoring and control program: sets out recommendations for long-term monitoring and control to maintain optimum efficiency. And with Atlas Copco's exclusive AIRConnect, air compressors can be monitored from remote locations to monitor real-time performance to help maximize efficiency.

Audits for Everyone?

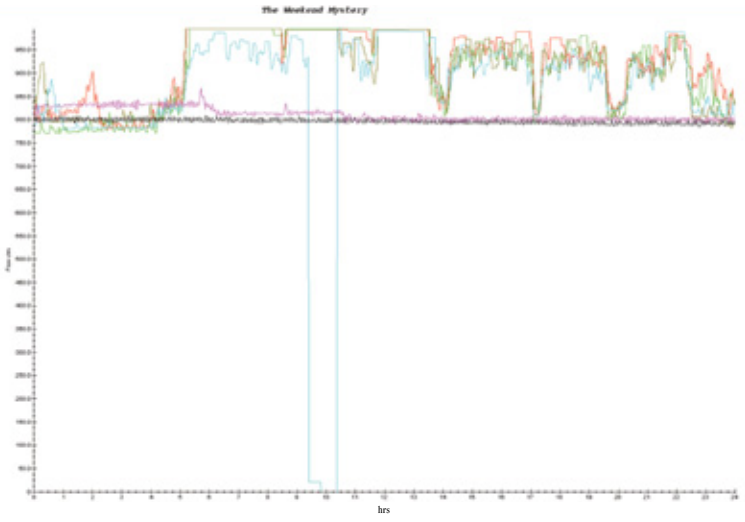
So, are inexpensive compressed air audits available? Of course, but as with the more comprehensive studies, be cautious of how they are performed and by whom. Here are a few good questions to ask before an audit:

- Do you have references or previous customers that I can speak with?
- Will you help evaluate the complete system — both supply and demand side?
- What kind of report will you supply?
- Will you help remedy the inefficiencies?
- Will you offer a post audit and perhaps an annual PM check-up study?
- Have I reviewed the magazine articles on audits and asked all of the same questions?

We mentioned the importance of running a weekend study earlier. Even though production may not operate on the weekend, the importance of data logging those days can be significant. Fig-4 is from a software program that allows the audit technician to simulate cfm consumption, which is converted from the amp study. Remember, this is fairly easy with load/no-load air compressors. When the inlet throttle is open, you are making compressed air, and when it is closed, you are not.

If a unit (as in Fig-4) is operating for long periods of time 'unloaded', it is similar to sitting in your car at a red light with the engine running (in some cases for several hours). Just like in your car, you are wasting energy when your compressor is idling. (A subject for another day: Variable Speed Drive (VSD) air compressors. Considered the hybrids of the industry, VSD compressors actually 'stop running when they come to the red light.')

Fig-4



The black and fuchsia lines represent the weekend study. Production was not operating; the units were run so a profile could be created to show suspect air leaks. As we see in Fig-4, this facility had lots of air leaks and they were not sure how many or how much cfm was being wasted until we ran the audit. The follow-up air leak detection study proved to be very beneficial. Several corrections were made and the customer is now saving thousands of dollars.

Summary

Companies may be hesitant to spend a lot of money on energy audits, especially when they have little understanding of the true possible savings. The objective is to help them understand the importance and the benefits of an audit — not only how they will lower energy costs, but how their production lines will operate more efficiently as well.

We have only discussed load/no-load air compressors within this article, but there are many other air compressors with less efficient control systems where even more savings can be achieved. And don't forget the demand side, where the corrections need to be made to cash-in on the real savings. All of the previously discussed information is directly related to initial base-load results and integrity of the analyzed data.

The point of this article was to answer the question: Are compressed air audits viable for everyone? Our answer is a resounding "yes"! By adjusting the audit scope to meet your needs, you can save big bucks, whether you operate a four billion-square-foot facility or much smaller operation.

About the Author

Bob Baker, a senior marketing specialist at Atlas Copco, has extensive experience as an energy auditor and systems manager. Bob has performed countless energy audits for customers across the Untied States. For a free copy of Atlas Copco's Compressed Air Manual — 7th Edition, please e-mail Paul Humphreys at paul.humphreys@us.atlascopco.com with "Air Manual" in the subject line. BP

Are compressed air audits viable for everyone? Our answer is a resounding "yes"! By adjusting the audit scope to meet your needs, you can save big bucks, whether you operate a four billion-square-foot facility or much smaller operation.

THE TECHNOLOGY PROVIDER

Soft Drink Bottler Saves Energy with Blowers

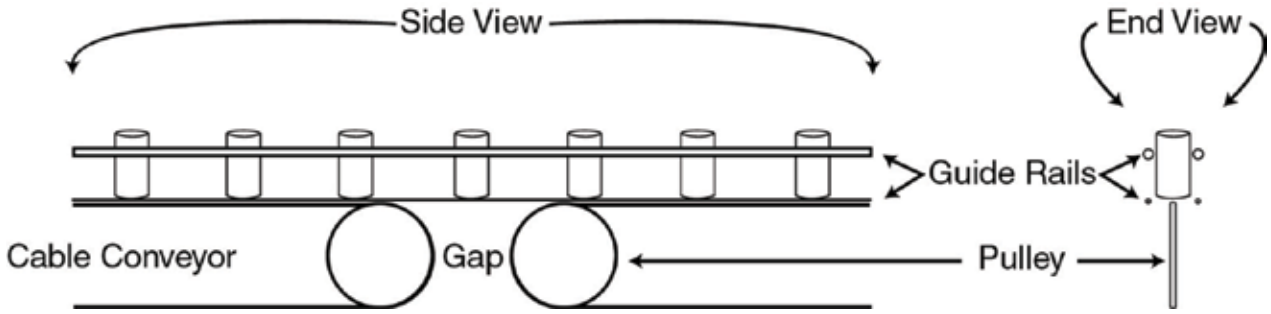
BY BETH TOMPKINS, JETAIR TECHNOLOGIES

Introduction

Rising energy costs and growing concern for industrial environmental impact have manufacturing taking a second look at their operations' energy efficiency. One area increasingly in review is the use — or more importantly, *the misuse* — of compressed air. When used *"inappropriately"* (as defined by the Department of Energy's Compressed Air Challenge), high-pressure compressed air bleeds into the atmosphere, producing a significant energy loss, as well as a comparably high demand on compressor utilization. With $1.5 billion in U.S. manufacturing compressed air energy costs each year (according to the Department of Energy), compressed air alternative solutions (e.g., high-speed, centrifugal blowers) represent a significant energy and cost savings option for manufacturers. Recently, a major U.S. soft drink bottling manufacturer replaced its compressed air system with a high-speed centrifugal blower. This resulted in 87% true energy power savings and 80% energy cost savings, as well as a return of compressed air compressor capacity.

Problem

A leading soft drink bottling manufacturer's compressed air needs were threatening to exceed its Michigan plant's compressed air capacity. Faced with the cost of buying a new compressor, the soft drink bottling manufacturer reassessed its compressed air use to identify compressor and energy savings opportunities. In the audit, the soft drink bottling manufacturer identified the use of compressed air in a gap transfer as a source of compressed air and energy inefficiency. The soft drink bottling manufacturer's system was generating 100 PSI compressed air for a needed 2–3 psi at the application site (50 times the pressure needed). This compressed air was directed through two ¼" copper tube nozzles to transfer empty, open aluminum cans (approximately 0.5 ounces or less in weight) from a single cable-pulley system to a second cable-pulley system over an unassisted gap of approximately 18–20 inches. The gap between the cable-pulley systems enabled the inkjet date imprinting, which is visible on the bottom of the cans. The compressed air application, although an inefficient use of compressed air, enabled the continual flow of the cans across the inkjet date imprinting application to the second cable-pulley system.



Gap Transfer System

Loss of compressed air to the atmosphere represents a significant energy and cost waste that can easily be eliminated with efficient, alternative solutions.

In the quest to regain compressed air capacity, the soft drink bottling manufacturer's plant engineer contacted JetAir Technologies regarding the possibility of replacing the compressed air application with a high-speed, centrifugal blower system. JetAir Technologies' applications engineer visited the soft drink bottling manufacturer's plant to assess the situation. The visit confirmed the manufacturer's concerns. JetAir Technologies' application engineer found significant compressed air and energy waste, as well as a concerning high noise level, resulting from the use of compressed air at the gap transfer.

Although needing only 2–3 psi of compressed air pressure at the site of the gap transfer, the system required the initial generation of 100 psi to meet this pressure requirement (50 times the needed amount). The flow measured at each nozzle was 49.9 cfm, or a total flow of 100 cfm. Assuming 4 cfm per kW, the application was requiring 22.7 hp or 18 kW of energy generation. With an operating schedule of 12 hours a day, 5 days a week, 50 weeks a year, the total energy usage was estimated at 53,430 kWh. Considering a rate of $0.077 per kWh, the application was costing the soft drink bottling manufacturer a total of energy and maintenance costs of $4,530 a year.

THE TECHNOLOGY PROVIDER

Soft Drink Bottler Saves Energy with Blowers

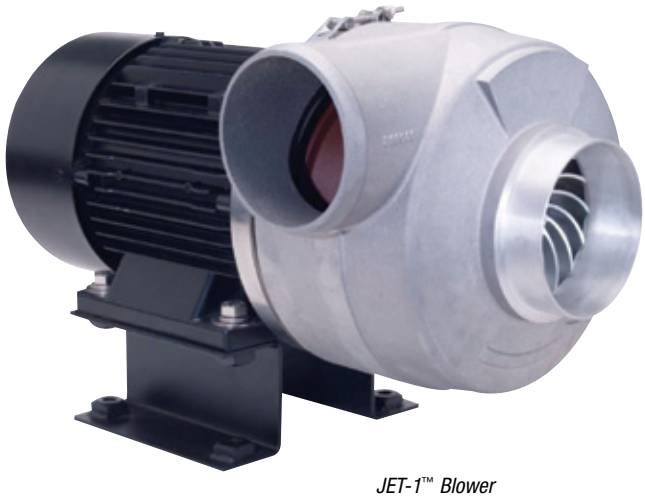
Once installed, the compressed air and energy savings and the operational benefits were immediate.

JetAir Technologies' engineers recognized the issue's similarity to a recent gap transfer project for a leading Styrofoam cup manufacturer. Having tested and provided a similar system, JetAir Technologies' engineers used this technology and experience to replace the compressed air nozzles with a custom, high-speed, centrifugal blower system. As a visual representation, the engineering team also sent an example video of the solution to the soft drink bottling manufacturer. *"That's one of the value-added things JetAir Technologies provides. We'll test just about anything, make a video tape of it, and post it."* — Scott Lynn, JetAir Technologies Eastern Regional Manager.

Solution

The JetAir Technologies' engineering team designed a custom solution that included a JET-1™ high-speed motor and blower, Variable Frequency Drive (VFD), and four custom adjustable-mount nozzles. The JET-1™ direct-drive technology enabled adjustable operation speeds (via VFD technology) of up to 20,000 rpm, creating adjustable flow rates of up to 750 cfm at pressures of 2.3 psi. The compact footprint of the motor and blower enabled it to be located within feet of the application connected via 3" diameter (75 mm) hoses to the adjustable nozzles. The nozzles were then mounted at each corner of the guide rails (bottom-top-left, bottom-top-right) at the beginning of the gap. The custom mounting application and nozzles provided the soft drink bottling manufacturer adjustable air directional flow, while the VFD technology provided air flow and pressure adjustability.

JetAir Technologies' engineering testing of the custom solution demonstrated significant operational and energy savings. While the system originally consumed 22.7 hp (18 kW), JetAir Technologies' custom JET-1™ blower solution enabled a true energy consumption of only 3 hp (2.2 kW). This represented an energy reduction of 20 hp, or an 87% true energy consumption savings. Based upon the soft drink bottling manufacturer's production cycle and kW per hour rate, the JET-1™ custom solution's energy costs were estimated at only $970 per year (including maintenance), resulting in a total yearly savings of $3,560. This drastically reduced the soft drink bottling manufacturer's annual energy costs by 80%. These energy cost savings offered an estimated 65% return on investment in the first year, and 125% return on investment in two years.



JET-1™ Blower

Results

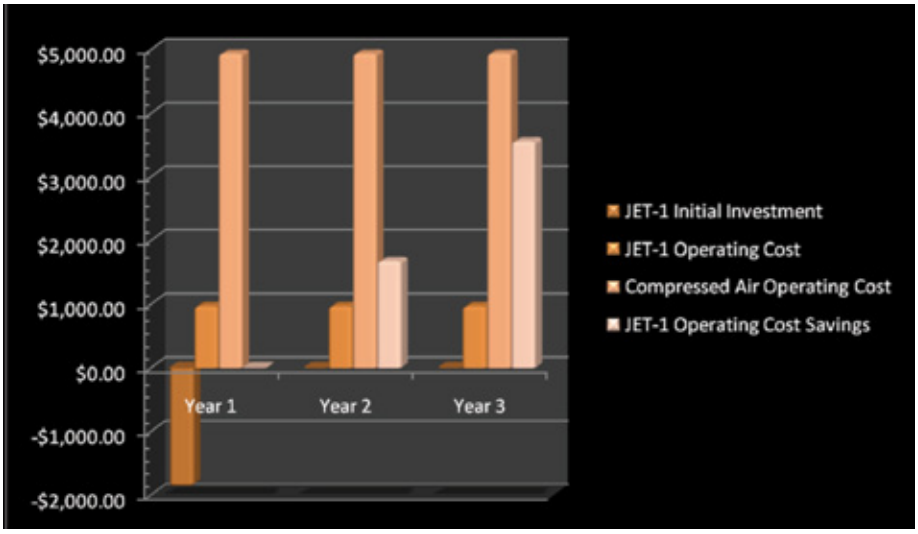
Once installed, the compressed air and energy savings and the operational benefits were immediate. *"It was quieter. It was saving compressed air and saving horsepower,"* said Scott Lynn, JetAir Technologies Eastern Regional Manager. *"They ran power to it, set it up, turned it on, and haven't had any problems. When I called to follow up, the plant engineer told me it was much quieter than the old system."*

The soft drink bottling manufacturer's installation of the JET-1™ blower system eliminated the *"inappropriate use of compressed air"* (as defined by the DOE's Compressed Air Challenge), effectively reducing the amount of compressed air bled to atmosphere. This reduction of energy waste translated into a dramatic 80% reduction in yearly energy costs, lowering monthly costs from $380 to $80. As an added bonus, the efficient and streamlined design of the JET-1™ blower system eliminated the high-pitched operational noise emitted by the old gap transfer system, much to the plant engineer's appreciation.

"It's like printing money," said the leading soft drink bottling manufacturer's manager.

Loss of compressed air to the atmosphere represents a significant energy and cost waste that can easily be eliminated with efficient, alternative solutions. High-speed centrifugal blowers offer an environmentally appropriate, effective and cost-conscious alternative to compressed air. Realization of these energy and cost savings, however, begins with a compressed air utilization assessment. As demonstrated by the leading soft drink bottling manufacturer's experience, reassessing your compressed air usage may offer significant and immediate compressed air, energy, and cost savings. With rising energy costs and environmental concerns, mitigating your company's energy use and environmental impact is imperative in identifying savings opportunities. Alternatives like high-speed centrifugal blowers offer an opportunity to operate more efficiently, effectively reducing your environmental impact and increasing your savings. BP

For more information, please contact Brendan Smith, JetAir Technologies, tel: 805-654-7000 Main, email: brendan.smith@jetairtech.com, www.jetairtech.com



Operating Cost Savings with JET-1™ System

With rising energy costs and environmental concerns, mitigating your company's energy use and environmental impact is imperative in identifying savings opportunities.

ENERGY INCENTIVES

Manitoba Hydro's Performance Optimization Program

BY ROD SMITH, COMPRESSED AIR BEST PRACTICES® MAGAZINE

Compressed Air Best Practices® interviewed Mr. Ron Marshall, CET, CEM, Industrial Systems Officer of Manitoba Hydro.

Good morning. Please describe Customer Engineering Services at Manitoba Hydro.

Good morning. We are part of the Industrial and Commercial Solutions Division, which is part of the Customer Care and Marketing Business Unit at Manitoba Hydro. Customer Engineering Services has a staff of approximately 35 people, and our role is to provide value-added engineering services to help our industrial and commercial customers use the power we produce more wisely — with a high priority given to energy efficiency.

What is your role?

My role is to assist customers in optimizing their compressed air systems. This occupies my time almost exclusively, as well as that of one of my colleagues. I work with Hydro's **Performance Optimization Program**. It mainly deals with systems using motor driven rotating electrical machinery, with some process optimization.

A few years ago we added a natural gas program to our portfolio.

Please describe the Performance Optimization Program and why it's been so effective.

The Power Smart Performance Optimization Program provides industrial and large commercial customers with the technical support and financial incentives that are necessary to identify, investigate and implement system efficiency improvements throughout a facility. The program promotes energy efficiency through the optimization of three-phase electrical power end-use systems, including compressed air, pumps and fans, industrial refrigeration, process heating, electro-chemical processes and plant-wide energy management systems. The result is lower operating costs and improved system performance.

The network of contacts we maintain is a key reason why we do so many projects with compressed air systems. In the compressed air market, you have to be there in the mind of the customer when the need to improve a compressed air system arises, usually after the failure of some equipment or when failure is imminent.

Of course when there is a problem with a system, the first place a customer will call is their compressed air service provider, so we have set up communication networks with all the compressed air suppliers in Manitoba, so we can be quickly made aware of any improvement opportunities. Often to properly size future equipment and to set a base case for incentive calculation purposes, a system assessment needs to be done. If this is the case, the customer has the option of either using a compressed air supplier or having Manitoba Hydro do the assessment. We then directly pay the service providers to do data logging of the plant and perform basic data collection and end-use assessment, so the service is at no cost to the customer. When we receive this data from the air compressor service provider, we then have a very good baseline for the system and a foundation on which to make a savings prediction and an incentive offer if future efficiency measures are implemented.

This system works very well and captures a high percentage of all compressed air equipment replacements in Manitoba because all the suppliers are on board with the program. Most suppliers cover territory not covered by Manitoba Hydro and report the take-up of energy efficiency measures in those areas without incentives or assistance, which can be strikingly different.

ENERGY INCENTIVES

Manitoba Hydro's Performance Optimization Program

"In 2009, our group did 97 Performance Optimization projects on all processes, including compressed air, blowers, pumps, refrigeration, energy management (demand control) and fans. Compressed air optimization projects represented 86 of the 97 projects done in 2009 — that's 89% of the total projects! Compressed air projects also received 89% of the total 2009 incentive payout of $2.5 million dollars."

— Ron Marshall, CET, CEM, Industrial Systems Officer of Manitoba Hydro

What are the financial incentives offered?

A basic assessment is done at no cost to the customer. If a customer wants a full feasibility study done, we cover 50% of the first $10,000 of the cost of the study plus 25% of the remaining cost, up to a maximum of $15,000 per study.

Project incentives are paid at $.010/kWh for first-year savings — plus $200/kW on winter demand and $200/kW on summer demand.

There are limits. We don't pay more than 50% of the total project cost. We don't pay on projects with less than a one-year simple payback. We feel one-year payback projects are "no-brainers" and don't need incentives. Our incentive limits are $250,000 per project, although we will fund higher levels for large special projects.

How is measurement and verification of energy savings done?

Measurement and verification (M&V) is currently done on 100% of our projects. We have our suppliers return to the facility when the project is complete and do the logging again to verify results. This is very important because often a simple screwdriver adjustment or incorrect push of a button can change the system control characteristics and cause the system to operate less efficiently. Unfortunately, some suppliers and equipment operators don't care so much about the system efficiency after the sale and installation justification, so it often becomes our responsibility to make sure the system is working from an energy standpoint and that the operators are trained on how the system should be set up.

For M&V we use ACR data loggers (an amp logger) and calibrate them to equivalent power to compensate for power factor changes at different loading levels. We also use a power meters, but amp logging is the safest and most convenient method because you don't usually have to shut down the compressors for safe installation as no live voltage connection is required. Many systems cannot be shut down during normal working hours, so it saves us our nights and weekends.

What have the results been for compressed air system assessments?

It's been excellent! In 2009, our group did 97 Performance Optimization projects on all processes, including compressed air, blowers, pumps, refrigeration, energy management (demand control) and fans. Compressed air optimization projects represented 86 of the 97 projects done in 2009 — that's 89% of the total projects! Compressed air projects also received 89% of the total 2009 incentive payout of $2.5 million dollars.

We are pleased to see the growth of all Performance Optimization projects supported by Manitoba Hydro. We did 45 projects in 2006, 65 projects in 2007, 85 in 2008 and 97 projects in 2009. We are on track to continue to grow the project number in 2010.

Any advice for other incentive program managers looking to do more compressed air projects?

My advice is to be "Johnny on the Spot" and to "Keep it Simple". You have to be there in the minds of the customers with an efficient solution to their issues when the inevitable problems happen. In Manitoba, most plant engineers and compressed air suppliers know that when their air system crashes, Hydro is there to assist with substantial funding! For the system to work best, good communication with the suppliers and customers through marketing and training is critical.

The incentive program needs to be simple enough for customers to understand and apply to without taking an inordinate amount of the customer's time. We've found the most effective way to increase participation is to cut through most of the red tape on behalf of the customer. In most cases, all they have to do is ask for equipment quotations and sign the application papers. We currently do the most of the study and assist the customer in understanding what equipment they need and how it should operate — even following through as long as it takes to ensure the system ultimately works correctly.

Where are the main compressed air optimization opportunities?

For very large compressed air systems, the main opportunity is usually reducing compressed air leaks and eliminating inappropriate end uses. For small single-compressor systems, the primary opportunity is most often changing the compressor control mode. Matching the control mode (modulation, load/unload, variable speed drive) with the demand environment will then unlock extra savings potential gained from leak and end-use reduction. For example, if you reduce leaks and decrease your system demand by 10% and have a modulating compressor, the resulting turn-down of power consumption will only be about 3%. But if the system is converted to VSD or a start-stop control, a 10% reduction in flow will provide a near linear 10% reduction in energy, thereby unlocking 7% in extra savings.

Reducing the pressure differential in dryers, filters, piping and distribution components also makes a big difference. We often see undersized piping and big pressure drops across filters, connectors and hoses, causing the customer to jack up the main compressor pressure to compensate. A good experiment I like to perform to illustrate the concept with plant personnel is to make a "piping T" with an installed pressure gauge and quick connectors and connect various air tools. When the tool is not operating, there is no pressure drop across its associated supply piping because there is no flow, so the gauge reads line pressure. Pull the trigger on the tool, and then see what happens. Quite often, the customer is surprised to see a 30–40 psi pressure drop!

"For the system to work best, good communication with the suppliers and customers through marketing and training is critical."

— Ron Marshall

ENERGY INCENTIVES

Manitoba Hydro's Performance Optimization Program

"Learn more about your compressed air systems by taking courses from the Compressed Air Challenge®. The CAC® seminars are excellent and will help you understand the cost of compressed air and what you can do about it."

— Ron Marshall

We also commonly make the following recommendations:

- Use bigger compressed air filters. We recommend low-pressure drop mist eliminator filters and/or double-sized filters. These reduce pressure drop significantly and reduce problems like excessive cycling of load/unload air compressors. We also recommend the installation of no-loss drains on the filters
- Use efficient air dryers with lower pressure differentials and cycling or dew point-dependent controls
- Large control storage (air receivers) should always be installed for better control of all types of compressors, even VSD style, with the bulk of the volume located after the air treatment products for "dry storage"
- Regulate the plant pressure using flow control valves at the main compressor rooms
- Keep the piping velocity under 30 feet per second in worst-case conditions, and never blindly size the piping at the same size as the compressor or dryer outlet. This usually means larger pipes, but significantly less pressure differential
- Recover your compressor heat and displace heating loads in winter

What advice do you have for Energy Managers?

Learn more about your compressed air systems by taking courses from the **Compressed Air Challenge®**. The CAC® seminars are excellent and will help you understand the cost of compressed air and what you can do about it. Once you understand the issues, then call in an expert to make a system assessment.

We find the most important compressed air system adjustment is often "between the ears" of the system operator — in making them aware of the high costs and levels of waste. System operators and end users need to be aware of the financial implications of compressed air energy issues, so once you're done with your training, you can pass that knowledge on to your people. The Compressed Air Challenge® courses are product neutral so as not to favor any one manufacturer, and are now very accessible due to the development of the CAC® new **web-based training** — allowing you to learn at your desk even while you munch your sandwich!

Manitoba Hydro hosts very well attended face-to-face **Compressed Air Challenge®** training sessions once a year, a key component to the marketing and awareness success of the program.

What advice do you have for the equipment manufacturers of compressed air products?

In general, I applaud the recent advancements the air compressor and air treatment manufacturers have made in increasing the efficiency of their equipment. I also commend the Compressed Air & Gas Institute's (CAGI) efforts in making equipment data sheets available

and for implementing the performance verification program. These efforts will continue to help drive up the efficiency of the products and ensure end users can make more efficient choices.

All manufacturers should make sure that their distributors are aware of all the opportunities to save energy in compressed air systems. I know Kaeser Compressors, for example, does some in-house Compressed Air Challenge® training for its own people. I think this training changes the mindset of sales professionals and promotes the offering of better, more efficient projects for their customers.

Some things I'd like to see improve involve integrated air dryers housed within compressor enclosures. We are seeing non-cycling air dryers incorporated into expensive energy-efficient VSD air compressors. In such cases of lightly loaded systems with low operating hours, the dryer can consume more energy than the compressor! I'd like to see the introduction of more efficient cycling, thermal mass or VSD style dryers into these packages.

I'd also like to see air compressor manufacturers stop loading their compressor motors into the service factor. For some time now, most manufacturers have been pushing the motor capacity limits to get full load flow cfm numbers up for sales reasons. For example, a typical 100 hp compressor motor might consume over 88 kW when the unit is fully loaded at rated pressure, the equivalent to 118 hp. This uses more energy, negatively affects the life of the motors and when ambient temperatures go up — bad things can happen. BP

Thank you for your insights.

For more information, please contact Ron Marshall, CET, CEM, Industrial Systems Officer, Manitoba Hydro, Tel: 204-360-3658 or email: rcmarshall@hydro.mb.ca.

COMPRESSED AIR SYSTEM ANALYSIS

DEVELOPED BY WILLIAM SCALES AND DAVID M. MCCULLOCH FOR THE COMPRESSED AIR CHALLENGE®

As participants of the Compressed Air Challenge® **Fundamentals of Compressed Air Seminar** learn, a compressed air system analysis can highlight the true costs of compressed air and identify opportunities to improve efficiency and productivity.

Compressed air system users should consider using an auditor to analyze their compressed air system. A number of firms specialize in compressed air system analysis, and electric utilities, equipment distributors and manufacturers, energy service companies and engineering firms, also perform it. "When selecting a service provider, it is important that factors, in addition to price, be considered," says Niff Ambrosino, chief operating officer of Scales Industrial Technologies and a CAC® Fundamentals and Advanced Instructor. "The qualifications and capabilities of the audit technicians, and reputation in the local industrial community are key and should also be considered."

Fundamentals of Compressed Air Systems WE

The Compressed Air Challenge® (CAC®) is pleased to announce the third session of **Fundamentals of Compressed Air Systems WE** (web-edition) on September 13, 2010. Led by Frank Moskowitz and Tom Taranto, this web-based version of the popular Fundamentals of Compressed Air Systems training uses an interactive format that enables the instructor to diagram examples, give pop quizzes and answer students' questions in real time. Participation is limited to 25 students. Please visit **www.compressedairchallenge.org** to access online registration and for more information about the training.

If you have additional questions about the new web-based training or other CAC® training opportunities, please contact the CAC® at **info@compressedairchallenge.org** or call 301-751-0115.

"When selecting a service provider, it is important that factors, in addition to price, be considered"

— Niff Ambrosino, Chief Operating Officer of Scales Industrial Technologies and a CAC® Fundamentals and Advanced Instructor

An informed consumer should be aware that the quality and comprehensiveness of system analysis can vary. Independent auditors should provide recommendations that are systems-neutral and commercially impartial. Independent auditors should neither specify nor recommend any particular manufacturer's products.

A comprehensive compressed air system analysis should include an examination of both air supply and usage, and the interaction between the supply and demand. Auditors typically measure the output cfm of a compressed air system and the input kW, calculate energy consumption in kilowatt-hours and determine the annual cost of operating the system. The auditor may also measure total air losses caused by leaks and locate those that are significant.

All components of the compressed air system are inspected individually and problem areas are identified. Losses and poor performance caused by system leaks, inappropriate uses, demand events, poor system design, system misuse and total system dynamics are calculated, and a written report with a recommended course of action is provided.

"It is critical for compressed air system assessments to investigate the individual system components, the component interactions and the entire compressed air system as a whole," says Greg Harrell, Ph.D., P.E. of Energy Management Services and a Certified CAC® Fundamentals instructor. "Focusing on compressor controls, air dryers, end-use equipment, leaks and the interactions of all the components are all essential parts of an effective compressed air system management strategy. As an example of the necessity of the system focus consider a leak abatement program," he continues. "Significant attention could be given to eliminating leaks. However, if the compressor control strategy does not allow the compressors to efficiently reduce energy consumption in response, then this reduction may yield minimal benefit."

The Compressed Air Challenge® (CAC®) has developed guidelines to define two levels of system analysis services, independent of the type of firm offering these services. More information on these services can be found in the CAC® **Guidelines for Selecting a Compressed Air Service Provider**. An excerpt of these guidelines appears below. For a full copy of these guidelines, visit **www.compressedairchallenge.org** or purchase CAC® **Best Practices for Compressed Air Systems** (This 325-page manual is available at our **bookstore**):

COMPRESSED AIR SYSTEM ANALYSIS

"It is critical for compressed air system assessments to investigate the individual system components, the component interactions and the entire compressed air system as a whole."

— Greg Harrell, Ph.D., P.E. of Energy Management Services and a Certified CAC® Fundamentals instructor

Overview of Levels of Analysis of Compressed Air Systems

The following levels of analysis of compressed air systems have been developed in an effort to provide commonality of terminology, methods and procedures to be used by service providers, as well as the results to be expected by end users. Energy utilities are actively involved in these efforts, and some provide incentives to use these analyses to improve the energy efficiency of compressed air systems.

There are two levels of analysis: a basic assessment and a comprehensive audit. Conducting a basic assessment is the first step in analyzing a compressed air system. Depending on individual needs, this can be conducted either by trained plant personnel or by an experienced compressed air system services provider. A basic assessment is not intended to provide the level of detail found in a comprehensive audit, but significant reductions in energy (25% or more) and lower maintenance costs often result from a basic assessment alone. Once initial opportunities have been identified, you can decide whether additional analysis services are required to further define system dynamics and corresponding system improvement opportunities. This decision will depend, in part, on the size and complexity of the system being examined (both supply and demand) and whether critical issues requiring further investigation to identify their causes and potential remedies surfaced during the evaluation.

Basic Compressed Air System Assessment

A basic system assessment of a compressed air system is the first level of analysis. Depending on the complexity of the system, a basic system assessment can be conducted by either trained plant personnel or by an experienced compressed air system efficiency expert. Using readily available data combined with limited measurements, an expert can identify system inefficiencies and make recommendations that will result in energy cost reductions.

CAC Qualified Instructor Profile

Niff Ambrosino
Scales Air Compressor Corp.
185 Lackawanna Avenue
W. Paterson, NJ 07424
Ph: (973) 890-1010
Fax: (973) 890-7343
Email: niff@scalesair.com

Niff Ambrosino is chief operating officer for Scales Industrial Technologies, one of the nation's leading compressed air systems distributor and service companies. With over 38 years in the compressed air industry, Niff has in-depth experience working as a shop rebuild mechanic, field service technician, sales engineer, energy auditor/surveyor and manager. Niff is a certified Level I and Level II Compressed Air Challenge® instructor, has trained sales/service personnel and conducts compressed air system seminars for end users.

Production downtime and maintenance costs also may be reduced. Basic system assessment of the facility could reveal:

- Potentially inappropriate uses of compressed air
- Significant leaks
- Processes or individual end-uses most sensitive to low pressure
- System instability
- High-volume and intermittent uses
- Capacity control problems
- Maintenance and reliability issues

Comprehensive Compressed Air System Audit

A comprehensive system audit is the top level of system analysis, conducted by an experienced compressed air system auditor. It is a detailed analysis of the entire compressed air system, and may have been preceded by a basic system assessment. Measurements and data logging are generally part of comprehensive compressed air system audit procedures.

The customer's objectives and system problems will be discussed prior to the start of the audit, and the proposed procedures also will be explained. The objective is proper management of the complete compressed air system for optimum efficiency and reliability. This includes alignment of the supply side (compressors, their controls, aftercoolers, dryers, filters and primary air receivers) with the demand side (distribution piping system, secondary air receivers and all of the end-uses of compressed air, including leaks), in conjunction with the needs and financial objectives of the business unit.

There are two levels of analysis: a basic assessment and a comprehensive audit.

CAC Qualified Instructor Profile

Greg Harrell, Ph.D., P.E.
Energy Management Services
341 Willocks Drive
Jefferson City, Tennessee 37760
Ph: (865) 719-0173
Email: gregharrell@emscas.com

Greg Harrell is a certified Level I Compressed Air Challenge® instructor. Dr. Harrell has conducted many energy surveys for industrial clients throughout the world and is also a primary instructor in the North Carolina State University Energy Management Diploma Program.

The instructors featured here are available to lead a Compressed Air Challenge® seminar at your facility. Visit www.compressedairchallenge.org for more information.

KNOW PRESSURE
COMPRESSED AIR CHALLENGE®

COMPRESSED AIR SYSTEM ANALYSIS

A comprehensive system audit is the top level of system analysis, conducted by an experienced compressed air system auditor.

The auditor should accomplish the following during a comprehensive audit:

1. Establish a baseline, against which the results of any proposed changes are measured.
2. Draw a block diagram and a review of the compressor room to determine present compressor operations, control strategy and the storage capacity.
3. Record compressor and dryer pressures and temperatures.
4. Validate end-use pressure and quality requirements.
5. Conduct data logging of readings of power and pressure (and flow, if applicable) throughout the system for a more in-depth analysis of the dynamics of the system and resulting problems. Provide graphs showing data collected over time.
6. Construct a demand profile to identify significant end-uses and their impact.
7. Construct a pressure profile to identify what determines the system operating pressure and to identify possible changes.
8. Review primary and secondary air receiver capacities.
9. Establish a controls strategy through real-time analysis.
10. Identify customer approach to air leak detection and repair and make recommendations for improvement.
11. Review differences in shift operations and impact on air use.
12. Identify compressed air end-uses which may be better served by other means and recommend suitable alternatives.
13. Compare air quality provided for each end-use with what is really needed and make appropriate recommendation(s).
14. Review maintenance procedures and training.
15. Review initial verbal proposals with all who attended a pre-audit meeting to obtain buy-in from all departments involved.
16. Provide a comprehensive written report of all findings, recommendations, and results. BP

COMPRESSED AIR

BEST PRACTICES

FREE SUBSCRIPTION

DIGITAL EDITION FREE WORLDWIDE | PRINT EDITION FREE TO U.S. SUBSCRIBERS

2010 FOCUS INDUSTRIES!

Energy Rebates, Oil & Natural Gas Drilling & Refining, Bulk Handling Pulp & Paper, Concrete, Steel & Metals, Processing Food-Powder-Pharma, Hospitals & Labs, Energy Audits, Water Treatment, Food Packaging, Energy Management Systems

Working Together for Compressed Air Best Practices

Compressed Air Best Practices® is a technical magazine dedicated to discovering **Energy Savings** and **Productivity Improvement Opportunities** in Compressed Air Systems for specific **Focus Industries**. Each edition outlines "Best Practices" for compressed air users — particularly those involved in **managing energy costs in multi-factory organizations**.

Utility and Energy Engineers, Utility Providers and Compressed Air Auditors share techniques on how to audit the "demand-side" of a system — including the **Pneumatic Circuits** on machines. This application knowledge allows the Magazine to recommend "**Best Practices**" for the "supply-side" of the system. For this reason we feature **air compressor, air treatment, measurement and management, pneumatics, blower and vacuum** technologies as they relate to the requirements of the monthly **Focus Industry**.

- **Compressed Air Users — Focus Industry**
  - A. Energy and Utility Managers share experiences
  - B. Audit case studies and "Best Practice" recommendations
- **Utility Providers & Air Auditors**
  - A. Utility Company Rebate Programs
  - B. Case Studies by Expert Compressed Air Auditors
- **Compressed Air Industry**
  - A. Profiles of Manufacturers and Distributors
  - B. Product Technologies Best Suited for the Focus Industries
  - C. Industry News

To subscribe visit www.airbestpractices.com

International pricing for print edition — $65 in Canada and $95 for other countries.

SUSTAINABILITY PROJECTS FOR INDUSTRIAL ENERGY SAVINGS

Ozone Laundry System Reduces Hotel's Operational Costs by 40%

BY MARC DEBRUM, CLEARWATER TECH, LLC

Growing operational costs and lower-than-average occupancy rates spurred Apple Farm Inn and Suites in San Luis Obispo, California to explore economic and facility efficiency through the installation of an ozone laundry system. At the Apple Farm Inn laundry facility, an evaluation was conducted in late 2006 and early 2007, which compared the costs of laundering by traditional methods versus ozone laundering.

Facilities and Equipment

The Apple Farm Inn is a hospitality hotel with 104 occupancy rooms. Laundry processed includes bedding, towels from rooms and the swimming pool area, bath mats, and robes. The laundry room consists of two 80 lb. Unimac Commercial Washers and two 120 lb. Unimac Commercial Dryers. An average of twenty loads were laundered daily, for a daily total of 1,600 lb. Traditional laundering was conducted for one month, followed by ozone laundering for a second month.

The ozone system installed for this study was a ClearWater Tech EcoTex system consisting of an ECO^2 ozone generator (maximum ozone output rating of 8 grams per hour at 3% concentration by weight), a SeQual Technologies Workhorse 8c Oxygen Concentrator, an AeroQual 100 Ambient Air Ozone Monitor, and an EcoTex Diffuser installed in the sump of the clothes washer.

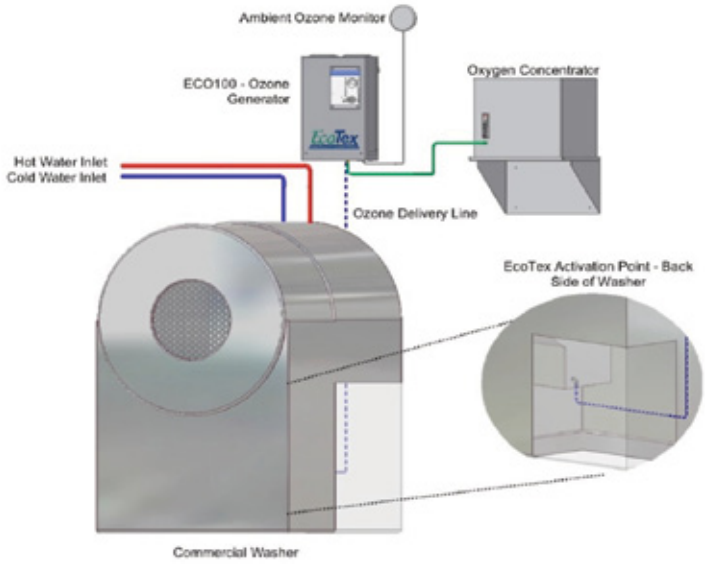


Fig-1 Schematic diagram of the ozone system installation at Apple Farm Inn.

Traditional Cycles

PROGRAM: Sheets/Towels

STEP	TEMP	LEVEL	TIME	S1	S2	S3	S4	S9
1 SUDS	H	M	8	20	3			
2 BLEACH	H	M	7			13		
3 RINSE	H	H	2					
4 EXTRACT		E	2					
5 RINSE	W	H	2					
6 FINAL RINSE	W	M	3				3	
7 EXTRACT		E	5					
Total Cold Water:	0							
Total Warm Water:	52							
Total Hot Water Gallons:	74							
Total Gallons:		126						
Total Time (min):			29					0
Total Time (sec):				20	3	13	3	
Total Chemical Used/Signal (OZ):				4	0.6	2.6	0.6	
Total Chemical Used/Wash (OZ):								7.8

Fig-2 Laundering cycles used for the traditional procedure.

Ozone Cycles

PROGRAM: Sheets/Towels

STEP	TEMP	LEVEL	TIME	S1	S2	S3	S4	S9
1 SUDS	H	M	5	14	3	10		5
2 RINSE	C	H	2					2
3 RINSE	C	H	2					2
4 FINAL RINSE	C	M	2				3	2
5 EXTRACT		E	6					
Total Cold Water:	82							
Total Warm Water:	0							
Total Hot Water Gallons:	22							
Total Gallons:		104						
Total Time (min):			18					11
Total Time (sec):				14	3	10	3	
Total Chemical Used/Signal (OZ):				2.8	0.6	2	0.6	
Total Chemical Used/Wash (OZ):								6.0

Fig-3 Laundering cycles used for ozone laundering.

Traditional vs. Ozone Laundering Cycles

A key step in the application of ozone use in a commercial laundry facility is to determine the appropriate cycle configurations. Among other factors, these wash cycles are designed based on the type of linen being laundered, the soil content of the linen, and the capacity of the washer. Figures 2 and 3 provide a visual indication of the differences between the traditional wash cycle and ozone wash cycle, respectively, used at the Apple Farm Inn. Chemical signals are as follows: S1 = Break (alkali, pH increase chemical), S2 = Detergent/Suds, S3 = Bleach, S4 = Sour/Soft, S9 = Ozone.

The ozone cycle uses two fewer steps by removing an extract and combining detergent (suds) and bleaching into one step. Removing these two steps, in addition to reducing the amount of water and time in each of the steps, allows for 22 fewer gallons of water to be used (18% savings) and 11 minutes less in over-all time of laundering — time which not only saves labor but also electrical consumption.

An analysis of the amount of hot, warm and cold water used in the laundering cycles shows that the ozone cycle reduces the volume of elevated temperature water by 37 gallons (27%) per wash load. Additional savings in natural gas also result from the use of less hot water. A portion of the savings shown in the test case cycles comes from chemicals, which have been reduced in the ozone cycle by 1.6 ounces (21% savings).

Traditional Cycle	
Water	
Total Avg Per Load - Gallons	141.00
Avg Cost Per Load	$1.69
Cost Per Month	$974.59
Cost Per Year	$11,695.10
Chemical	
Total Avg Per Load - Ounces	7.60
Avg Cost Per Load	$0.99
Cost Per Month	$569.09
Cost Per Year	$6,829.06
Electrical	
Total Avg Per Load - kWH	1.53
Avg Cost Per Load	$0.21
Cost Per Month	$123.70
Cost Per Year	$1,484.42
Natural Gas	
Total Avg Per Load - Therms	0.62
Avg Cost Per Load	$0.77
Cost Per Month	$444.02
Cost Per Year	$5,328.26
Labor	
Total Avg Per Load - Minutes	29.50
Avg Cost Per Load	$4.92
Cost Per Month	$2,712.00
Cost Per Year	$33,984.00

Fig-4

Ozone Cycle	
Water	
Total Avg Per Load - Gallons	104.00
Avg Cost Per Load	$1.25
Cost Per Month	$718.85
Cost Per Year	$8,626.18
Chemical	
Total Avg Per Load - Ounces	6.00
Avg Cost Per Load	$0.78
Cost Per Month	$449.28
Cost Per Year	$5,391.36
Electrical	
Total Avg Per Load - kWH	1.07
Avg Cost Per Load	$0.15
Cost Per Month	$86.12
Cost Per Year	$1,033.48
Natural Gas	
Total Avg Per Load - Therms	0.12
Avg Cost Per Load	$0.15
Cost Per Month	$84.77
Cost Per Year	$1,017.28
Labor	
Total Avg Per Load - Minutes	18.00
Avg Cost Per Load	$3.00
Cost Per Month	$1,728.00
Cost Per Year	$20,736.00

Fig-5

Commodity/Consumables Used

Figures 4 and 5 show the Traditional and Ozone formula totals used in each of the one month test times for each process. The two bottom lines show the costs per month and projected costs per year, respectively. The ozone system resulted in annual cost savings in all categories: water, chemicals, electrical (with ozone considered as electrical), natural gas, and labor, equaling $13,248, a 38% total annual savings.

Labor and Production Savings

One of the most interesting benefits found in the Apple Farm Inn case study is that of labor and production savings, which also can be quantified as facility efficiency. This efficiency was equated to the overall reduction of cycle time saved by the ozone laundry system. This does not necessarily mean that the facility paid less in staff labor, but rather that the staff was available to perform other housekeeping duties. The efficiencies of less water and fewer rinsing cycles resulting from ozone laundering allowed the Apple Farm Inn to launder nearly 60 more loads per month more than with their traditional wash cycles.

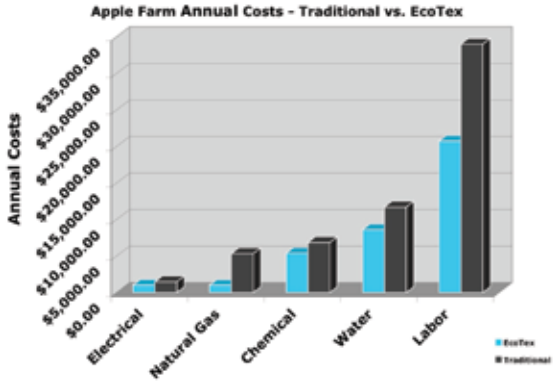


Fig-6 Annual costs of traditional vs. ozone laundering at Apple Farm Inn.

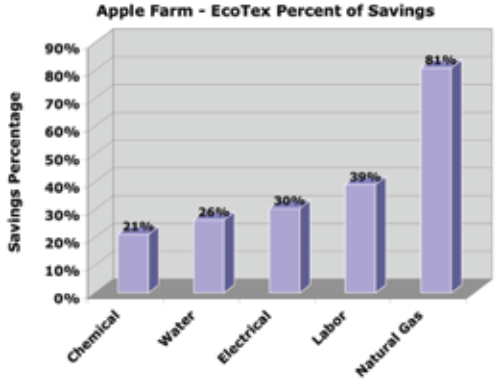


Fig-7 Percent of annual savings by ozone laundering at Apple Farm Inn.

OZONE LAUNDRY SYSTEM REDUCES HOTEL'S OPERATIONAL COSTS BY 40%

Payback With Labor Savings	
Cost Per Pound - Traditional Cycles	$0.11
Cost Per Pound - EcoTex Cycles	$0.07
Savings Per Pound	$0.04
Cost Per Load - Traditional Cycles	$8.60
Cost Per Load - EcoTex Cycles	$5.40
Savings Per Load	$3.20
Monthly EcoTex Facility Savings	$1,757
Annual EcoTex Facility Savings	$22,517
Annual EcoTex Facility Savings Percentage	38%
Retail Cost of EcoTex System	$14,370
Payback (months)	7.7

Fig-8 Estimated payback time, considering labor savings.

Return on Investment

Ozone laundry systems not only provide microbiological benefits, but through reduced cycles times, water, energy, and chemicals, they can also pay for themselves — typically within short time periods. As shown in Figures 4, 5 and 7, the ozone laundry system has saved the Apple Farm Inn nearly 40% of the annual overall costs related to the washing of linens in their laundry facility. This savings paid for the ozone laundering system in less than eight months.

The rate of return on a system such as this may increase dramatically through state and local energy providers and water companies who provide grants, rebates and other incentives to facilities that install energy and water-saving technologies and equipment.

Figure 8 shows an estimated payback time of 7.7 months resulting from the ozone laundering system, including the labor savings of $1,756 per month, or $22,517 (annually).

Conclusion

Although wash formula design and results may vary from facility to facility, ozone-laundering formulas and processes can provide higher levels of cleanliness and disinfection while increasing a facility's energy and labor efficiencies. For nearly three years, the Apple Farm Inn and Suites has benefited financially as a result of the lower consumption of water (especially hot water), energy, and labor. In addition to the savings, the facility and its management have been very grateful for the addition of their state-of-the-art environmentally-friendly laundry system. BP

Marc DeBrum is in Applications Engineering at ClearWater Tech, LLC. He can be reached at 800-262-0203 or by e-mail at mdebrum@cwtozone.com. You can also go to the website at http://www.ecotexlaundry.com.

RESOURCES FOR ENERGY ENGINEERS

TRAINING CALENDAR

TITLE	SPONSOR(S)	LOCATION	DATE	INFORMATION
Compressed Air Systems	Association of Energy Engineers	Online Seminar	8/23/10	www.aeeprograms.com
Compressed Air Challenge® Advanced Mgmt of Compressed Air Systems	Efficiency Vermont, Burlington Electric DOE EERE	S. Burlington, VT	8/31–9/1	Peter Wilhovsky Tel: 888-921-5990 x1328 www.compressedairchallenge.org
Compressed Air Challenge® Fundamentals of Compressed Air Systems	Compressed Air Challenge®	Web-based	9/13/10	Tel: 301-751-0115 www.compressedairchallenge.org info@compressedairchallenge.org
Energy Efficient Compressed Air System Design	Air Centers of Florida Ingersoll Rand	Saint Lucie West, FL	9/24/10	John Teneriello email: j.teneriello@acfpower.com www.acfpower.com
Compressed Air Challenge® AIRMaster+ Specialist Training	Efficiency Vermont, Burlington Electric DOE ITP	S. Burlington, VT	9/27–30/10	Peter Wilhovsky Tel: 888-921-5990 x1328 www.compressedairchallenge.org
Compressed Air Challenge® Fundamentals of Compressed Air Systems	Manitoba Hydro Compressed Air Challenge®	Winnipeg, MB	10/26/10	Veronica Walls Tel: 204-360-7229 email: vwalls@hydro.mb.ca www.compressedairchallenge.org
Compressed Air Challenge® Advanced Mgmt of Compressed Air Systems	Manitoba Hydro Compressed Air Challenge®	Winnipeg, MB	10/27–28/10	Veronica Walls Tel: 204-360-7229 email: vwalls@hydro.mb.ca www.compressedairchallenge.org

Editors' Note: If you conduct compressed air system training and would like to post it in this area, please email your information to rod@airbestpractices.com.

PRODUCT PICKS

New Air Nozzles

EXAIR's new PEEK Super Air Nozzles™ deliver strong blowing force while providing non-marring protection should the air nozzle come in contact with other surfaces. The engineered thermoplastic construction offers excellent resistance to chemicals, fatigue and temperatures up to 320 °F (160 °C). Applications include part drying, machinery and parts cleaning, chip removal, part ejection, liquid blow-off and cooling hot parts.

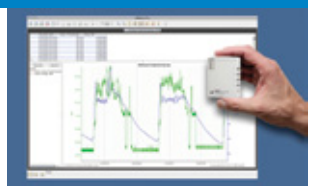
The PEEK Super Air Nozzles™ provide high air amplification and strong blowing force. At 80 psig, the sound level is under 76 dBA, which meets OSHA noise requirement 29 CFR 1910.95(a). Safe operation is assured since the airflow cannot be blocked as required by OSHA Standard 29 CFR 1910.242(b). Installation of these engineered air nozzles qualify for energy provider rebates.

The Model 1110-PEEK Nano Super Air Nozzle with an M6 x 0.75 inlet measures only 0.78" (20mm) in length, has a diameter of 0.25", an air consumption of 8.3 scfm and produces 8.1 ounces of blowing force. The Model 1102-PEEK Super Air Nozzle has a ⅛ NPT inlet, measures 1.19" (30mm) in length, has an air consumption of 10 scfm and produces 9 ounces of blowing force. The Model 1100-PEEK Super Air Nozzle has a ¼ NPT inlet, measures 1.75" (44mm) in length, has an air consumption of 14 scfm and produces 13 ounces of blowing force. Prices start at $26.

EXAIR Corporation
Tel: (800) 903-9247
E-mail: techelp@exair.com
www.exair.com

PRODUCT PICKS

Multi-channel Data Logger



Onset announced that it has broadened its offerings for energy and environmental monitoring by expanding the range of measurement options for its line of HOBO U12 data loggers. Specifically, multi-channel versions of HOBO U12 data loggers can now measure and record kilowatts, air velocity, gauge pressure, differential pressure, DC current and other energy and environmental parameters.

The expanded measurements are possible through the introduction of a new, compact power adapter. The adapter enables energy and building management professionals to conveniently power external sensors that require 12V A/C excitation power. This augments the company's existing line of measurement options, which includes air temperature, relative humidity, light intensity, A/C current and A/C voltage. The adapter can also power any user-supplied external sensor that requires up to 400 mA at 12 VDC.

HOBO U12 data loggers are small, durable devices designed for high-accuracy indoor environmental and energy monitoring. They can record data unattended for days, weeks or months at a time, storing up to 43,000 measurements. Using a USB connection, HOBO U12 data loggers offer convenient, high-speed data offload directly to a computer or to a HOBO U-Shuttle data transport device.

For plotting and analyzing data gathered by the HOBO U12 data loggers, Onset offers HOBOware® software, an intuitive graphing and analysis software package for Windows and Macintosh. HOBOware provides a user-friendly interface for graphing, analyzing and printing data files, as well as exporting data to Microsoft Excel and other spreadsheet programs.

Onset Computer Corporation
Tel: 800-564-4377
E-mail: sales@onsetcomp.com
www.onsetcomp.com

RESOURCES FOR ENERGY ENGINEERS

COMPANIES

Tencarva Acquires ESSCO

Tencarva Machinery Company announced the acquisition of Greensboro-based Electric Service and Sales Company Inc. (ESSCO), a division of Enerphase Industrial Solutions Inc., as of May 28, 2010, according to Rod Lee, president.

Stan Shelton, president of ESSCO, will continue as manager for the new ESSCO Division of Tencarva and Don Benton will remain as operations manager. All other ESSCO personnel, including outside sales, inside sales, engineering, repair and others will continue to be a part of the ESSCO Division. ESSCO is a distributor for Toshiba motors and drives, Marathon motors and ABB drives and controls.

"We are pleased to announce that Tencarva, our long-time account and largest customer for the past several years, has purchased the assets of the ESSCO Division," Shelton comments. "This is an exciting time for those of us at ESSCO. We become part of one of the largest industrial distributors in the country," he continues. "We believe the combination of our electrical knowledge and Tencarva's resources will provide great benefits to our customers and manufacturers.

Lee explains, "ESSCO has been an important supplier for Tencarva for years. Most of the motors that Tencarva's team mounts on pump packages built in Greensboro come from ESSCO. They also design and build electrical control packages and have incorporated the ITT PumpSmart drives in several packages built for Tencarva customers over the past several years."

"We welcome the ESSCO employees to the Tencarva family," Lee emphasizes. "And we believe they will be an excellent addition to Tencarva as they help create many avenues for growth."

A service-oriented company established in 1955 in Greensboro, ESSCO has been involved with industrial motor control and system integration for over 40 years. The company also has a motor rewind shop in Martinsville, Va. and a sales office in Kingsport, Tenn. ESSCO is a complete source of quality industrial products and services and provides complete system integration services. Included are variable speed drives, power ride through systems, Servo motors and controls, multi-axis motion controllers and software, PLCs, motors, uninterruptible power supplies, motor controls, circuit breakers, disconnect switches, transformers, line reactors and filters, process instruments, non-contact dancer assemblies, pilot devices and gear boxes, and proximity, photoelectric and sonic sensors.

Tencarva Machinery Company is a distributor specializing in liquid process, compressed air, vacuum equipment and custom-designed systems for the industrial and municipal marketplace. Tencarva is dedicated to providing the highest-quality process machinery, coupled with superior customer service and integrity.

Tencarva Machinery Company
Tel: 336-665-1435
http://www.tencarva.com.

Atlas Copco Acquires Distributor

Atlas Copco Compressors LLC has purchased certain assets of American Air Products, Inc. The acquired business has been a long-serving Atlas Copco compressor distributor in the states of Minnesota, North Dakota and South Dakota, as well as areas of Wisconsin.

"Feet on the street and maintaining the closest relationship with the customer continues to be a high priority for us in the U.S.," says Stephan Kuhn, business area president, Atlas Copco Compressor Technique. "This acquisition gives us the opportunity to bring some experienced sales and aftermarket people into Atlas Copco, and will allow for an even greater customer focus."

The acquired business, operating on the market under the name Clayhill, has a well-developed customer base and market presence within the region. Sales mainly consist of compressor equipment and parts. The economic activity in this region is both varied and competitive, and offers a good opportunity for Atlas Copco to grow customer relationships going forward.

Approximately 18 employees will join Atlas Copco from American Air Products as a result of this acquisition. The American Air Products business will be incorporated into the Central Region of Atlas Copco Compressors in the U.S. The Clayhill name will be used for an interim period.

Atlas Copco
www.atlascopco.com

COMPANIES

Kaeser Earns ENERGY STAR Label

Kaeser Compressors, Inc. is proud to announce its United States headquarters building has earned the ENERGY STAR Label! Kaeser became an ENERGY STAR Partner in 2009, and its headquarters in Fredericksburg, Virginia earned the label this year with a rating of 83 — well above the national average and exceeding ENERGY STAR requirements.

"We were actively engaged in energy reduction long before it was popular. For decades, we have been helping our customers save energy by optimizing — and where possible, reducing — their compressed air consumption," said Frank Mueller, president of Kaeser Compressors. "So, it only makes sense that as one of the very first industrial manufacturers to establish an ISO14001 Environmental Program, we are reducing our own energy footprint and taking advantage of today's energy efficient building technologies."

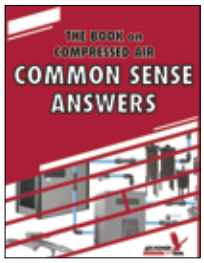
Last year, an expansion added 17,500 sq. ft — nearly doubling the office space. Matt McCorkle, staff engineer and contact for information on the building's designation, outlined some the key features. "The new section includes several energy-saving elements, such as a reflective TPO Roof, an underfloor air distribution system and high-efficiency lighting fixtures," said McCorkle. "The existing building also saw recent improvements with projects, including a warehouse lighting retrofit and upgrades to the HVAC control system."

The 120,000 sq. ft. facility supports a national network of factory-trained representatives for the Kaeser product line, which offers rotary screw air compressors, oil-less reciprocating compressors, rotary lobe blowers, clean air treatment equipment, portable compressors and air system controls. Read Kaeser's building profile at www.energystar.gov.

Kaeser Compressors
Tel: 800-777-7873
www.kaeser.com.

LITERATURE & SERVICES PICKS

The Book on Compressed Air Common Sense Answers



NEW! Providing practical solutions to the everyday issues facing plant staffs who operate and maintain plant air systems and the engineering staff who design and evaluate air systems. Real life experiences flow throughout covering common problems and opportunities that touch all industries. New electronic energy saving products are reviewed in detail, and how to apply them through the complete air system, from the compressor room to the shipping dock, is explained. Savings calculation methods and measurement protocols are identified. Features "Ask the Experts" section answering questions posed by real users to Air Power USA staff. (Red book, Hard cover. 1st edition — 2009).

Black/white print copy $85.00 US
Color print copy $105.00 US
To purchase, call Air Power USA at 740-862-4112
or visit www.airpowerusainc.com

New Edition of "Best Practices for Compressed Air Systems®" from the Compressed Air Challenge®

The Compressed Air Challenge® has released the Second Edition of their authoritative "Best Practices for Compressed Air Systems®."* The Best Practices manual provides tools needed to reduce operating costs associated with compressed air and to improve the reliability of the entire system. The 325-page manual addresses the improvement opportunities from air entering the compressor inlet filter, through the compressor and to storage, treatment, distribution and end uses, both appropriate and potentially inappropriate. Numerous examples of how to efficiently control existing and new multiple compressor systems are provided in one of the many appendices.

The Best Practices manual created by the Compressed Air Challenge® begins with the considerations for analyzing existing systems or designing new ones. The reader can determine how to use measurements to audit their own system, how to calculate the cost of compressed air and even how interpret electric utility bills. Best practice recommendations for selection, installation, maintenance and operation of all the equipment are included in each section. BP

**The Best Practices for Compressed Air Systems® manual is a product of the Compressed Air Challenge®, co-authored by Bill Scales and David McCulloch and is not associated with Compressed Air Best Practices® Magazine.*

Compressed Air Challenge®
www.compressedairchallenge.org

WALL STREET WATCH

BY COMPRESSED AIR BEST PRACTICES®

The intent of this column is to provide industry watchers with publicly held information, on publicly held companies, involved with the sub-industry of compressed air. It is not the intent of the column to provide any opinions or recommendations related to stock valuations. All information gathered in this column was during the trading day of July 26, 2010.

JULY 26, 2010 PRICE PERFORMANCE	SYMBOL	OPEN PRICE	1 MONTH	6 MONTHS	12 MONTHS	DIVIDEND (ANNUAL YIELD)
Parker-Hannifin	PH	$62.19	$58.61	$59.44	$47.12	1.72%
Ingersoll Rand	IR	$37.29	$39.15	$36.59	$23.24	0.76%
Gardner Denver	GDI	$50.41	$47.95	$41.61	$27.04	0.40%
Atlas Copco ADR	ATLCY	$15.39	$14.49	$12.58	$9.88	2.57%
United Technologies	UTX	$70.90	$68.18	$69.87	$53.25	2.44%
Donaldson	DCI	$46.99	$46.47	$41.09	$36.45	1.03%
SPX Corp	SPW	$58.28	$56.57	$57.14	$54.42	1.75%

Atlas Copco Announces 2010 1st Quarter Earnings

Atlas Copco Group
Market Development

Demand improved sequentially, i.e. compared with previous quarter, both for equipment and aftermarket. This was particularly pronounced in emerging markets and for mining equipment, but an improvement was also noted for industrial and construction equipment. Overall, order intake was significantly above the low levels of previous year.

Demand for mining equipment developed very favorably in **North America**. Demand for most types of industrial and construction equipment and for the aftermarket improved sequentially and compared with previous year.

The sales development for all types of equipment and most customer segments was favorable in **South America** and orders received were record high.

In **Europe**, overall demand remained relatively weak. Compared to the fourth quarter 2009, orders improved slightly in aftermarket, but stayed more or less flat for equipment. Compared with previous year, there was a moderate increase both for equipment and aftermarket. An improvement was seen in Germany and the Nordic countries, whereas southern Europe remained weak.

Earnings and profitability

Operating profit amounted to MSEK 2 627 (2 172); previous year includes redundancy costs of MSEK 230. The operating margin improved to 17.2% (14.5 adjusted) and was positively affected by the cost and efficiency measures that were introduced as from Q4 2008. A favorable sales mix and price increases also supported the profit margin. This more than offset the negative effects of lower volumes and less favorable currency rates. The net currency effect was MSEK -75.

Net financial items were MSEK -130 (-378) of which interest net MSEK -85 (-277). The improvement in interest net reflects the significant reduction of the net indebtedness in the last year, as well as a lower effective interest rate. Other financial items were MSEK -45 and include unfavorable exchange rate differences and fair value adjustments on financial instruments.

Profit before tax amounted to MSEK 2 497 (1 794), corresponding to a margin of 16.3% (10.8).

Profit for the period totaled MSEK 1 855 (1 378). Basic and diluted earnings per share were SEK 1.53 (1.13) and SEK 1.52 (1.13), respectively.

Compressor Technique

The Compressor Technique business area consists of seven divisions in the following product areas: industrial compressors, compressed air treatment products, portable compressors and generators, gas and process compressors and expanders, service and specialty rental.

MSEK	JANUARY – MARCH		CHANGE
	2010	2009	%
ORDERS RECEIVED	7,968	7,703	+3
REVENUES	7,659	8,360	-8
OPERATING PROFIT	1,577	1,384	+14
– as a percentage of revenues	20.6	16.6*	—
Return on capital employed, %	49	53	—

** Includes items affecting comparability of MSEK -120 in 2009. Adjusted margin was 18.0%.*

Industrial Compressors

The demand for stationary industrial compressors improved. Strong growth was recorded in Asia and sales in North and South America increased. Order intake in Europe remained on a low level. Demand for small and medium-sized compressors was relatively better than for large machines. Order intake for air treatment products such as dryers, coolers and filters improved slightly, both sequentially and compared with previous year.

Gas and Process Compressors

Order intake of gas and process compressors were higher than previous quarter and slightly better than previous year, primarily thanks to orders won in the Middle East.

Portable Compressors, Generators and Rental

Demand for portable compressors and generators improved significantly from a low level. Strong development was seen in most emerging markets and in the United States, partly due to increased sales to rental companies.

The specialty rental business, i.e. rental of portable air and power, recorded lower revenues in North America and Europe, partly compensated by higher sales in emerging markets.

Aftermarket

Sales of service and spare parts increased firmly in all regions. The best development was seen in emerging markets.

Product Development

A range of oil-free screw blowers, which offer a more energy efficient solution for low-pressure applications, was introduced. The range of dryers was also extended with several new models, including a range of integrated refrigerant dryers for small oil-injected compressors for the Asian market. The smallest oil-injected screw compressor range with variable speed drive has been redesigned with a new compression element and a new electronic control unit. This new range offers significant energy savings and lower noise.

Structural Changes

On March 1, the acquisition of Quincy Compressor, with the exception of the Chinese operations, was finalized. Approvals from the Chinese authorities are expected in the second quarter. In 2009, Quincy had approximately 400 employees, revenues of MUSD 125 and an operating profit margin of approximately 7%.

In January, a compressor distributor in Louisiana, the United States, was acquired.

Profit and Returns

Operating profit increased to MSEK 1 577 (1 384 including redundancy costs of MSEK 120). Operating margin reached 20.6% (18.0 adjusted). The increase was primarily due to last year's cost and efficiency measures, but a positive sales mix and price increases also gave support.

Return on capital employed (last 12 months) was 49% (53).

WALL STREET WATCH

SPX Corporation Announces 2010 1st Quarter Earnings

SPX Corporation (NYSE: SPW) reported results for the first quarter ended April 3, 2010:

First Quarter Highlights:

- Revenues decreased 6.4% to $1.09 billion from $1.16 billion in the year-ago quarter. Organic revenues* declined 11.6%, while completed acquisitions and the impact of currency fluctuations each increased reported revenues by 2.6%
- Segment income and margins were $106.3 million and 9.8%, compared with $126.2 million and 10.9% in the year-ago quarter
- Diluted net income per share from continuing operations was $0.37, compared with $0.77 in the year-ago quarter. The current-year quarter included a non-cash tax charge of $6.2 million, or $0.12 per share, related to changes in federal health care laws
- Net cash used in continuing operations was $25.1 million, compared with $35.0 million in the year-ago quarter. The decrease in cash used in continuing operations was due primarily to changes in working capital and lower spending on restructuring, which more than offset the decline in operating income
- Free cash flow from continuing operations* during the quarter was a negative $36.9 million, compared with a negative $50.3 million in the year-ago quarter. The improvement was due primarily to the items noted above, in addition to lower capital expenditures in 2010

"We are encouraged by positive signs that the recovery of the global economy is underway, and we have seen various levels of improved performance in our early cycle businesses," said Christopher J. Kearney, chairman, president and chief executive officer of SPX. "Nevertheless, continued softness in our transformer business weighed on our first quarter results, which remain below 2009 levels, and we maintain the view that recovery in our mid-to-late cycle businesses will lag the broader economy.

"We remain confident in our long-term strategy, are committed to executing it and believe the steps we have taken to enhance our business during the global recession have us well positioned for growth when our markets recover. We are revising our EPS guidance range to $3.00 to $3.30 per share, resulting in an increase to our mid-point guidance of $0.05 compared to our previous range of $2.90 to $3.30 per share. We also have higher expectations for cash flow performance, and are increasing our guidance range to $180 million to $220 million from $160 million to $200 million," added Kearney.

Financial Highlights — Continuing Operations

Flow Technology

Revenues for the first quarter of 2010 were $354.0 million compared to $394.0 million in the first quarter of 2009, a decrease of $40.0 million, or 10.2%. Organic revenues declined 15.3%, driven primarily by softness in the oil and gas market and lower demand for large-scale systems in the food and beverage market. Completed acquisitions and the impact of currency fluctuations increased reported revenues by 0.6% and 4.5%, respectively, from the year-ago quarter.

Segment income was $41.3 million, or 11.7% of revenues, in the first quarter of 2010 compared to $50.1 million, or 12.7% of revenues, in the first quarter of 2009. Segment income and margin declined due primarily to the organic decline noted above, offset partially by the benefits from restructuring actions taken in 2009.

Test and Measurement

Revenues for the first quarter of 2010 were $204.4 million compared to $196.0 million in the first quarter of 2009, an increase of $8.4 million, or 4.3%. Organic revenues increased 2.2%, driven primarily by increased demand in the global automotive aftermarket and sales of portable pipe and cable locators in the U.S. and Europe. The impact of currency fluctuations increased revenues by 2.1% from the year-ago quarter.

Segment income was $13.4 million, or 6.6% of revenues, in the first quarter of 2010 compared to $5.8 million, or 3.0% of revenues, in the first quarter of 2009. The increase in segment income and margins was due primarily to the benefits realized from restructuring actions initiated in 2009 and the impact of the organic revenue increase noted above.

Thermal Equipment and Services

Revenues for the first quarter of 2010 were $353.4 million compared to $342.2 million in the first quarter of 2009, an increase of $11.2 million, or 3.3%. Organic revenues declined 7.4% in the quarter, driven primarily by project timing for cooling systems. Completed acquisitions and the impact of currency fluctuations increased reported revenues by 8.2% and 2.5%, respectively, from the year-ago quarter.

Segment income was $31.5 million, or 8.9% of revenues, in the first quarter of 2010 compared to $21.4 million, or 6.3% of revenues, in the first quarter of 2009. The increase in segment income and margins was due primarily to favorable project mix and incremental profits from SPX Heat Transfer Inc.

Industrial Products and Services

Revenues for the first quarter of 2010 were $173.8 million compared to $227.4 million in the first quarter of 2009, a decrease of $53.6 million, or 23.6%. Organic revenues declined 23.7% in the quarter, driven primarily by volume and pricing declines for power transformers as well as lower demand in our solar crystal growers and broadcast equipment product lines. The impact of currency fluctuations increased revenues by 0.1% from the year-ago quarter.

Segment income was $20.1 million, or 11.6% of revenues, in the first quarter of 2010 compared to $48.9 million, or 21.5% of revenues, in the first quarter of 2009. The decrease in segment income and margins was due primarily to the organic declines noted above. BP

COMPRESSED AIR BEST PRACTICES®
www.airbestpractices.com

Advertising & Editorial: Rod Smith
rod@airbestpractices.com
Tel: 251-680-9154

Subscriptions & Administration: Patricia Smith
patricia@airbestpractices.com
Tel: 251-510-2598
Fax: 412-831-3091

A Publication of: Smith Onandia Communications LLC
217 Deer Meadow Drive
Pittsburgh, PA 15241

Compressed Air Best Practices® is published monthly by Smith Onandia Communications LLC., 217 Deer Meadow Drive, Pittsburgh, PA 15241. Phone 251-510-2598, Fax 412-831-3091, email patricia@airbestpractices.com. Compressed Air Best Practices® is a trademark of Smith Onandia Communications, LLC. Publisher cannot be held liable for non-delivery due to circumstances beyond its control. No refunds. Standard postage is paid at 233 Jefferson Street, Greenfield, Ohio 45123. Canadian and international distribution: IMEX International Mail Express, 1842 Brummel Drive, Elk Grove Village, IL 60007. POSTMASTER: Send address changes to Compressed Air Best Practices,® 217 Deer Meadow Drive, Pittsburgh, PA 15241. SUBSCRIPTIONS: Qualified reader subscriptions are accepted from compressed air professionals, plant managers, plant engineers, service and maintenance managers, operations managers, auditors, and energy engineers in manufacturing plants and engineering/consulting firms in the U.S. To apply for qualified reader subscriptions, please fill in the reader response cards herein and mail or fax or go to www.airbestpractices.com. To non-qualified subscribers subscriptions are $65 in Canada and $95 for other countries. When available, extra copies of back issues are $4 plus shipping. Contact Patricia Smith for subscription information at tel: 251-510-2598 or email: patricia@airbestpractices.com. REPRINTS: Reprints are available on a custom basis, contact Patricia Smith for a price quotation at tel: 251-510-2598 or email: patricia@airbestpractices.com.

THE MARKETPLACE

TECHNOLOGY

33rd WORLD ENERGY ENGINEERING CONGRESS

PRESENTED BY

The Association of Energy Engineers

HOSTED BY

SAIC® From Science to Solutions

FEATURING

FEMWORKS 2010

Green Street EXPO at WEEC
Sponsored By
LEARN MORE AT energystar.gov

Recognized as the most important energy event of national scope for end users and energy professional in all areas of the energy field.

It is the one truly comprehensive forum where you can fully assess the "big picture" – and see exactly how the economic and market forces, new technologies, regulatory developments and industry trends all merge to shape your critical decisions on your organization's energy and economic future.

Keynote Speaker

Thomas L. Friedman
World renowned journalist and author. Speaking on opening session on Wednesday, Dec. 8, 2010

The World Energy Engineering Congress (WEEC) and expo target the complete spectrum of technologies and services of greatest importance to our delegates in attendance, including, but not limited to:

The Green Jobs Explosion • Energy & Policy Legislation • Government Energy Management – New Rules
Strategies & Sustainability for Green Buildings • Lighting Controls • Climate Risk Management
Existing Building Commissioning • Superior Energy Performance for Industry
Energy & Carbon Reduction Success Stories • Alternative Energy

Also, in order to address the interests and needs of the large number of U.S. government professionals who traditionally attend WEEC, AEE will again offer a section of the program known as **FEMWorks 2010**. First introduced as part of the 2006 WEEC agenda, this special multi-track portion of the WEEC conference will include a comprehensive series of workshops for federal energy managers.

www.energycongress.com • 770-447-5083 • info@aeecenter.org

"A team like ours runs on adrenaline … and on clean, reliable compressed air."

— J. D. Gibbs
Team President – Joe Gibbs Racing,
technology partner with Kaeser Compressors since 1998

JOE GIBBS RACING

Nobody knows a winner better than Joe Gibbs Racing. That's why they've installed Kaeser compressed air systems in their state-of-the-art raceshop.

Reliable air is the lifeblood of Joe Gibbs' operation – just as it is in yours. From CNC milling centers to the fab shop and everywhere else in your plant, Kaeser provides all the clean air you require to keep you running at peak performance, 24/7.

Available in any size you need, our units are engineered for easy maintenance and energy efficiency ... but most of all, for ***reliability***. So, when you want a winner, choose Kaeser.

KAESER COMPRESSORS

Built for a lifetime.™

(866) 516-6888
www.kaeser.com/sigma
info.usa@kaeser.com

Member of COMPRESSED AIR AND GAS INSTITUTE CAGI www.cagi.org

Kaeser Compressors, Inc., P.O. Box 946, Fredericksburg, VA 22404 USA

ISO