The Magazine for ENERGY EFFICIENCY in Compressed Air, Pneumatics, Blower and Vacuum Systems

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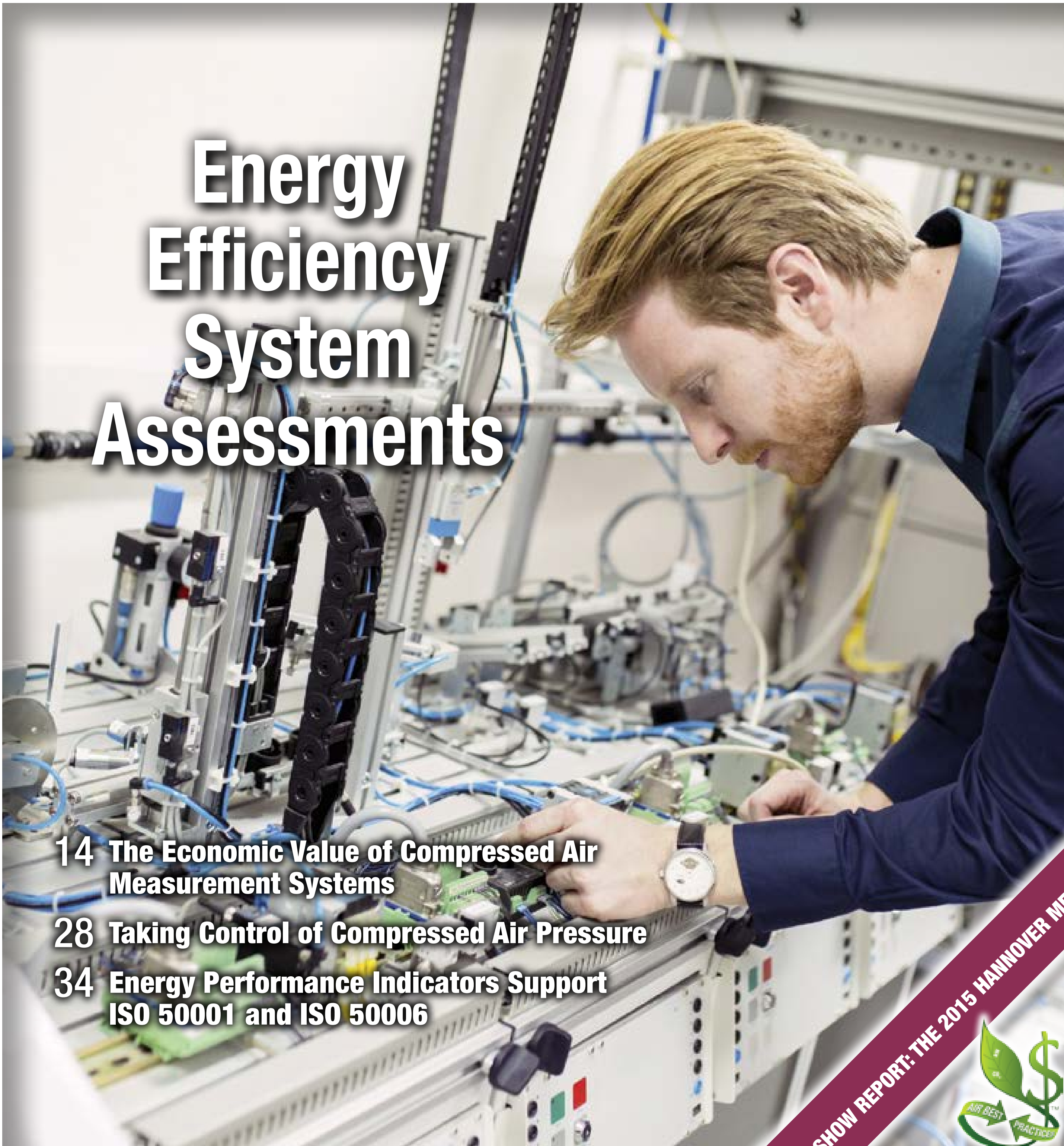
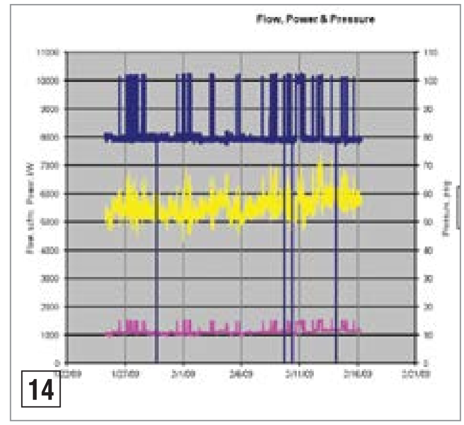
June 2015



Energy Efficiency System Assessments

SUSTAINABLE MANUFACTURING FEATURES



COLUMNS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FROM THE EDITOR | Energy Efficiency System Assessments

Our industry must be doing something right. Lately, I'm fielding some phone calls and emails from hedge funds and research firms hired by the financial world. They want to know who are the main players in the blower market? What are the market drivers in the compressed air industry? Not sure what this means, but I admit it's nice to be noticed.

I often tell these inquirers how our category has embraced energy conservation and created a strong "retrofit" market. Our first article, titled "Determining the Economic Value of Compressed Air Measurement Systems," will challenge most readers. Written by Tim Dugan, from Compression Engineering, it shines a sobering spotlight on how quickly the future savings of an energy efficiency audit can disappear without measurement and control.

Hank van Ormer, from Air Power USA, provides us with another practical system assessment story. He says, "A commonly overlooked area of inefficient compressed air use is dust collector pulse-jet cleaning." Hank reviews the operating principles of both bag (sock) and reverse-flow filter, pulse-jet dust collectors. He then provides several case studies providing examples of how to fix issues and optimize compressed air use.

How many plants have control of plant pressure? Does plant pressure manage the air compressor performance and energy consumption? Our Editorial Associate, Clinton Shaffer, provides us with an article profiling the use of ConservAIR I/C flow controllers to provide a buffer between the supply and demand side of the system. The article features interviews with Pneumatech's Joe Fresch and long-time flow control installer Don Dyck from CAPS Inc. out of Alberta.

The energy management system standard ISO 50001:2011 and the energy measurement standard ISO 5006:2014 assists Energy Teams in identifying what and how to measure. Ron Marshall, on behalf of the Compressed Air Challenge®, writes about which compressed air system Key Performance Indicators are being considered for inclusion by a new draft CSA Standard (Canadian Standards Association), designed to support these ISO Standards.

We finish the issue with my report on the 2015 Hannover Messe. I spent four solid days walking the booths and hope the reader can, in some small way, enjoy the Messe by reading the article and viewing the booth pictures. There were some real innovations again this year on display!

Thank you for investing your time and efforts into ***Compressed Air Best Practices®***.

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INDUSTRY NEWS

EPA Honors 2015 Energy Star Partners of the Year

The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) honored 128 businesses and organizations in 33 states with the Energy Star's Partner of the Year award for their commitment to saving energy and protecting the environment through superior energy efficiency achievements. Awardees help save energy in innovative ways, including working with utilities to offer rebates to customers, creating more efficient products, and launching efficiency projects.

In 2014 alone, Energy Star partners, including the 128 Partners of the Year awardees, prevented more than 300 million metric tons of greenhouse gas emissions and reduced utility bills for Americans by $34 billion.

"Our Energy Star Partner of the Year award winners demonstrate that energy efficiency is a smart business decision that supports their bottom line, and helps their customers save money and energy," said EPA Administrator Gina McCarthy. "I congratulate our Energy Star Partners of the Year for their leadership and commitment to reducing greenhouse gas emissions and taking action that will help us leave a healthier planet for future generations."

This year's awardees include manufacturers, retailers, public schools, hospitals, real estate companies, home builders and other businesses and organizations — from Fortune 500 companies to small businesses. Several organizations are first-time Energy Star Partner of the Year awardees.

About Energy Star

For more than 20 years, people across America have looked to EPA's Energy Star program for guidance on how to save energy, save money, and protect the environment. Behind each blue label is a product, building, or home that is independently certified to use less energy and cause fewer of the emissions that contribute to climate change. Today, Energy Star is the most widely recognized symbol for energy efficiency in the world, helping families and businesses save $300 billion on utility bills, while reducing carbon pollution by two billion metric tons since 1992.

For more information about Energy Star, visit www.energystar.gov.

BOGE America Helps Expand Red Hare Brewing's Canning Process

Recently, BOGE America made their mark in the trendy world of microbrewing when the company's BOGE C 30 air compressor helped Red Hare Brewing Company — located in Marietta, Georgia — to dramatically expand their canning process.

Canned beer is not a new product — it's been available in the United States for over

"In 2014 alone, Energy Star partners prevented more than 300 million metric tons of greenhouse gas emissions and reduced utility bills for Americans by $34 billion."

80 years. However, cans have long been regarded as the mark of low-quality beer, with glass bottles serving as the packaging of choice for craft-brewed beer for years. Thanks to breweries like Red Hare, cans are now making a resurgence due to their lower cost and better ability to protect the beer from light and oxidation. Cans are also smaller, lighter, and more easily recycled.

Red Hare was the first craft brewery in Georgia to adopt canning, and it's proven to be a wise choice. The market has responded favorably to the quality of Red Hare's beer, and that success has driven them to dramatically expand their canning line. Since canning lines are largely air-operated, BOGE America was able to assist Red Hare in their canning expansion.

BOGE America studied the air demands of the new canning system, and custom-specified an air system to suit the expansion. According to BOGE Area Sales Manager, Kurt Schoeller, the German-engineered BOGE C 30 air compressor was the perfect choice for Red Hare:

"Craft breweries are often comparatively small facilities, with employees working in close proximity to machinery, so a BOGE C 30, with its small footprint and low noise level, is a great option. The reliability and energy efficiency of the C 30 are also very important to young companies that must accurately forecast their costs. BOGE provided a total turn-key air system, freeing Red Hare to focus on other aspects of their expansion."

Red Hare is an innovator in their field. In addition to being the first craft brewery in Georgia to can its beer, they're also the first brewery in the world to use a new high-

INDUSTRY NEWS

recycled-content aluminum can. A reliable supply of clean, dry BOGE air will help facilitate their innovation for years to come.

For more information, visit www.boge.com/us.

CalPortland Receives 2015 Energy Star Partner of the Year — Sustained Excellence Award

The U.S. Environmental Protection Agency (EPA) has awarded CalPortland with a 2015 Energy Star Partner of the Year — Sustained Excellence Award for the company's continued leadership in protecting the environment through superior energy efficiency achievements. CalPortland's accomplishments were recognized by EPA in Washington, DC, where they were honored for their long-term commitment to energy efficiency.

CalPortland's energy program has matured significantly since its formation in 2003. This is the 11th consecutive year that EPA has awarded the Energy Star Award to CalPortland. This year, CalPortland is receiving Energy Star Partner of the Year — Sustained Excellence recognition for the company's advancement as a global leader in the promotion of best energy management practices throughout industry. Some of the key 2014 accomplishments include:

- Saving 29 billion British thermal units over 2013, and reducing energy intensity by 16 percent since 2003. Cumulative energy reductions have amounted to $73.1 million
- Achieving CalPortland's President's 2014 $1 Million Energy Savings Challenge, which motivated all employees to implement energy-saving ideas
- Developing an innovative company-wide concrete truck fuel efficiency program with fuel control stations, real-time truck production management systems, new technologies, and improvement of driver habits and truck management
- Engineering a clinker cooler replacement project at the Rillito cement plant with expected energy savings of over $2.6 million per year

"Through their sustained participation with Energy Star, CalPortland is helping Americans save money, save energy, and do their part to reduce our nation's greenhouse gas emissions that fuel climate change," said EPA Administrator Gina McCarthy. "I applaud CalPortland for earning EPA's highest Energy Star award, the 2015 Partner of the Year — Sustained Excellence Award, demonstrating a strong commitment to energy efficiency and to preserving a healthy planet for future generations."

The 2015 Partner of the Year — Sustained Excellence Awards are given to a variety of organizations to recognize their contributions to reducing greenhouse gas emissions through superior energy efficiency achievements. These winners have reduced greenhouse gas emissions by setting and achieving aggressive goals, and employing innovative energy efficiency approaches.

About CalPortland

CalPortland Company is a major producer of cement, ready mixed concrete, aggregates, concrete products and asphalt in the western United States and Canada. Founded in 1891 with the principle of providing unsurpassed quality, CalPortland remains a leader in the industry through its commitment to quality, safety, customer service, technical excellence and environmental leadership.

For more information about CalPortland Company, visit www.calportland.com.

FS-Elliott Continues Expansion with New Service Center

FS-Elliott Co., LLC, a leading manufacturer of oil-free centrifugal air and gas compressors, recently announced the completion of their 67,000 square foot service center located on its headquarter campus in Export, PA.

FS-Elliott's service center houses the Global Services group, a team of professionals responsible for providing a full portfolio

FS-Elliott's new service center in Export, PA

INDUSTRY NEWS

of support, including remote technical assistance, operation and maintenance training, and performance upgrades designed to further improve machinery operation. The entrance to the facility includes an equipment display, allowing visitors to get an up-close look at the internal components of a centrifugal compressor. Three large meeting rooms, four smaller breakout rooms, and a visitor lounge are available for on-site customer meetings.

Operator and maintenance service training programs will be held in a state-of-the-art training room located in the service center. Training programs can follow a standardized format or a program customized to specific needs, allowing customers to maximize the effectiveness of their compressor equipment and extend its product life. During these sessions, customers are invited to tour FS-Elliott's manufacturing and testing facility while observing the structure of the customer-focused organization firsthand.

"The relationship with our customers does not end with equipment installation," stressed David Tschudy, Director of Global Services. "FS-Elliott offers a full portfolio of after-sale products, from installation supervision to remote or on-site technical support, training programs, and auxiliary upgrades. This allows us to assist our customers in optimizing the efficiency and reliability of their equipment."

In addition to its headquarters location, FS-Elliott has offices located in Basingstoke, United Kingdom; Houston, Texas; Jubail, Kingdom of Saudi Arabia; Los Angeles, California; Pune, India; Shanghai, China; Kuala Lumpur, Malaysia; and Taipei, Taiwan.

For more information, visit www.fs-elliott.com.

Hitachi America's Air Technology Group Announces Personnel Appointments

The Air Technology Group (ATG) of Hitachi America recently made two new personnel appointments in its continual effort to provide world-class service and support.

Camilo Villalobos, formerly the Distribution Area Manager for the East Coast, including the U.S., Mexico and Canada, was recently appointed as the Manager of Hitachi America ATG.

Camilo first joined Hitachi in 2008 as a Service Manager, and has more than 20 years of experience in the compressor industry. He is a mechanical engineer with post-graduate studies in business administration — MBA-PDD, and he has special training in international operations, marketing and sales.

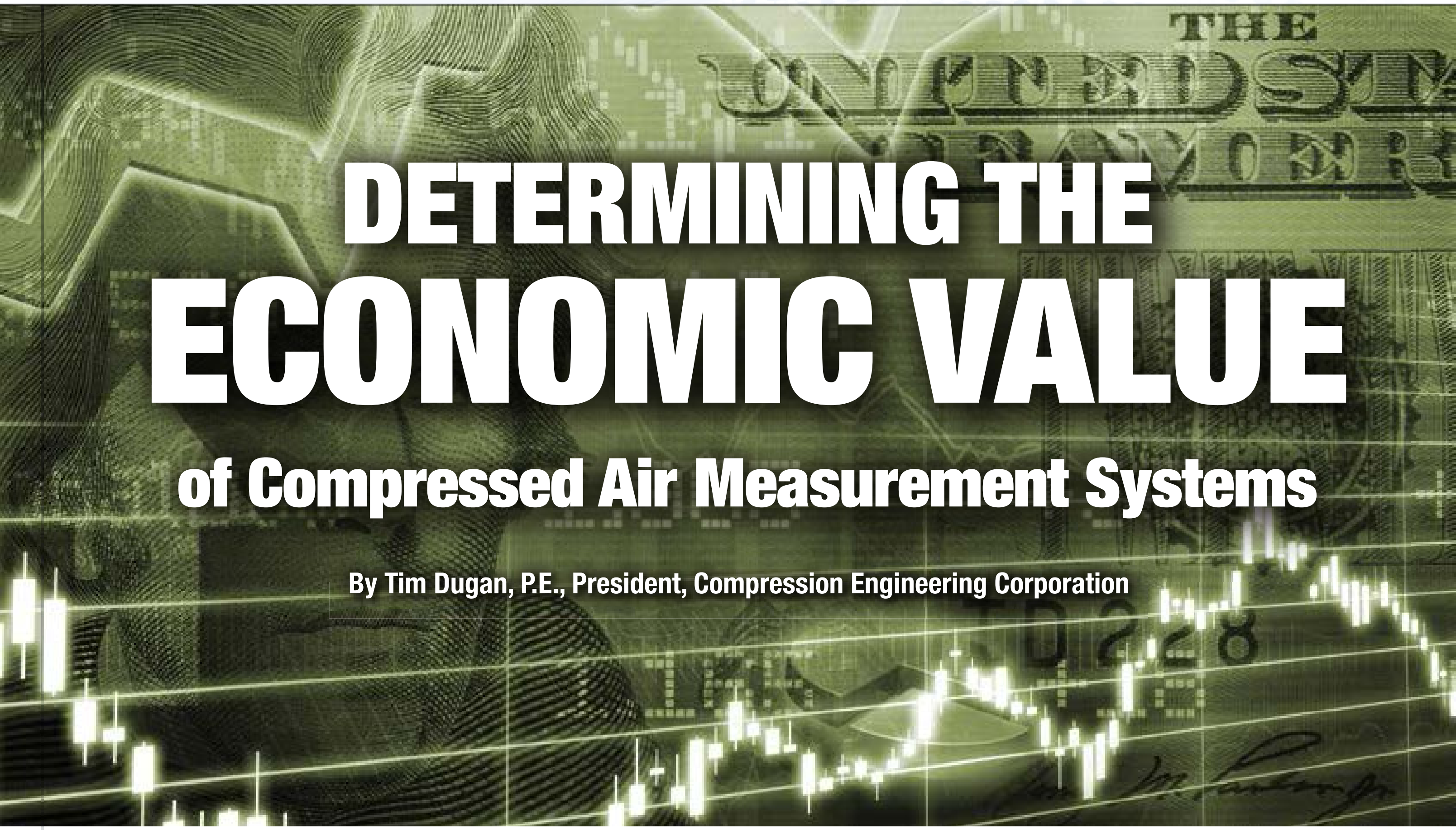
"Hitachi is a great organization with an outstanding, well renowned and trusted portfolio of products," Camilo said. "Combining our products with our passion, dedication and skilled Hitachi team, and with our exceptional distributors and partners, we together will pursue and accomplish many successes. Join us in our efforts to refocus our business strategies to move Hitachi-ATG to the next level in the market."

Camilo Villalobos, recently appointed Manager of Hitachi-ATG

Warren Story, recently appointed Senior Service Specialist of Hitachi-ATG

Hitachi-ATG also added Warren Story to its team as a Senior Service Specialist. His diverse educational background, which includes a degree in electronic engineering, a Bachelor's degree in business management, and a Master's degree in business administration (MBA), coupled with more than 25 years in the field, make him an ideal addition to the ATG service team.

For more information, visit www.hitachi-america.us/ice/atg/.



DETERMINING THE ECONOMIC VALUE of Compressed Air Measurement Systems

By Tim Dugan, P.E., President, Compression Engineering Corporation

A common adage that has been quoted many times in this journal is: "If you don't measure it, you can't manage it." This is partly true. It assumes that managers are willing and able to manage the costs and reliability of their compressed air system. Without data, however, they can't do an effective job. But because managers are at times already overwhelmed with data, more data doesn't automatically make them a better manager. A better way of saying it is: "Appropriate measurement can make you a better manager."

For this article, I will focus on the energy cost of a compressed air system, so the measurement system will need to justify itself by helping to manage cost. But what do we mean by "managing cost?" Usually costs are managed at the project level. In other words, they are capital costs. Project engineers are held to very tight budgeting constraints for capital costs. They have a multi-stage approval process, and are very methodical. If that project is a project justified by energy savings, it has one other important number — energy savings. Who is watching over those costs? Is there anyone in the entire organization charged with making sure project energy cost savings are actually sustained over time? In some organizations, this is beginning to show up in actual job descriptions. For instance, the job title of "energy manager." In the past, energy managers were more concerned with energy purchasing (getting the best deal for each energy source) and capitalizing on incentives. Now, more and more energy managers are equally concerned with maintaining energy savings at the process level.

Supporting Your House of Cards

Without process-level energy management, the entire house of cards falls. If all of your projects are unmanaged once they are started up, then you can't manage the aggregate energy used at the meter. The energy savings numbers become merely an abstraction, a way to get what you really want — an incentive check or a project approval. Once you get that, there might be little incentive to determine if you're actually saving the money you thought you were. This article will be very helpful for those who want or need to know.

Properly implemented, a compressed air measurement system is partly an insurance policy. It is a way to ensure that you are still getting what you initially thought you were going to get. In other words, it is a way to prevent your project benefits from evaporating into thin air. Beyond being an insurance policy, it is a management tool for maintaining and increasing system reliability, which can pay for the project quicker than sustained energy savings.

This article will show one method to place a real dollar value on a compressed air measurement system. Using an actual example, it will show you how to define an appropriate budget for a measurement system. Subsequent articles will explain how to select components, design systems, and use the data from them.

Definitions

Before I launch into the article, let me define several key terms:

Energy Management Information System (EMIS): "Energy Management Information Systems (EMIS) are software tools that store, analyze, and display energy consumption data."[1] This is in contrast to Energy Management Control Systems (EMCS) that include control.

Supervisory Control and Data Acquisition System (SCADA): An industrial computer system that monitors and controls a process.

Net Present Value: The current worth of a future sum of money or stream of cash flows given a specified rate of return, less the initial investment. Future cash flows are discounted at the discount rate, and the higher the discount rate, the lower the present value of the future cash flows.

Key Performance Indicator (KPI): This is a calculated value, based on real-time monitoring, that indicates the energy (or other) performance of a system.

Commissioning: "Commissioning ensures that the new building [in this case, process] operates initially as the owner intended and that building staff are prepared to operate and maintain its systems and equipment."[2]

It can also mean to verify the energy savings of a project, but technically that is measurement and verification.

Measurement and Verification (M&V): The process for quantifying savings delivered by an energy conservation measure.

Recommended Methodology for Valuing a Compressed Air EMIS

In a nutshell, I recommend an economic analysis of the declining savings that will probably occur without an effective EMIS. The recommended steps are as follows:

1. Acknowledge that compressed air projects decline in savings over time. Design your project to minimize slippage.
2. Properly commission your compressed air improvement project.
3. Establish KPIs and benchmarks from commissioning data.
4. Calculate the net present value of the project over the life of the project.
5. Calculate the net present value of the project with the declining value of energy savings, if the project is unmanaged.
6. Value the measurement and management system budget as a percentage of the difference between the two.

Compressed Air Project Savings Can "Slip Away"

I know we all love to work in that imaginary world where our spreadsheets are "reality," and we don't want to be confused with the facts. Then we step into that other world where chaos reigns. Most of the time, it is just too much work to connect the dots between the two. Let me help you a bit by describing one project and why its energy savings declined.

DETERMINING THE ECONOMIC VALUE OF COMPRESSED AIR MEASUREMENT SYSTEMS

Project Example: Paper Mill Integration

This project integrated three 700-hp centrifugal compressors, consolidated dryers, and added a screw compressor (See Figure 1).

A million-dollar project's savings can evaporate in 12 years or less. Fortunately, there are other project benefits. However, the one that was used to finance the project will be gone. Currently, we are tuning up the system, and hope to not only recover the lost savings, but improve from the commissioned state by 1,200,000 kWh/yr ($48k/yr), or over 10 percent.

PROJECTED SAVINGS VS. REALIZED SAVINGS AFTER 5 YEARS	
Projected Energy Savings	5,500,000 kWh/yr ($220k/yr)
Actual Energy Savings (2009)	4,200,000 kWh/yr ($168k/yr)
Project Cost	$1,000,000
Reduced Savings (2014)	2,400,000 kWh/yr ($96k/yr)
Slippage Over 5 Years	$72k/yr

TIME UNTIL SAVINGS DISAPPEAR	
Additional Slippage per Year	$14k
Years Until Savings are Gone	7 more

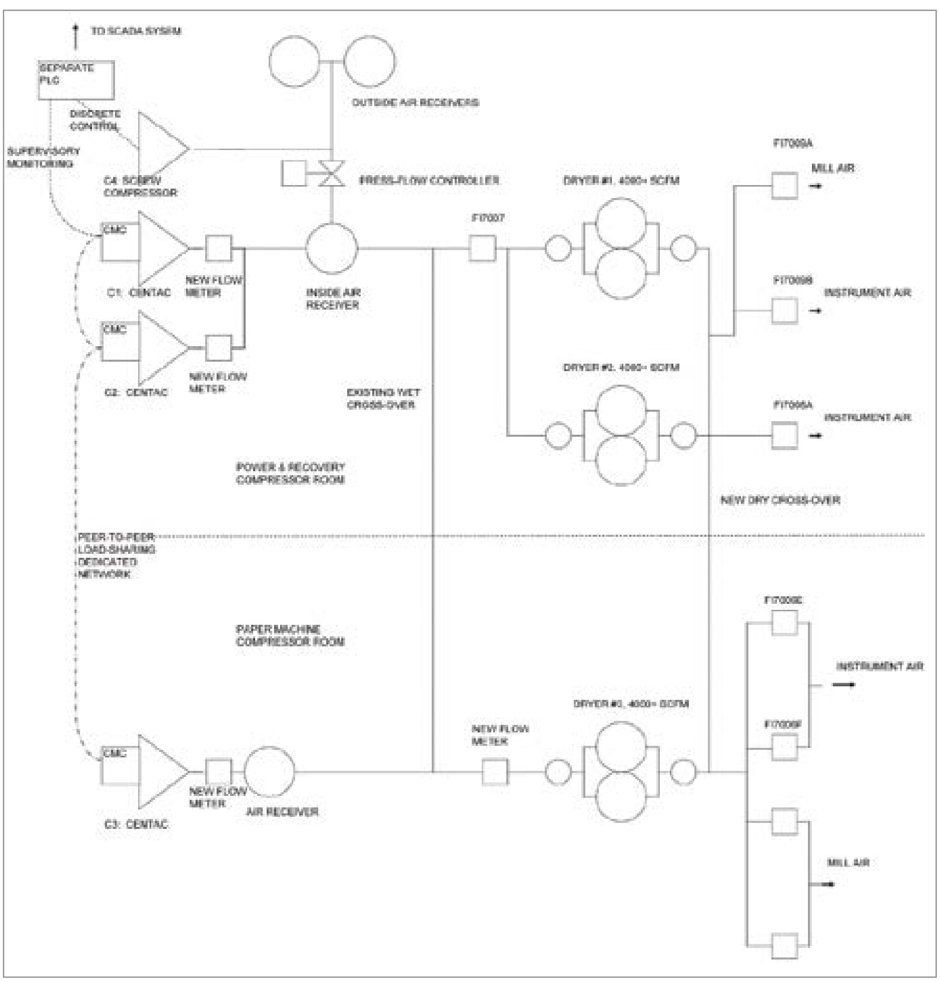


Figure 1: Large System Schematic

What Caused the Savings to Evaporate?

In this case, the following reasons became evident during the tune-up assessment:

- **Staff Turnover:** The programmer who set up the PLC controls left the company, and the new staff members were not aware of the correct algorithm.
- **Incomplete Implementation:** Several items relating to comprehensive control were not implemented in the initial project, which led to its being "fragile" to small changes. It was not a "robust" design.
- **Lack of Monitoring System:** They had current and flow meters, but no total system performance metric. They had no idea that all four compressors did not need to run.
- **Demand-Side Measures Were Undone:** The blowers used for air-bar replacement were not reliable. Inlet filters clogged.

My point is that compressed air systems are not static. They will slip in savings — period. It is simply a matter of time. If it isn't for the above reasons, some other factors will raise their ugly heads. The world will never be perfect, even if the project design seems to be perfect. You need a measurement and management system in place to correct it when it happens.

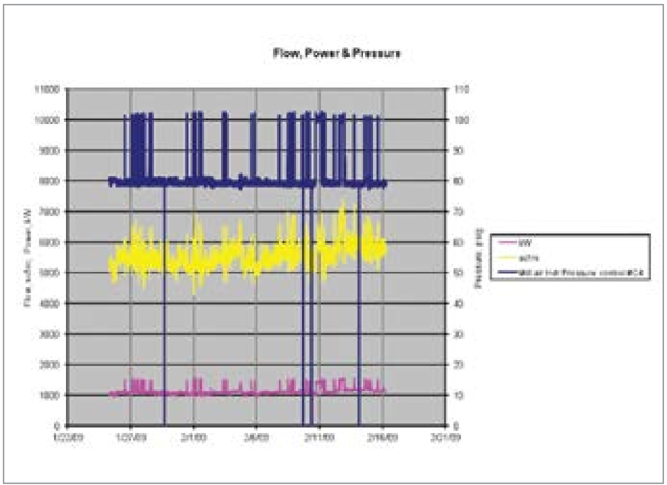


Figure 2: Overall System Performance Data

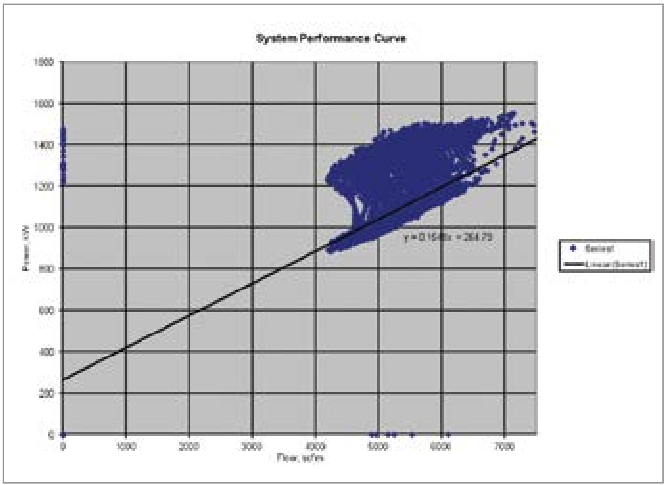


Figure 3: System Efficiency Curve

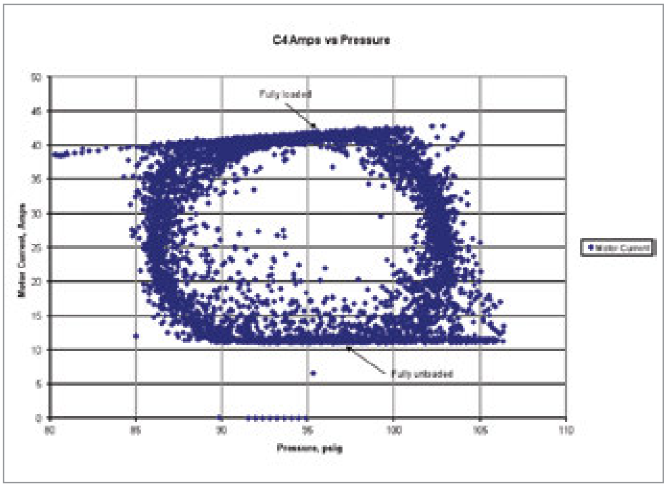


Figure 4: Compressor Controls Plot

DETERMINING THE ECONOMIC VALUE OF COMPRESSED AIR MEASUREMENT SYSTEMS

Steps to Properly Commission Your Compressed Air Project

1. Comprehensively Measure the System

This doesn't mean to overdo it. It just means that every compressor needs to be monitored for energy input, and there needs to be some reasonable metric that total flow can be derived from. Although it is ideal to have monitoring embedded into the capital project, it is hard to get accomplished with all the other aspects of the project. The minimum measurement is as follows:

- Compressor current (power is better but not always practical).
- Indication of compressor flow percent: This depends on the compressor. An actual flow meter is preferred, but not always possible during commissioning.
- Pressure at the compressor control point(s): Pressure in a different location will not tell you how the compressor controls are actually performing.

2. Calculate System Performance

The following can be derived from the data:

- System total flow and power (See Figure 2 on pg. 17).
- System efficiency curve — power versus flow: This shows the "turn-down" of the system. Does it shave power as flow reduces? (See Figure 3 on pg. 17)
- Control plots: These show if the compressor load controls are operating correctly and efficiently (See Figure 4 on pg. 17).

Establish Key Performance Indicators (KPIs) and Benchmarks From Commissioning Data

1. The following KPIs were developed from the commissioning data:

Total Flow	5767 scfm
Total Power	1225 kW (total, incl. dryers)
System Efficiency	4.71 scfm/kW
System Efficiency Slope	15.5 kW/100 scfm
The Dead Load Was Unknown	There was no downtime in the dataset.

2. The following benchmarks are available for this type of system and load:

System Efficiency	5.5 scfm/kW for an optimal system
System Efficiency Slope	18.2 kW/100 scfm for an optimal system

Calculate Net Present Value of Project with Initial Energy Savings

Energy savings are basically a cash-flow stream. You want to keep it flowing full-bore, providing benefit to your bottom line. See Table 1 (pg. 20) for the project economics. I want to highlight one number, the net present value (NPV) of the project, which is $674k.

DETERMINING THE ECONOMIC VALUE OF COMPRESSED AIR MEASUREMENT SYSTEMS

Financial Analysis of Efficiency Improvements

Simulating Streams of Cash Inflows and Outflows

SAMPLE ANALYSIS

Discount Rate:	8%
Finance Rate:	8%
Reinvestment Rate:	8%
Inflation Rate	0%

	Today	End of YR 1	End of YR 2	End of YR 3	End of YR 4	End of YR 5	End of YR 6	End of YR 7	End of YR 8	End of YR 9	End of YR 10
Date:	0	1	2	3	4	5	6	7	8	9	10
CASH OUTFLOWS (after Date 0 rebates)											
Single investment	$ (1,000,000)										
Subtotal	$ (1,000,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Rebate/incentive rec'd at Date 0 [1]	$ 600,000										
SUBTOTAL OUTFLOWS	$ (400,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
CASH INFLOWS											
Energy savings		$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000
SUBTOTAL INFLOWS	$ -	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000
Annual Cash Flow	$ (400,000)	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000	$ 160,000
PV of Outflows (for SIR calculation)	$ (400,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
PV of Inflows (for SIR calculation)	$ -	$ 148,148	$ 137,174	$ 127,013	$ 117,605	$ 108,893	$ 100,827	$ 93,358	$ 86,443	$ 80,040	$ 74,111
Annual Present Value	($400,000.00)	$148,148	$137,174	$127,013	$117,605	$108,893	$100,827	$93,358	$86,443	$80,040	$74,111

NOTE THAT CERTAIN RETURNS VARY DEPENDING ON THE LENGTH OF THE ANALYSIS TERM

	10-YEAR	1-YEAR	2-YEAR	3-YEAR	4-YEAR	5-YEAR	6-YEAR	7-YEAR	8-YEAR	9-YEAR	10-YEAR
NPV	$ 673,613	($251,851.85)	($114,677.64)	$12,335.52	$129,940.29	$238,833.61	$339,660.75	$433,019.21	$519,462.23	$599,502.07	$673,613.02
SPP	2.5										
ROI	40.0%										
IRR	38.5%	#NUM!	-13.7%	9.7%	21.9%	28.6%	32.7%	35.1%	36.7%	37.8%	38.5%
MIRR	19.2%	-60.0%	-8.8%	9.1%	15.9%	18.6%	19.7%	19.9%	19.8%	19.6%	19.2%
SIR	2.7	0.4	0.7	1.0	1.3	1.6	1.8	2.1	2.3	2.5	2.7

Table 1: Original Project Economics

Financial Analysis of Efficiency Improvements

Simulating Streams of Cash Inflows and Outflows

SAMPLE ANALYSIS

Discount Rate:	8%
Finance Rate:	8%
Reinvestment Rate:	8%
Inflation Rate	0%

	Today	End of YR 1	End of YR 2	End of YR 3	End of YR 4	End of YR 5	End of YR 6	End of YR 7	End of YR 8	End of YR 9	End of YR 10
Date:	0	1	2	3	4	5	6	7	8	9	10
CASH OUTFLOWS (after Date 0 rebates)											
Single investment	$ (1,000,000)										
Subtotal	$ (1,000,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Rebate/incentive rec'd at Date 0 [1]	$ 600,000										
SUBTOTAL OUTFLOWS	$ (400,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
CASH INFLOWS											
Energy savings		$ 160,000	$ 145,600	$ 131,200	$ 116,800	$ 102,400	$ 88,000	$ 73,600	$ 59,200	$ 44,800	$ 30,400
SUBTOTAL INFLOWS	$ -	$ 160,000	$ 145,600	$ 131,200	$ 116,800	$ 102,400	$ 88,000	$ 73,600	$ 59,200	$ 44,800	$ 30,400
Annual Cash Flow	$ (400,000)	$ 160,000	$ 145,600	$ 131,200	$ 116,800	$ 102,400	$ 88,000	$ 73,600	$ 59,200	$ 44,800	$ 30,400
PV of Outflows (for SIR calculation)	$ (400,000)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
PV of Inflows (for SIR calculation)	$ -	$ 148,148	$ 124,829	$ 104,151	$ 85,851	$ 69,692	$ 55,455	$ 42,945	$ 31,984	$ 22,411	$ 14,081
Annual Present Value	($400,000.00)	$148,148	$124,829	$104,151	$85,851	$69,692	$55,455	$42,945	$31,984	$22,411	$14,081

NOTE THAT CERTAIN RETURNS VARY DEPENDING ON THE LENGTH OF THE ANALYSIS TERM

	10-YEAR	1-YEAR	2-YEAR	3-YEAR	4-YEAR	5-YEAR	6-YEAR	7-YEAR	8-YEAR	9-YEAR	10-YEAR
NPV	$ 299,547	($251,851.85)	($127,023.32)	($22,872.53)	$62,978.96	$132,670.68	$188,125.60	$231,070.50	$263,054.41	$285,465.57	$299,546.65
SPP	2.5										
ROI	40.0%										
IRR	27.8%	#NUM!	-16.4%	4.7%	15.3%	21.0%	24.1%	25.9%	27.0%	27.5%	27.8%
MIRR	14.2%	-60.0%	-10.8%	5.9%	12.0%	14.4%	15.2%	15.3%	15.0%	14.7%	14.2%
SIR	1.7	0.4	0.7	0.9	1.2	1.3	1.5	1.6	1.7	1.7	1.7

Table 2: Declining Savings Project Economics

Calculate Net Present Value of Project with Declining Energy Savings

This project's stream is drying up, and by year 12, it will be a dry ditch. See Table 2 for the project economics. I want to highlight the NPV of the project, which is $300k. *That is $374k less than the initial projections. If savings are increased by just 3 percent /year, that goes up to $508k.*

Determine Value for Measurement and Management System Budget

So how much would you pay to greatly increase the probability of not losing $400k, or increasing the chance of gaining another $100k? In my view, it is worth from 10 to 20 percent of that, or $50 to $100k. For a system this size, that is a more than adequate budget for a robust compressed air SCADA system that includes an EMIS. Training needs to be included in that budget so it becomes part of your management system. The cost of integrating it into your exiting IT system also needs to be included. It can be spent through direct hardware, software and staffing within your own facility's department. It can also be done completely separately, even as a performance contract, with leased equipment in conjunction with a service contract. At the end of the day, it's your money, and you make the call on how to spend it. If it were mine, I would want to do it right by installing a robust SCADA with an EMIS overlay. I would use it as a model for other processes in the plant. BP

For more information, contact Tim Dugan, P.E., President, Compression Engineering Corporation, tel: (503) 520-0700, email: Tim.Dugan@compression-engineering.com, or visit www.comp-eng.com.

To read more articles about ***Compressed Air Measurement,*** please visit www.airbestpractices.com/technology/instrumentation.

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Maximizing Dust Collection System Efficiency

By Hank van Ormer, Air Power USA

A commonly overlooked area of inefficient compressed air use is dust collector pulse-jet cleaning — either bag (sock) type, or reverse flow filter type. Dust collector systems are vital to many plant operations, particularly with respect to meeting both indoor and outdoor air quality standards. They are also often used to collect income-producing product. At the heart of a pulse-jet type dust collector is the proper installation and availability of compressed air.

Proper operation of dust collectors is critical to minimizing cost and maximizing system effectiveness. There are many types and sizes that use a pulse of compressed air to clear the bag or filter. This pulse is usually controlled by a timer, which may or may not have an auxiliary demand control. The timers are generally set by the operators to what they believe is appropriate for proper cake removal and bag life. A properly working demand pulse control will dramatically lower the operating cost.

In this article, we review the operating principles of both basic types of pulse-jet dust collectors — bag (sock), and reverse flow filter. We then examine the effects of various installation and accessory selection issues through several case studies, providing examples of how to fix the issues and optimize the system's compressed air use.

Basic Operating Theory of Bag Type Pulse-Jet Dust Collectors

The dust is collected on the bag or fingers, and when the cake of dust is of appropriate thickness and structure, a pulse (or pulses) of compressed air is used to hit or shock the bag and knock the cake off. This pulse may sometimes be accompanied by physical shaking. Depending on the design, reverse airflows may also be incorporated.

When the cake is removed correctly from the dust collector, the system removes dust from its assigned environment and has a normal bag life. When the cake is not removed efficiently, the dust collector does not always continue to remove dust effectively from its assigned environment, and the bag life can be significantly shortened. Dust collection system designs specify the compressed air inlet pressure to the manifold and pulse valves necessary for effective dust removal.

> "Proper operation of dust collectors is critical to minimizing cost and maximizing system effectiveness."
>
> — Hank van Ormer, Air Power USA

Based on this pressure, the pulse valve sends a given volume or weight of air to the bag at a predetermined velocity to strike and clear the cake. The actual amount and weight of the air is dependent upon the pulse nozzle being fed compressed air at a pre-determined minimum and steady pressure.

The dust collector must receive the correct pressure (or close to it) and a steady repeatable pressure level for each pulse, particularly if timers are used to control the pulses. The operator may experiment to find the right timing sequence at a desired compressed air inlet pressure. However, if this pressure varies, the performance will be inconsistent and unsatisfactory, and it may also use a great deal more compressed air.

Dust Collector Filter Reverse Flow Pulse Cleaning

The reverse flow filter dust collector utilizes cartridge elements that are cleaned by "back flushing" with compressed air. This momentary airflow reversal is induced by a short burst of compressed air similar to pulse-jet bag dust collectors. The compressed air is released from the storage receiver by a fast-acting, high-flow diaphragm valve. This pulse of air dislodges the accumulated dust from the element. The dust then dumps into the hopper or collector drawers.

Each pulse cleans a series of filter elements, leaving the remaining cartridges available to continue filtering the air. Each diaphragm valve typically operates one pulse-jet blow pipe. Each pulse-jet blow pipe contains a nozzle for each cartridge — usually up to three cartridge filters per pipe. As the pulse of air reaches the nozzle, it is accelerated through the smaller diameter, creating a low-pressure center, or Venturi, which pulls in surrounding air through the filter in a counter-flow direction.

The rated flow of compressed air per pulse is usually 3 to 6 cubic feet, with normal pulse durations of .15 to .5 second. One valve typically opens every 15 seconds. Obviously, there are other designs with different specifications. Most of the time there will only be one valve opening every 15 seconds, but sometimes there could be two or more pulses simultaneously.

How Dust Collectors Impact Compressed Air Systems

From a compressed air standpoint, the supply of proper compressed air is the same. Whether pulse-jet direct or pulse-jet reverse flow, the basic valve operation is very similar and will vary by model, brand, conditions and material.

MAXIMIZING DUST COLLECTION SYSTEM EFFICIENCY

<table>
<tr><th colspan="2">OBJECTIVE: SIZE STORAGE TO ALLOW PULSE 12 FT³ IN .15 SECONDS TO ONLY DROP 3 PSIG</th></tr>
<tr><td colspan="2">2 valves x 6 ft^3 = 12 ft^3
12 ft^3 x 60 sec ÷ .15 sec = 4800 cfm rate of flow</td></tr>
<tr><th colspan="2">CALCULATING STORAGE SIZE</th></tr>
<tr><td rowspan="4">T = Time (seconds)
V = Volume storage (ft^3)
C = Capacity cfm (4,800) rate of flow
Pa = Psia (14.5)
P1 = Initial receiver pressure (100)
P2 = Final receiver pressure (97)</td><td>$\frac{V}{T} = \frac{(C)\ (Pa)}{(P1 - P2)(60\ seconds)}$</td></tr>
<tr><td>$\frac{V}{.15} = \frac{(4800)\ (14.5)}{(100 - 97)\ (60\ seconds)}$</td></tr>
<tr><td>$\frac{V}{.15} = \frac{69{,}600}{180}$</td></tr>
<tr><td>V = 10,440 / 180
V = 58 ft3
58 ft^3 x 7.48 gallons/ft^3 = recommended 600 gallons (or more) receiver size required</td></tr>
<tr><th colspan="2">CALCULATING 14-SECOND REFILL RATE OF FLOW</th></tr>
<tr><td colspan="2">Time allowed = 14 sec
12 cu. ft. x 60 sec ÷ 14 sec
257 cfm rate of flow</td></tr>
<tr><td colspan="2">Effect on header: Negligible</td></tr>
</table>

Figure 1: Calculating Pulse Rate of Flow to Dust Collectors

Regardless of whether the pulse-jet dust collector is bag or filter type, the critical support system of piping, storage and controls is important for not only the operating performance and maintenance cost, but also the compressed air actual demand and its effect on energy costs.

The use of a demand type pulse control, as opposed to timer activated, allows the operation to run with optimum compressed air usage. This is commonly referred to as an automatic pressure differential pulse controller.

Rate of Flow is a Necessary Factor for Dust Collector Applications

Flow rate is the average flow of compressed air in cubic feet per minute (cfm), either required by a process or delivered to the system. Rate of flow is the actual rate of flow of compressed air demand expressed in cfm — regardless of duration. Even relatively small air demands in cubic feet can have a very high rate of flow, if they occur over a very short time period. Dust collectors have this characteristic.

Sequence controllers can have a very significant impact on the required rate of flow. For example, Figure 1 shows a dust collector system that has two pulsing valves that use 6 cubic feet over .15 second for each pulse. Both valves open together every 7 seconds. If this is the case, and the dust collector performance and integrity are a problem due to low entry pressure at the pulse, appropriate storage and piping can be a very effective correction when properly implemented.

Although the actual flow is only 12 cubic feet (Figure 1), its rate of flow is 4800 cfm, meaning that piping and all additional components have to handle this burst as if it was 4800 scfm in order to deliver the air at an appropriate pressure. Additionally, a standard regulator cannot handle this .15-second duration, since it cannot open fast enough to supply the air. In short, 12 ft^3 of air has .15 seconds to get to the pulse valve at the appropriate entry pressure. If this does not happen, the entry pressure collapses and the pulse-jet becomes ineffective.

Case Study 1: Alleviating Restricted Airflow by Properly Sizing Piping and Storage

Figure 2a illustrates a very common installation or system situation that causes restricted airflow. This occurs because the proper rate of flow was not identified for the dust collector cleaning action — either prior to the installation or prior to some operational change. Feed line sizing, regulator sizing and air supply all require an identified rate of flow. You cannot use average flow rate. Figure 2b shows the corrected

> "The use of a demand type pulse control, as opposed to timer activated, allows the operation to run with optimum compressed air usage. This is commonly referred to as an automatic pressure differential pulse controller."
>
> — Hank van Ormer, Air Power USA

system, in which compressed air stored in a properly sized vessel supplies the pulse air required in time through a large pipe. The restrictor refill valve slows down the tank refill, protecting the main air system.

Case Study 2: Addressing Inlet Air Pressure Issues for Proper Operation

In the configuration shown in Figure 3a (pg. 26), entry air to the dust collector manifold was controlled by manually cracking the 2-inch ball valve to restrict the flow and protect the main compressed air system. The plan was for the operator to watch the pressure gauge and manually adjust the valve as required.

In actual performance, this did not work. When checked during operation, four out of six dust collectors had excessive entry pressure loss (>10 psig, see the chart in Figure 3a). The plant experienced poor results, short bag life, and could not run the automatic demand control.

A properly designed system is displayed in Figure 3b (pg. 26). Compressed air storage with a restrictor refill valve was designed with proper input data to hold entry pressure loss at <5 psig. Performance improved, and the automatic demand controls run well and use less air, resulting in longer bag life.

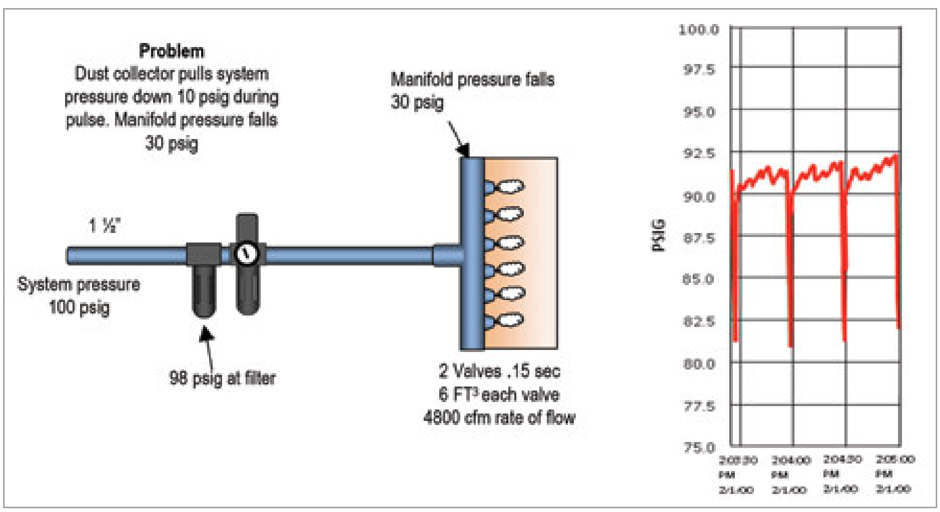

Figure 2a: The dust collector was not installed with enough storage or pipe size to deliver the air to the manifold in a short time duration.

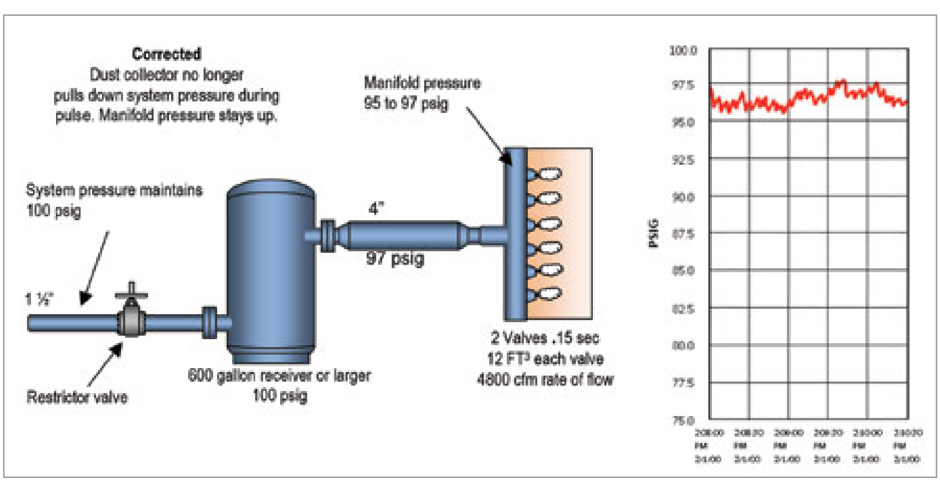

Figure 2b: Corrected System with Properly Sized Storage and Piping

MAXIMIZING DUST COLLECTION SYSTEM EFFICIENCY

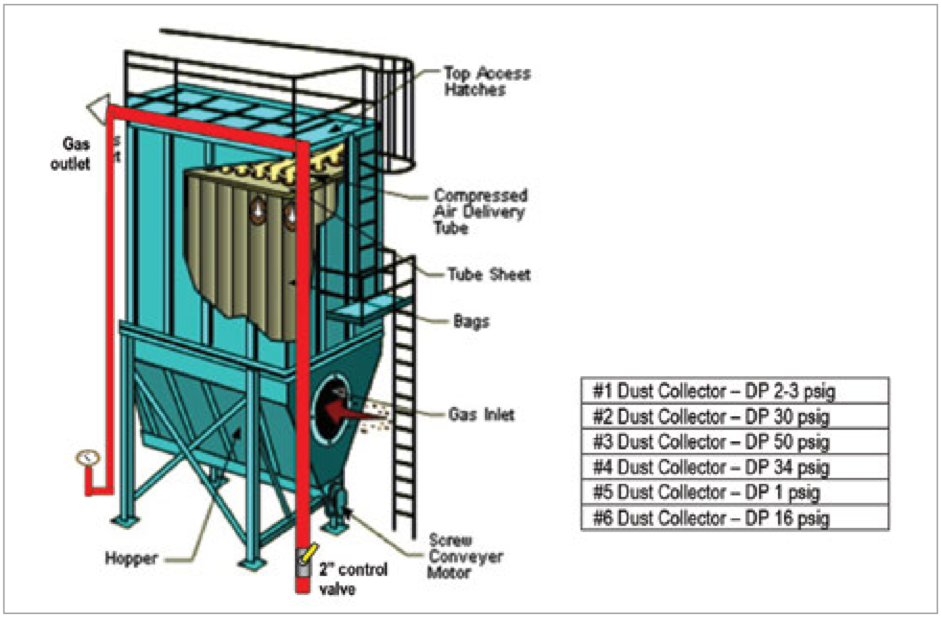

Figure 3a: Excessive Pressure Loss at Entry

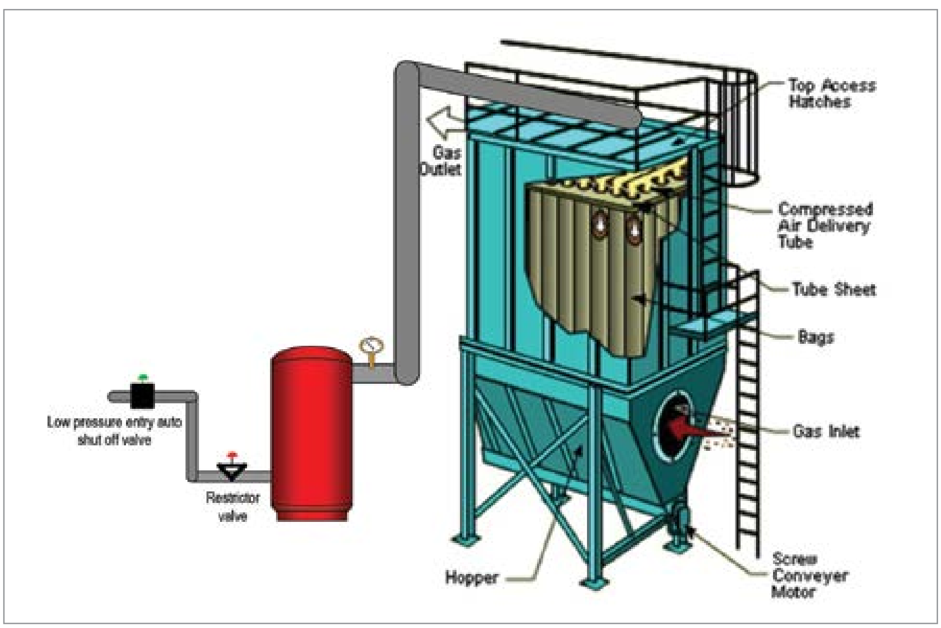

Figure 3b: Restrictor Refill Valve Holds Entry Pressure Loss

Case Study 3: Sizing Storage to Offset Slow Regulator Response Time

Standard regulators usually will not work for the normal pulse duration. The first installation, displayed in Figure 4a, included one regulator, and a second parallel regulator was added. It still did not work, and the collector header fell to 50 psig. To address the issue, the regulator was replaced with a properly sized receiver and restrictor valve refill, which can be seen in Figure 4b.

Tips for Typical Pulse-Jet Dust Collector Operation (Bag or Filter)

As seen in the previous case studies, issues with compressed air delivery and supply may create an ineffective pulse. Here are a couple of recommendations to ensure an effective pulse:

- Use proper line size to handle rate of flow without high pressure loss.
- Integrate storage to supply air without pulling down feed to collector.
- Monitor inlet pressure and drop at pulse.
- Monitor flow pressure ahead of the receiver.
- Monitor pressure at the dust collector manifold entry.

Other Recommendations for Dust Collector Optimization

Some dust collector manufacturer instructions will specify a filter and regulator. Be sure the regulator selected will fully open in the time allowed for the application. Otherwise, the installation should be augmented with a properly installed air receiver fed with 100-psig system pressure, an adjustable restrictor valve, and an appropriate check valve (as shown in Figure 4b) on the 2-inch feed to the vertical air receiver. Install the air receiver near the dust collector entry. When one pulse valve opens, expect a 1-psig drop. That drop should not exceed 3 psig. If two valves open simultaneously, the minimum entry pressure of 90 psig is still covered.

Pulse-jet dust collectors are a continuing source of leaks, particularly when pulse-jet diaphragms fail and become very large compressed air leaks. An open 3/4-inch diaphragm pulse valve can leak 200 to 250 cfm, and 50 to 60 hp worth of compressed air is equivalent to about $24,000/year.

Often, leaks are hard to hear, and sometimes — when first heard — they are ignored in the hopes that someone else will notice and repair it. After all, it is a hot (or cold), dusty and noisy job, and it is often above

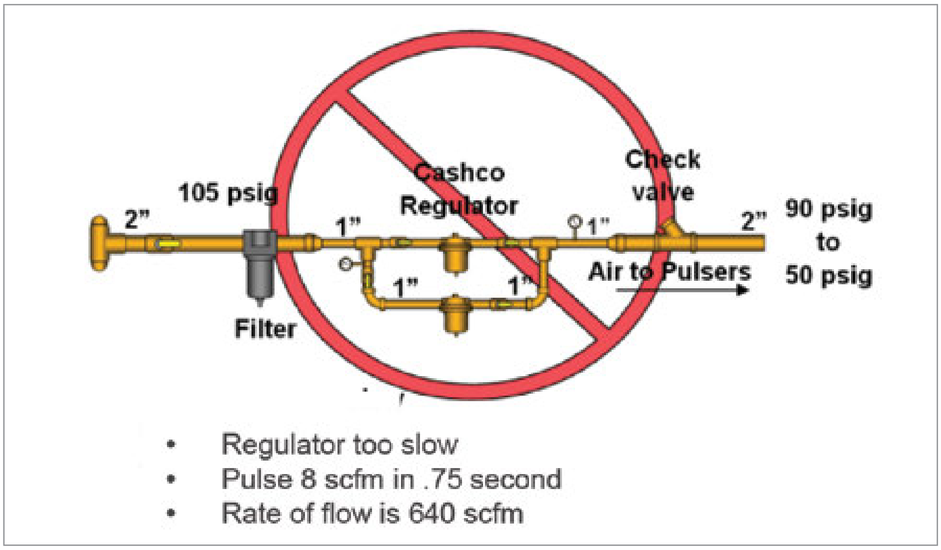

Figure 4a: Process Air Supply

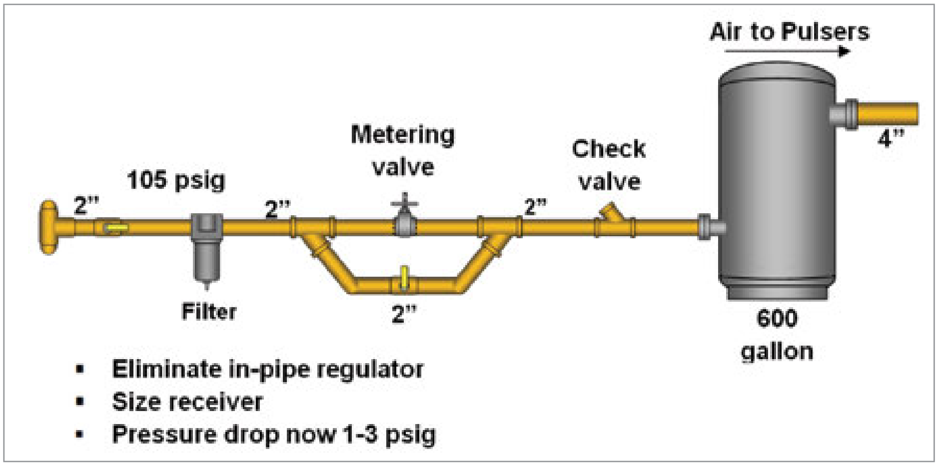

Figure 4b: Auxiliary Storage Stabilizes the System

ground. There are some excellent electronic monitoring systems available that will identify leaks from failed solenoid pulse jet valves. These can also monitor filter performance, and condition and monitor the system's capability to stay in compliance. For these systems to perform as designed, the compressed air supply should deliver solid, consistent performance at the point of use.

Designing "By the Book"

When a plant or operation with significant dust collecting is audited, it is very rare to find anyone in operations who is aware of what the dust collectors operating specifications are and how or why the pipe sizes were selected. When you get the facts and go "by the book," an amazing thing happens — the system works like it's supposed to. BP

This article was adapted from Dust Collection Training Materials provided by Air Power USA. For more information, please contact Hank van Ormer, Air Power USA, at hank@airpowerusainc.com, or visit www.airpowerusainc.com.

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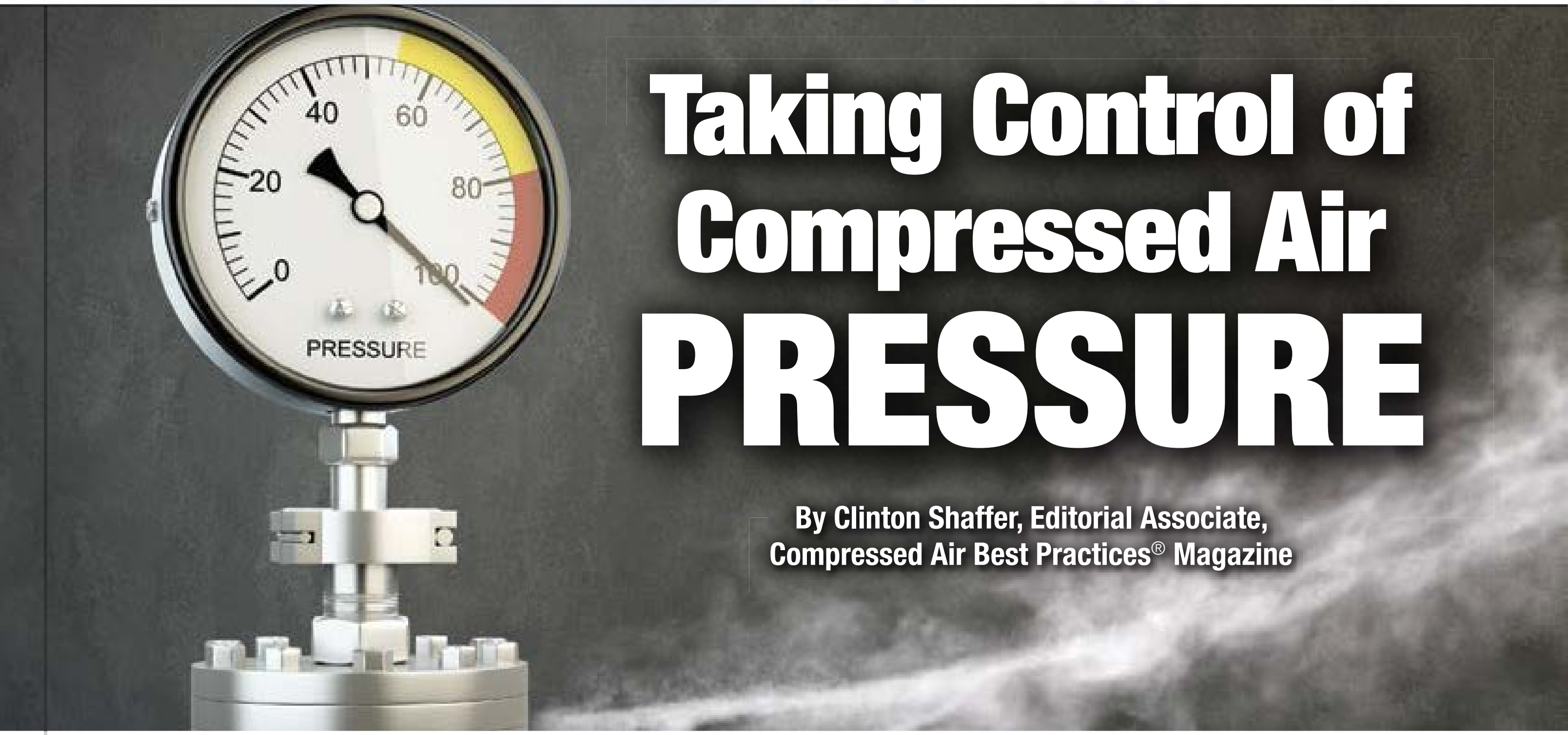

Taking Control of Compressed Air PRESSURE

By Clinton Shaffer, Editorial Associate,
Compressed Air Best Practices® Magazine

"Jurassic Park," Michael Crichton's 1990 novel about a theme park full of genetically engineered dinosaurs, circles around one central theme — control. In fact, there are literally nine chapters titled "Control," and most of those chapters follow the brilliant, chain-smoking systems engineer John Arnold as he ravenously tries to restore the control systems after a catastrophic collapse.

Figure 1: The ConservAIR S-Series I/C

Now, you might be wondering what on earth this has to do with compressed air.

Simple: If you don't have control systems in place, you are letting your compressed air system run amok — essentially the equivalent to letting a tyrannosaur romp freely through a resort. One effective way of controlling the pressure of your compressed air system is to use a flow controller. The ConservAIR® S-Series Intermediate Control® (I/C) can help facility managers understand and manage plant pressure to reduce their facility's overall pressure and generate substantive energy savings.

Reacting Quickly to Pressure Changes

For starters, the ConservAIR I/C is a mechanically run flow controller. It comprises multiple, similarly sized valves that work in parallel to split air moving through a system. A relatively simple pressure regulator controls those valves. It reacts almost instantaneously to changes in air demand and adjusts the valves accordingly, allowing the device to maintain a pressure set point to within ±1 psi.

The ConservAIR flow controller can maintain that tight pressure set point due in large part to the parallel orientation of multiple control valves. The valve configuration — which consists of several smaller valves that work in unison — reacts much faster to changes in air pressure than other flow controllers that use larger single butterfly valves.

When I spoke with Joe Fresch, VP of Pneumatech North America and Regional Sales Manager of Chicago Pneumatic, he helped explain why the multiple parallel configuration reacts so quickly to air pressure changes:

"If you can imagine a single butterfly valve trying to oscillate to make sure an 85-psi set point doesn't move, it'll sometimes get up to 87 or 88, and sometimes down to 82 or 81 — all while trying to maintain 85 psi," he explained. "Because we are splitting air between smaller, parallel valves, we have very little valve travel, and that allows just the right

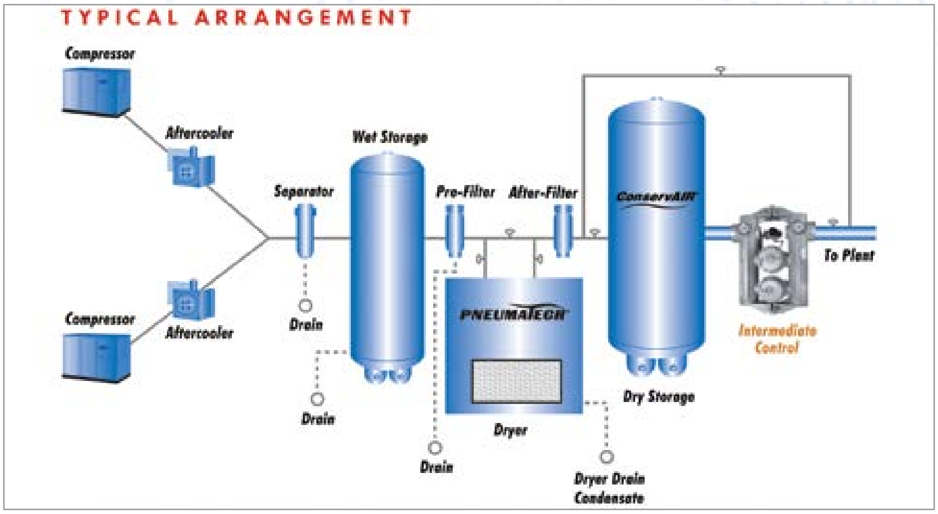

Figure 2: The dry storage and the I/C act as a buffer between the supply side (left) and the rest of the plant.

amount of air to be released from storage to maintain that set point."

In other words, it takes a lot longer to open or close a single large valve than it does to close multiple smaller valves, so the adjustments to air pressure take place much quicker.

According to Fresch, the ConservAIR I/C "gets as much speed if not more with the multiple parallels than one would with one sophisticated PID controller and a single butterfly valve."

Segmenting Supply and Demand

To learn more about the real-life application of the device, I spoke with Don Dyck, Owner and Operator of Compressed Air Performance Specialists (CAPS), Inc., a compressed air consultancy located in Alberta, Canada. Don has 30 years of experience in the compressed air industry. While his company is not affiliated with any OEM, Don uses ConservAIR controllers in every project.

"When I use flow controllers, they are there for two specific reasons," Don explained. "They afford me the ability to control the downstream pressure into the plant and maintain it on a consistent basis. Without that management, then you are seeing a lot of fluctuations downstream into your plant production area, which affects performance on point-of-use equipment. On the front end, or prior to the flow controller, it affords me the capability to precisely control the compressors."

In a correctly designed system (Figure 2), a flow controller acts as a buffer between the supply side and the demand side, effectively separating the air compressor and the point-of-use equipment. With the unit in place, the plant pressure can be stabilized, allowing for a consistent supply of compressed air to the end users. Additionally, the air compressor is no longer directly exposed to fluctuations in demand, and is simply tasked with feeding a receiver tank. This allows for greater efficiency, as a compressor no longer has to turn on or unload with every change in pressure.

The bottom line is that the ability to stabilize plant air pressure and precisely control the operation of the supply side (air compressor) can be tremendously beneficial — in regards to both process reliability and energy efficiency.

TAKING CONTROL OF COMPRESSED AIR PRESSURE

> "You can't just put that I/C into the system and expect to save tens of thousands of dollars...it requires tools from the system to perform at its optimal level."
>
> — Don Dyck, CAPS Inc.

Gaining a Systems Level Perspective

There is one important caveat to using a flow controller that needs to be thoroughly explained. You cannot simply integrate one into a compressed air system and expect it to generate energy savings. The device is dependant on a well thought-out system design, and — most importantly — storage.

"You can't just put that I/C into it and expect that you're going to save tens of thousands of dollars." Don explained. "It will help, but it has to have the tools to be able to perform at its optimum level."

In order to operate effectively, a flow controller needs to work in conjunction with a properly sized receiver tank. The controller reacts to any surge in pressure in the facility, and supplies air from a receiver tank accordingly. Consequently, all the air compressor has to do is fill the receiver tank.

At atmospheric pressure, there are approximately 7.4 gallons of air in one cubic foot, so a 400 gallon receiver tank holds nearly 3000 cubic feet at atmospheric pressure. By pressurizing the air to 150 psi, that same tank can hold approximately 30,000 cubic feet. If the plant only needs 100-psi pressure, and the tank is storing 30,000 cubic feet, there is a lot of extra air in the tank to do work. The I/C can then efficiently and intelligently allocate that extra air.

Storage only works, however, if there is a pressure differential across the inlet and the outlet of the receiver tank. The ConservAIR I/C allows you to create and manage that pressure differential.

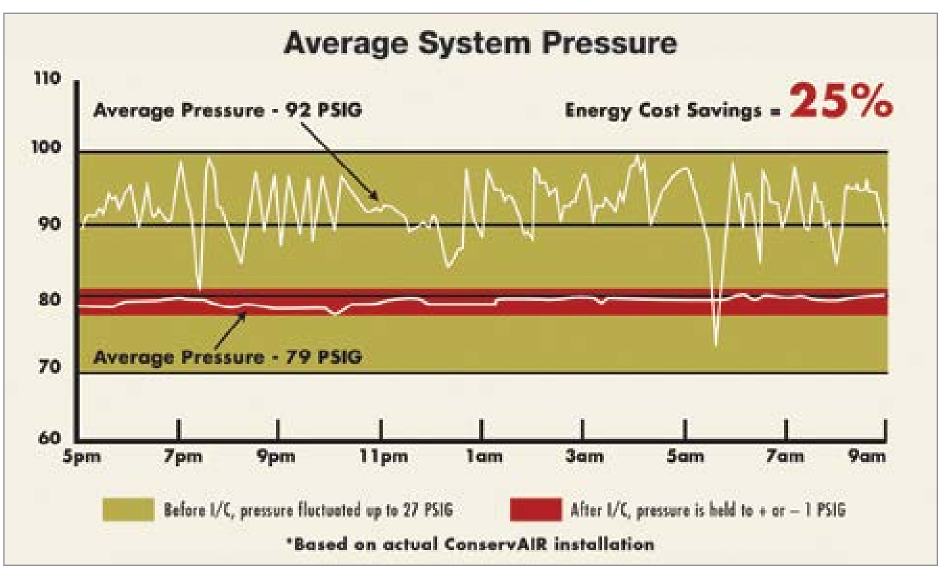

Figure 3: Installing an I/C can stabilize average system pressure and save on energy costs.

"There are two components of storage," according to Fresch. "There is a receiver tank that adds a certain number of gallons of storage, and then there is a pressure differential imparted across the tank by the I/C. If you go into that tank at 100 psi and you come out at 100 psi, you really don't have true storage."

Addressing the Misconception: Pressure Differential vs. Pressure Drop

Unsurprisingly, pressure differential can generate a lot of speculation, because it can be easily confused with pressure drop — or inefficiency in a system that might be caused by an air dryer, a filter or leaks. If you have been in the compressed air industry for even a short time, then you know that pressure drop is bad, and can be very energy intensive.

To better understand the difference between pressure differential and pressure drop, I spoke with Ed Maxwell, a partner and independent sales representative at Eastern States Associates, Inc., with 40 years of experience in the compressed air industry.

"That is the biggest hurdle to get people to understand," Maxwell told me. "If an air compressor generates 125 psi of air, and it goes through the dryer and it loses 5 psi because of the dryer, that's a loss of efficiency in the system. When we say we are going to take 150 psi and reduce it to 110 psi, people think of pressure drop."

In actuality, creating a pressure differential through the receiver tank creates system efficiency. By lowering the pressure coming out of the tank, you are creating storage, and the flow controller can then efficiently manage that storage.

Put simply, pressure drop is an unintentional loss in system pressure that can wreak havoc on energy efficiency. Pressure differential is an intentional, controlled lowering of system pressure at the storage tank, which helps to maintain a constant pressure set point and lets you run your compressors more efficiently.

"Lower the amount of pressure you are feeding into the system, and you increase system efficiency," Fresch said. "You feed all of the points of use with less air, lowering what we call artificial demand."

Setting System Pressure

Once a person understands the logic behind a flow controller, the final challenge is determining the pressure set point. This process requires vigilance on the part of facility management, and it can take a couple of weeks to iron out. With the potential energy savings, however, it is well worth the effort.

"People don't know what their equipment operates at or requires — all they know is what they've been using," Maxwell explained. "If you think your equipment needs 100 pounds of air, we're going to try to make it run at 95. If you're happy with how it runs at 95, then we're going to keep it at 95, and the company is going to save a tremendous amount of money in energy."

ConservAIR in Action

To the put the capabilities of the ConservAIR into context, Don spoke with me about several applications in which he used the device to improve compressed air system efficiency. The first facility we discussed was a major food processing plant in Alberta, Canada. The plant had two 150-hp air compressors running at nearly full load, and the facility management was adamant about their need to run both.

By determining how much air pressure the facility actually needed for its applications, Don was able to use multiple flow controllers and "zone" them throughout the facility. That meant that for each point of use, he could implement an I/C along with properly sized storage, and regulate the air pressure specifically for each application.

TAKING CONTROL OF COMPRESSED AIR PRESSURE

"No compressed air system is perfect, and facilities always change, making it all the more important to have a control system in place."

— Clinton Shaffer, Editorial Associate, Compressed Air Best Practices® Magazine

Using this method, the facility was able to completely shut off one of the 150-hp compressors in less than a year. Don was even able to get the other compressor to consume the same amount of energy as a 100-hp machine, thanks in large part to flow controllers with air receiver storage.

"The system was working so well that they actually had two major plant expansions off of one 150-compressor," Don explained when discussing the job. "They didn't have to add on, they took the spare 150-hp and started producing the plant's own nitrogen with it, which saved them tons of money in contract nitrogen costs."

Solving Problems with Reverse Flow

During our discussion, Don described another job at a major food processing plant in Ontario, Canada. This facility had an improperly installed flow controller that was causing huge disruptions in plant operation. In his system assessment, Don identified a problem that was literally sucking air from other points of use.

"It was because this particular manufacturer's so-called mass flow pressure controller actually could allow air to flow backwards," Don said. "So in other words, instead of going inlet to the outlet, it could go outlet to the inlet to satisfy air demand that was actually upstream of it. That air demand would literally draw all of the compressed air of the main piping system from the production floor."

Unfortunately, the management's initial answer was to add more air compressors. This left them with an inefficient bank of compressors, including a 150-hp, a 300-hp and a 500-hp machine.

A nitrogen generation system positioned upstream from the controller was consuming air from the rest of the facility. To solve the problem, Don separated the facility's compressed air system into two manageable systems by using flow controllers with air receiver storage.

First, he dedicated the 150-hp air compressor to the twin-tower nitrogen generation station. That system incorporated a 2560 gallon receiver and a ConservAIR I/C. Don then took the 300-hp air compressor and dedicated it to the rest of the facility, utilizing the same configuration. The 500-hp machine, which was rarely used in the first place, was left with absolutely nothing to do.

Under Control

No compressed air system is perfect, and facilities always change, making it all the more important to have a control system in place. That way, you can monitor and adjust to evolving demands, keeping your compressed air system operating as efficiently as possible. The ConservAIR I/C can be an incredibly effective tool for controlling the dinosaur that is your compressed air system. Used properly, and in conjunction with other parts of the system, it can help tame your compressed air demand and reduce waste — generating significant energy savings in the process. And, fortunately for you, there are no velociraptors preventing you from getting your system under control. BP

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For additional information, contact Joe Fresch, tel: (414) 397-7222, email: jfresch@pneumatech.com; Ed Maxwell, tel: (413) 427-5458; email: edmaxwell@easternstates.com; or Don Dyck, tel: (403) 453-2000, email: caps.inc@shaw.ca.

Or visit their respective company websites at www.pneumatech.com, www.esaair.com,, and www.compressedairperformancespecialists.ca.

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ENERGY PERFORMANCE INDICATORS SUPPORT ISO 50001 AND ISO 50006

By Ron Marshall for the Compressed Air Challenge®

Organizations across the world are gaining control of their energy spending by measuring and managing their utilities. In doing so, they may be using standards such as ISO 50001:2011 (energy management systems — requirements with guidance for use) to help set up an energy management system (EnMS) that will improve their energy performance. This improved performance might lower energy bills, making products more affordable in the marketplace and improving an organization's carbon footprint.

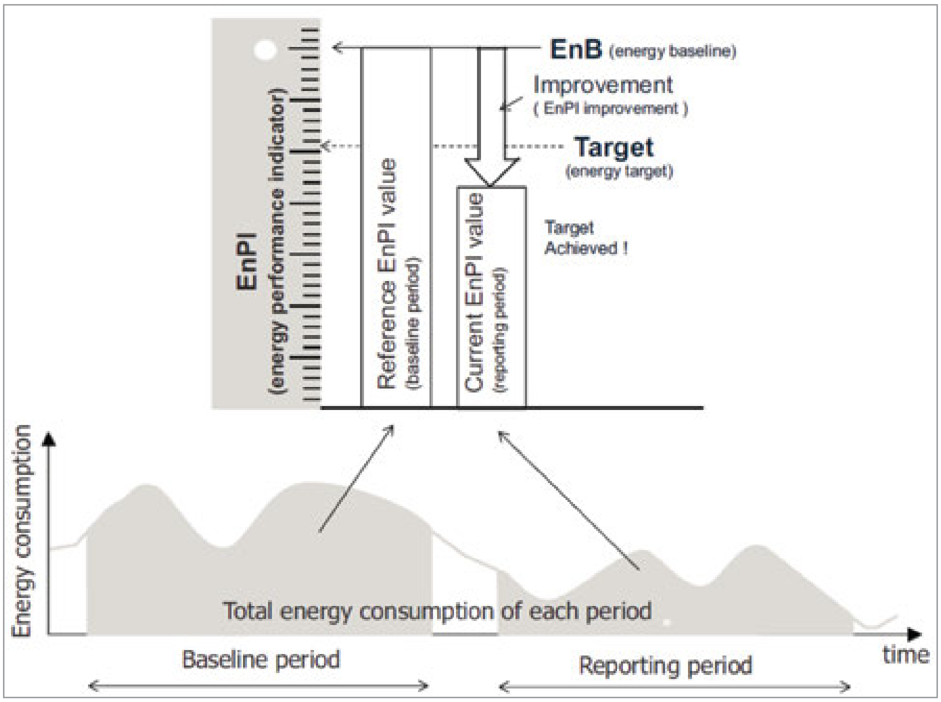

Figure 1: EnPIs can be used to compare a baseline period with a reporting period to determine if energy targets are being achieved. (Source ISO 50006:2014 – Used with permission)

Setting up an energy management system is more than just installing instrumentation. It is about establishing a comprehensive management system that is based on an established energy policy that contains established objectives, targets, and action plans related to significant energy use. To be effective, this EnMS must have the support of personnel at all levels of the organization — most importantly upper management.

As part of the EnMS, significant energy uses (SEUs) are identified by looking at relevant data captured by measurement systems. SEUs are energy uses that make up a significant portion of an organization's energy consumption or represent significant potential for savings. Often compressed air systems meet these criteria, and are targeted for optimization and continuous monitoring in industrial facilities.

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If a compressed air system is identified as an SEU, then Energy Performance Indicators (EnPIs) must be established to help energy teams compare the performance of the system within specific measurement periods against a baseline period, which is called an Energy Performance Baseline (EnB). Figure 1 shows how this might be done for energy consumption. This comparison may indicate changes to the system based on equipment control malfunction, and would help energy teams identify this and take corrective action. The comparison might also show the energy savings as result of an energy improvement project.

To guide energy teams in establishing EnBs and EnPIs for general systems within a facility, ISO 5006:2014 has been established (Energy management systems — Measuring energy performance using energy baselines (EnBs) and energy performance indicators (EnPIs) — General principles and guidance). This international standard supports ISO 50001 and assists teams in defining indicators that might

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Sample Period Comparison for supply New Compressors based on 7-Day total.

Sample Period	Start Date	Average CFM	Daily kWh	Daily Cost	Annual kWh	Annual Cost	Specific Power	Leak Load (CFM)	Annual CO2 Emissions
May 5-11, 2014	05/05/2014	1,882	7,819.46	$422.26	2,736,810	$147,788	17.32	1,016.9	2,060,707 kg
May 12-18, 2014	05/12/2014	1,948	7,822.91	$422.43	2,738,018	$147,853	16.74	1,037.0	2,061,616 kg
May 19-25, 2014	05/19/2014	1,937	7,765.08	$419.32	2,717,776	$146,760	16.66	3,907.6	2,046,375 kg
June 18-24, 2014	06/18/2014	1,923	8,493.46	$458.63	2,972,712	$160,526	18.35	1,220.6	2,238,331 kg
June 23-29, 2014	06/23/2014	2,311	8,210.86	$443.38	2,873,800	$155,185	14.77	2,062.7	2,163,855 kg
Jun 30-Jul 6, 2014	06/30/2014	1,971	7,381.75	$398.59	2,583,611	$139,515	15.56	989.7	1,945,354 kg
Jul 7-13, 2014	07/07/2014	1,908	8,801.15	$475.26	3,080,402	$166,342	19.22	1,066.8	2,319,417 kg
Jul 14-20, 2014	07/14/2014	1,889	8,875.11	$479.26	3,106,289	$167,740	19.59	1,226.0	2,338,910 kg
Jul 20-27, 2014	07/21/2014	1,897	8,039.61	$434.13	2,813,864	$151,949	17.66	1,246.2	2,118,725 kg
Jul 27-Aug 2, 2014	07/27/2014	1,911	8,011.23	$432.61	2,803,931	$151,412	17.42	1,246.2	2,111,246 kg
Aug 4-10, 2014	08/04/2014	1,739	8,132.51	$439.14	2,846,377	$153,704	19.50	1,002.3	2,143,206 kg
Aug 12-18, 2014	08/12/2014	1,817	8,471.76	$457.47	2,965,115	$160,116	19.37	999.8	2,232,611 kg
Sep 1-7, 2014	09/01/2014	1,749	8,147.04	$439.94	2,851,463	$153,979	19.42	1,089.8	2,147,036 kg
Sep 8-14, 2014	09/08/2014	1,908	8,499.10	$458.96	2,974,684	$160,633	18.51	1,091.1	2,239,816 kg

Chart 1: Monitoring EnPIs on a weekly basis helps identify periods of time where system problems occur or leakage levels rise.

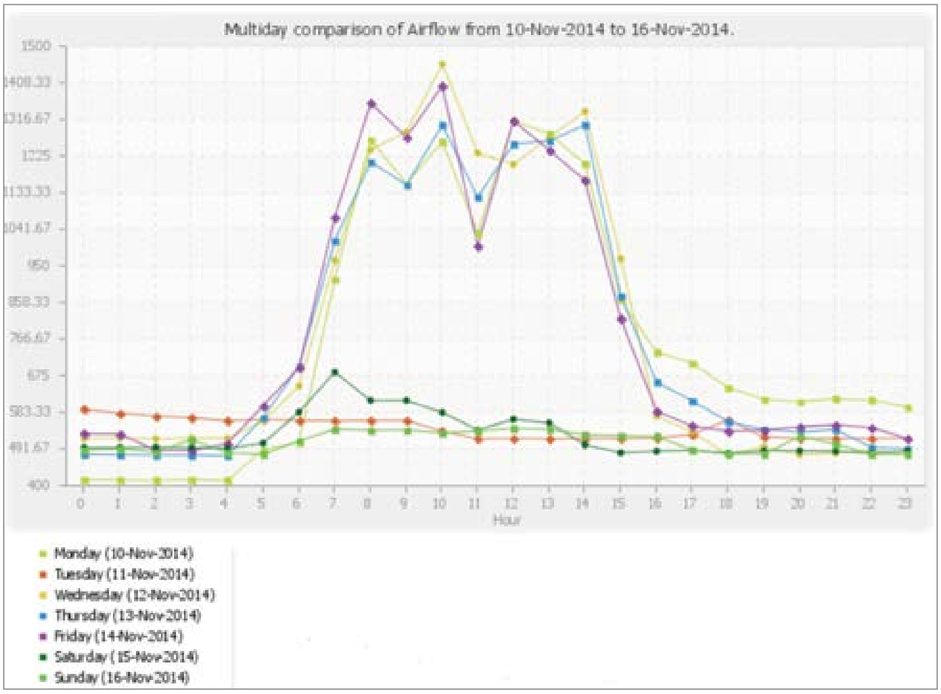

Chart 2: Inspection of the data and comparison of various weekdays can yield valuable information about the system operation.

help manage the performance of systems that might be SEUs in a facility.

Compressed air systems can be managed by setting specific EnPIs that relate to the energy performance of the system. Like any SEU, this management is done by measuring specific elements of the system within a specific measurement boundary. For compressed air systems, this means keeping track of the energy going into air compressors and treatment equipment and measuring what comes out — the compressed air flow.

Measurement and assessment of dynamic systems, such as compressed air, can be tricky because constantly changing conditions, such as production volumes due to seasonal variations, or regular changes in product mix can change the energy consumption of a compressed air system. A compressed air system's energy consumption might go down under certain conditions, yet the specific power of the system (kW input per production output) might increase, indicating that the system has become more inefficient in producing compressed air. If the energy consumption going into the compressed air system's measurement boundary is not properly compared to the compressed air volume produced, then incorrect assumptions about system energy performance can be made.

Energy Performance Indicators for Compressed Air Systems

Over the past three years, a technical committee of the Canadian Standards Association (CSA) composed of industry experts and industrial users has been developing a standard for compressed air system energy performance measurement that fits the ISO 50001 and 50006 framework. This standard is now in draft form and is currently at the public input stage. If adopted, this standard will assist compressed air users in creating energy performance indicators for their compressed air systems.

The standard recognizes that the complexity of the data collection varies with the size and make-up of each individual system. Some systems are small with lower return on investment for energy measurement systems, therefore, methods to determine EnPIs should be simple. Larger systems may represent large energy payoffs if system performance is improved, therefore, more complex systems with more expensive permanent measurement systems may be appropriate.

Some relevant EnPIs being considered for inclusion in the draft CSA standard are:

- **System Specific Power (SSP):** This is a measurement of the production efficiency of a compressed air system, and is a ratio of the power input compared to the compressed air output.
- **Total Energy Consumption:** This is simply the energy consumption in kWh of a system.
- **Specific Energy Consumption:** This metric is the ratio of energy consumption divided by some specific production output.
- **Portion of Non-Productive Usage:** This is the proportion of the airflow during non-productive periods divided by the average airflow, calculated in percent.

The standard proposes allowing the user to develop their own EnPIs based on data that is relevant to their unique needs.

Example Uses of Energy Performance Indicators

Troubleshooting — A producer of gypsum board has a permanent measuring system connected to its compressed air system. The system consisted of two large screw compressors feeding into a heated desiccant dryer. The measurement system tracks system specific power and energy consumption. After a period of time, the average specific power, calculated weekly, increased to a higher level than the average of previous weeks, and remained there for a month. Analysis of the collected data revealed that the air dryer dew point control system had failed due to a calibration issue, and it was causing the air dryer to regenerate continuously rather than at a reduced rate depending on moisture loading.

Monitoring — A cabinet-making facility installed a monitoring system to monitor compressor and dryer power consumption as well as system flows from two systems in their plant. Weekly averages were generated that calculated system specific power, system energy consumption and leakage rate. The leakage rate was estimated by automatically sampling — about an hour of system operation at midnight on Saturday night when plant production has been shut down. The system has a sophisticated compressor control system that orchestrates the operation of the system compressors to ensure all except one are fully loaded. On occasion after maintenance activities, staff members forget to place the compressors in the remote control position, allowing one or more of the units to run unloaded for extended periods. This condition was detected by comparing average specific power within the latest measurement period with the average value. Leakage levels can also be tracked, and focused leak detection activities initiated if levels rise above the plant's acceptable threshold.

Simple Estimating — A small flour mill has set up a manual log of the hour counters on their two compressors. On a weekly basis, the staff checks the accumulated loaded and run time hours, and uses these to calculate the estimated power consumption and produced flow. Specific power and energy are used to ensure the compressor controls maintain adequate system efficiency. System energy is also tracked and compared to the plant production output. A change in this value indicates that leakage levels and inappropriate uses of compressed air should be addressed. The weekend hours from end of production Friday to start of production Monday morning are tracked, which helps track non-productive usage of compressed air in the plant. BP

For more information about the Compressed Air Challenge, please visit www.compressedairchallenge.org.

To read more about ***Compressed Air Standards,*** please visit www.airbestpractices.com/standards.

Show Report: THE 2015 HANNOVER MESSE

By Rod Smith, Compressed Air Best Practices® Magazine

Hannover Messe 2015 attracted 220,000 visitors with 70,000 coming from outside Germany. The show placed a major emphasis on the digitization of manufacturing. Deutsche Messe Board Member Dr. Joachim Kockler said, "Industry 4.0 has arrived. Digital integration is becoming a key aspect of modern manufacturing and this trend is set to continue at a rapid pace." It is clear our sector is investing in the "Industry 4.0" trend allowing compressed air system key performance indicators to be captured and managed. The goal of this article is to provide readers with a sampling of highlights catching my eye at the show — with apologies to the many companies left out due to editorial space limitations.

Innovations from BOGE and Ingersoll Rand

BOGE made a big splash with their innovative new HST line of oil-free turbo air compressors for the standard "plant air" pressures of roughly 80-120 psi. Discussing this "industry-first", Managing Director Thorsten Meier was thrilled by the interest in the new technology. "Our sales and service partners have come from all over the world and agree we have developed a next-step solution for oil-free customers." The space-saving and quiet (63-68 dba) units features many industry firsts including a titanium impeller running at 120,000 rpm and patent-pending designs for most major system components including the two and three-stage compression process, air-foil bearings, permanent magnet motors, air-cooled motor-cooling system, inverter, and control software.

Fred Crabb, Chris Hauck, and Ron Fry from Calgary-based Central Air Equipment and Boge's Thorsten Meier at the Boge Customer Day launch of their new high-speed turbo HST air compressor.

BOGE began the celebration the day before the Messe started, at a special "Customer Day" at the Paderborn-Lippstadt airport, located an hour away from their headquarters in Bielefeld. Over 300 guests from more than 50 countries were presented with new technologies at five different stations with the HST representing the grand finale. Having witnessed the changes over the past ten years in the 3-10 psi aeration blower market, I was excited for the BOGE team's future prospects and impressed by the investments and passion they have for their business.

Atlas Copco's big splash was centered on the new GHS Series rotary screw vacuum product line with standard VSD variable speed drive technology. Vacuum industry veterans like Copco's Phil Berridge and Mark Taylor were "pumped" (sorry, couldn't help it) by the new technology, "Vacuum systems have historically been owned by the operators, not the facilities people. Our new product lines featuring standard VSD, low-sound enclosures and Elektronikon control, will facilitate the trend towards the centralization of the vacuum system — a trend driven by energy efficiency and reduced maintenance costs."

I had a long talk with Marketing Vice President Conrad Latham and was very impressed by the impact of the SmartLink data monitoring program for compressors introduced two years ago. Shipped standard with most Atlas Copco air compressors, clients are given different data logging service options — so they can start learning what's happening with their system! I won't publish the number here as I'm not sure about permissions, but I can say the market acceptance has been tremendous. This is fantastic news for thousands of compressed air users who are now managing data real-time as it comes year-round to their desk top. Latham said, "We are now able to take energy intensity data from multiple plants operated by one company, and help their energy managers compare specific power performance metrics, such as cfm/kW, plant-by-plant." In my experience speaking with our Energy Manager readers, this is exactly the kind of data they are looking for.

Kaeser's focus on Industry 4.0 was focused on investments in making the Sigma Air Manager 2 (SAM 2) master control system more intuitive and user-friendly as if it were an Apple iPad. Using a large touch screen with icons on visual P&I diagrams, the objective is to show end users where the alarm functions are deploying and what/where the key performance indicators are. It won't require special training to understand what is happening with your compressed air system when you use this-just your fingers! The SAM 2 also has built-in Air Demand Analysis software. Kaeser USA President Frank Mueller said, "The SAM2 allows clients to deploy data-driven maintenance schedules (vs. time-based) for their systems and realize system improvements while reducing costs." Kaeser also introduced a larger Secotec cycling dryer model rated for 34 m3/min and a larger DBS Series blower model.

Airleader is an interesting German company really focused on networked compressor controls, controls training and simulation. I find the simulation focus particularly interesting as compressed air systems are always changing. Their simulation software helps clients simulate what would happen if a certain type of air compressor was added to the system. Jan Hoetzel is their U.S. Manager, "Simulation of what would happen is a very valuable tool made possible by the advanced Airleader software and reporting capabilities." I personally like the easy to understand tables it provides showing how the math is done.

Josval is an interesting Spanish manufacturer of air compressors based in Zaragoza. They build a high-quality and robust Moncayo piston compressor and offer it in very effective 64 dba low-sound enclosures from 4-20 horsepower. Manuel Vicente de Vera and Managing Director Manuel Loren told me their history goes back to piston compressors for air brakes — making their designs rugged and heavy-duty, ideal for outdoor applications. They also package a full range of rotary screw air compressors.

Ingersoll Rand had a significant presence at the show with top management present including Robert Zafari (Executive Vice President Industrial Segment) and Manlio Valdes (President Compressed Air Systems) most of the week. There was a new feel and excitement around Ingersoll Rand. You could feel the technical resources of IR's Trane business as they announced a global commitment to reduce their GHG footprint globally by 50% and introduced new refrigerants R452a and R513a for their compressed air dryers. In their first public exhibit since

Directors Thorsten Meier and Wolf D. Meier-Scheuven, from BOGE, next to the innovative 55 kW oil-free HST turbo air compressor (left to right).

Jeroen Hoen, Bob Rigouts and Conrad Latham, from Atlas Copco, next to the ZT22VSD-8.6 oil-free tooth air compressor featuring the SmartLink monitoring program.

The Kaeser Sigma Air Manager 2 uses a larger touch-screen and facilitates data-driven maintenance schedules for clients.

SHOW REPORT: THE 2015 HANNOVER MESSE

Giovanni Capellari, from Ingersoll Rand, next to the new SFD Series refrigerated dryer.

Jan de Bie, from JORC, introduced the Smart Guard Mini zero air-loss condensate drain designed for OEM applications like refrigerated air dryers.

Roberto Bettin, Don Joyce, and Antonio Pengo at the MTA booth in front of the new DEetm Enhanced Thermal Mass cycling refrigerated dryer.

the Cameron Centrifugal Compressor Division acquisition, managers like Cary Collins and Patrick Hirsh talked about a new chapter for the company as they enter engineered air and gas systems, "We've gone from 15,000 cfm (at maximum 200 psi) compressed air systems to 110,000 cfm at 1200 psi for multiple gas applications." Their booth had a new IR Turbo-Air NX 12000 centrifugal air compressor on display.

The highlight for me was IR's introduction of the new SFD Series refrigerated dryer capable of producing a pressure dew point of - 4 ˚F (- 20 ˚C). OK, I admit I was a bit skeptical at first! After spending a full hour with IR's Giovanni Capellari, from their O.M.I. division in Italy, I was completely convinced I was seeing a true innovation in refrigerated air dryer design. "This dryer targets customers running 1 to 3 shifts experiencing partial loads who want an ISO 8573.1 Class 3 dewpoint — with no purge air penalties," Capellari explained. "This pressure dewpoint class removes an extra 0.6 grams of moisture per cubic meter of compressed air vs. the traditional 38 ˚F (3 ˚C) dewpoint of refrigerated dryers."

Using the ozone-friendly R452a refrigerant, the system innovation lies in the use of "regenerating" twin evaporators. Compressed air coming from the air-to-air heat exchanger is cooled to the Class 3 dewpoint in one of the evaporators where a controlled frost is allowed to build up on the heat exchanger surface. A pressure sensor tells the valving system when to switch the inlet air to the second heat exchanger. The "frosted" heat exchanger is then "regenerated" by a portion of the warm inlet air. In this way, the unit's control system assures low-pressure drop and dewpoint. Capellari concluded, "Our clients are pleased to receive this level of air quality without any purge air costs or temperature and dewpoint spikes."

Compressed Air Treatment

JORC has really established itself as a global specialist in condensate management. Oil/water separators and condensate drains are their expertise. I spoke with President Jan de Bie and he told me they now have subsidiaries in Slovenia, Croatia, India, China and the U.S. The U.S. operation is led by Eugene White and warehouses all JORC products for fast deliveries. The company is introducing interesting lines of "mini" zero air-loss drains designed for refrigerated dryers and compressed air filters. The new products introduced were the Smart Guard Mini and Mini Mag zero air-loss drains. The zero air-loss feature combined with compact size and light-weight aluminum housings make them interesting

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Kevin O'Keeffe, James Doherty, David Wilson, Jay Francis, and Jeff Levengood from SPX Flow Technology (left to right).

Allan Hoerner, Denis Williams and Derek Turnbull from Parker FAF.

Volkan Ayhan, from Mikropor, reported achieving ASME Certification for his heated and heatless desiccant dryers warehoused in Michigan City.

OEM product lines. The connection height of the Smart Guard Mini, for example, is only 2.91" (74mm) making it easy to place under the condensate separator of a refrigerated dryer.

MTA was very excited to be introducing the third major evolution of their refrigerated dryer technologies since Antonio Pengo and his partners started the Company in 1982. Their new thermal mass cycling dryer technology, called DEetm (enhanced thermal mass) Series of refrigerated dryers covers flows from 32 to 225 m^3/min. MTA designed and patented aluminum heat exchangers include an air-to-chilled mass evaporator. This evaporator can store enough cold to handle partial loads from 0-20% allowing the refrigeration compressors to cycle off.

Using their experience in the chiller industry, MTA's new chiller evaporator (refrigerant to coolant fluid exchanger) is mounted inside the thermal mass tank itself, reducing power consumption and improving temperature control. The units deploy scroll refrigeration compressors using ozone-friendly R410A refrigerant. The refrigeration control system features a solenoid valve on the suction side with a calibrated orifice. This thermal mass dryer line also features no air-loss demand drains and a digital control system featuring an energy management system with full range of connectivity features.

SPX Flow Technology reported continued growth of their compressed air treatment brands including Hankison and PPC. They have just released the new EMMConnect refrigerated dryer control panel enabling enhanced monitoring and control of their non-cycling and energy-saving refrigerated dryers.

PARKER's FAF Division displayed a full array of compressed air treatment technologies from their different European air treatment brands including Hiross, domnick hunter and Zander. Allan Hoerner and Denis Williams told me they are introducing, in the U.S., new Allen Bradley 7" HMI PLC controllers on their heatless and heated desiccant dryers.

Measuring Compressed Air in the Piping System

BEKO continues to invest in Industry 4.0 themes as it has become a manufacturer of compressed air system instruments. The company introduced a new DPM dewpoint meter, a new PRM pressure monitor and a newly upgraded Metpoint OCV oil vapor monitoring system along with the UD01 Universal Display. The OCV self-calibrates by creating an clean air stream (using a mini BekoKAT) every thirty seconds.

Beko Technologies President Tilo Fruth said, "The convenience of on-sight calibration has created pre-orders for the OCV. We are also experiencing strong demand for our portable BDL dewpoint sensor." Beko's pioneering work with instrumentation reminds me of how they pioneered the demand-drain market talking about zero air-loss drains when most used mechanical float drains. Today, demand-drains have become a standard system component. Beko also displayed the first membrane dryer I've seen with adjustable dewpoint control. Humidity and temperature sensors, measuring dryer outlet air, send a signal to the purge valve to drive more or less depending upon the pressure dewpoint selected. On display in the booth was also the Drypoint AC HP 7000 psi desiccant dryer for marine applications.

Tilo Fruth, from Beko Technologies, next to the Metpoint® family of compressed air instruments.

VP Instruments is a very innovative flow meter manufacturer from Holland. I was very impressed by their new concept and introduction of "sensor cartridges" at the show. President Pascal van Putten was excited about the feedback they were receiving from booth attendees on the sensor cartridge one can use on their FlowScope flow meter. "Recalibration is an issue with flow meters and the required frequency depends upon air quality conditions. The new sensor cartridge allows end users to simply install a new cartridge at the equivalent price of a calibration-without the hassles of shipping back and forth." This appears to be a very practical solution matching the maintenance processes of air compressor service companies. Overcoming the calibration issues affecting flow meter performance can in turn provide a significant step forward towards getting more flow meters into compressed air lines to provide data.

Pascal van Putten, from VP Instruments displaying the new Sensor Cartridge for the FlowScope flow meter.

Teseo piping can be used for water, vacuum and compressed air systems. I like their focus on making it easy to work with piping. They focus on all the accessories required to make piping easier to instrument and to modify. This follows the Industry 4.0 theme of getting data from the compressed air system. They displayed new aluminum modular manifolds and new HBS System joints and fittings. Teseo has also partnered with VP Instruments, the flow meter manufacturer, to make it fast and easy to carry out the safe hot-tapping of the pipe to install a flow meter. BP

Paolo Nardi and Paolo Erculiani, from Teseo, focus on piping systems making it easy for factories to install "plug and play" flow meters, manifolds and bypasses.

For more information contact Rod Smith, Compressed Air Best Practices® Magazine, tel: 412-980-9901, email: rod@airbestpractices.com, www.airbestpractices.com

To read more about ***Compressed Air System Technology,*** please visit www.airbestpractices.com/technology.

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TECHNOLOGY PICKS

SPX Launches Control Unit for Refrigerated Dryers

SPX has launched the EMMConnect Refrigerated Dryer Control panel for enhanced monitoring and control of its principal range of non-cycling and energy-saving refrigerated air dryers. The unit features a user-friendly interface and provides a myriad of advanced monitoring features including alarms; event and data log; and master scheduler and maintenance reminders to provide ultimate control and peace of mind — all while maximizing performance.

"Refrigerated compressed air dryers have been used for many years as a cost effective and energy efficient solution for eliminating moisture from compressed air systems," said Jay Francis, National Sales Manager, Industrial Products Group, SPX Flow — Dehydration & Filtration. "With the launch of EMMConnect Refrigerated Dryer Control we can now provide advanced user-friendly controls that allow the dryer to be connected to any network, ensuring that users are always in touch with their critical processes."

Among the countless features, the most significant innovation comes with the control unit's connectivity options. The EMMConnect allows users to monitor the dryer's operation from anywhere in the factory utilizing Ethernet or RS485 communication protocols. This connectivity allows operators to have a means to efficiently monitor the operation of critical process equipment and to be able to respond more quickly and efficiently to issues that may impact their critical process through networked communication with the dryer.

The backlit display continuously provides operating feedback, providing information on date and time, and hours to service, as well as its total operating hours and vital parameters, such as temperature and dryer percent load. It provides protection for the dryers with alarms that allow operators to make adjustments and keep the dryer in operation. It also offers automatic reminders when it is time for scheduled maintenance, ensuring that the dryer runs efficiently for years to come.

When it comes to ensuring that the dryer is always running at peak performance, its operation can be analyzed from the data log that continuously records its operating performance along with alarms and power events, which is stored together with times and dates. With its master scheduling function, users can create a custom operating schedule to match the operation of the facility, saving time and money.

"As the demand for reliable, energy efficient equipment continues to grow, refrigerated dryer manufacturers are being challenged to provide control systems that allow operators to monitor and control units remotely," added Francis. "With the EMMConnect we have put effective control back in the hands of the operator, wherever he is in the factory. This fits with the way in which people work in the 21st century, by leveraging technology to increase efficiency and productivity."

For more information, please visit www.spx.com.

TECHNOLOGY PICKS

VPInstruments Introduces Revolutionary New Flow Meter

VPInstruments unveiled its all-new VPFlowScope at Hannover Messe.

Modular Design: Transmitter + VP Sensorcartridge = The Future

The new design comes as two interconnecting modular elements: the transmitter (the "head") and the VP Sensorcartridge® (the "probe"). There will be multiple VP Sensorcartridges available with various specifications. This is yet another fine example of VPInstruments' everlasting drive to innovate and be an industry leader.

No More Recalibration

The old-fashioned way of submitting an entire instrument for recalibration has been abandoned — instead the Sensorcartridge is simply replaced by a new one when the time comes. This is, in fact, cheaper and far less time-consuming than going through the whole calibration process. Not only does this mean the lowest possible total cost of ownership, users also benefit from zero downtime in the field, ergo no loss of data.

Preserve the Standard Already Set…

The good bits from the currently available VPFlowScope insertion model are there. The new VPFlowScope M, too, is a high-end, sophisticated multi-sensor measurement instrument with bi-directional sensitivity, standard RS485, 4..20 mA, USB interface and integrated data logger.

…And Enhance it with New and Even Better Features

On top of this, new functionality has been added to set the standard once again. New features include the exchangeable cartridge (to save on downtime and calibration costs), the newly designed transmitter with status LEDs and alarm information, and standard Ethernet (no external converters). In addition, the most complete version has an extremely large data logger with endless logging (more than half a year of logging capacity with a one-second interval on all channels), a full-color TFT screen, and built-in Wi-Fi. Assembled instruments are water-resistant.

Products from VPInstruments Quickly Pay for Themselves

VPInstruments provides real-time insight into the consumption of compressed air and technical gases. The equipment shows where, when and how much the usage is. And that is almost always significantly more than necessary. The innovative and user-friendly meters and monitoring equipment guarantee substantial savings. The web-based software of the VPVision monitoring system is the cornerstone of any energy management system with ISO 50001 certification. Investments in products by VPInstruments very quickly pay for themselves.

For more information, visit www.vpinstruments.com.

EXAIR Introduces New Digital Electronic Temperature Control

EXAIR's digital ETC (Electronic Temperature Control) is now available for Dual Cabinet Cooler Systems installed on large or high-heat load enclosures. An ETC Dual Cabinet Cooler system will keep electrical enclosures cool while minimizing compressed air use. Systems produce 20 °F air to eliminate high temperature malfunctions and protect sensitive electronics from harsh environments. They are available in cooling capacities up to 5,600 Btu/Hr.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

The ETC accurately maintains a constant temperature in the electrical enclosure that is slightly under the maximum rating of the electronics. It permits just enough cooling for the electronics without going so cold as to waste compressed air. A digital LED readout displays the temperature of the electrical enclosure (˚F or ˚C), then displays the user temperature setting when pressing the "push to set" button. When that setting is exceeded, the Cabinet Cooler System is activated.

The ETC is suitable for NEMA 4, 4X and 12 environments and works with EXAIR's UL listed Dual Cabinet Coolers systems, which are available with cooling capacities of 4,000, 4,800 and 5,600 Btu/Hr. All systems include an automatic drain filter separator to keep moisture in the compressed air out of the enclosure. Models are available for 120 VAC or 240 VAC, and lower cooling capacities are available. All products are CE compliant.

For more information, visit www.exair.com/dualetc.htm.

Zahroof Valves Offers Unprecedented 10-Year Warranty on Valve Housings

Zahroof Valves Inc. (ZVI) recently announced a best-in-industry, 10-year warranty on its stainless steel valve housings.

Depending on application, up to 20 percent of power required to operate a reciprocating compressor is lost in the compressor's valves — with losses increasing at higher operating speeds and higher molecular weights. In addition, the leading cause of unplanned compressor downtime is directly attributed to failures in the compressor valve, which result in costly lost production and repair costs. To tackle these ongoing issues and inefficiencies in the compressor, ZVI developed and introduced the StraightFlo Valve (SFV).

The ZVI SFV is a patent-pending, reciprocating compressor valve technology that results in step improvements in valve key performance indicators through its unique design.

The innovative design, based on the patented Modular Reed Valve technology, delivers a step change in reciprocating compressor performance, serviceability and reliability while reducing gas emissions to the environment. In addition to its 10-year warranty, the ZVI StraightFlo Valve has proven to improve valve efficiency by up to 40 percent and significantly extend run time between valve service intervals. The unique design of the SFV can be applied to all gas compression applications.

For more information, visit www.zahroofvalves.com.

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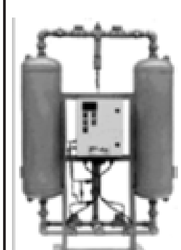

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