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

COMPRESSED AIR BEST PRACTICES

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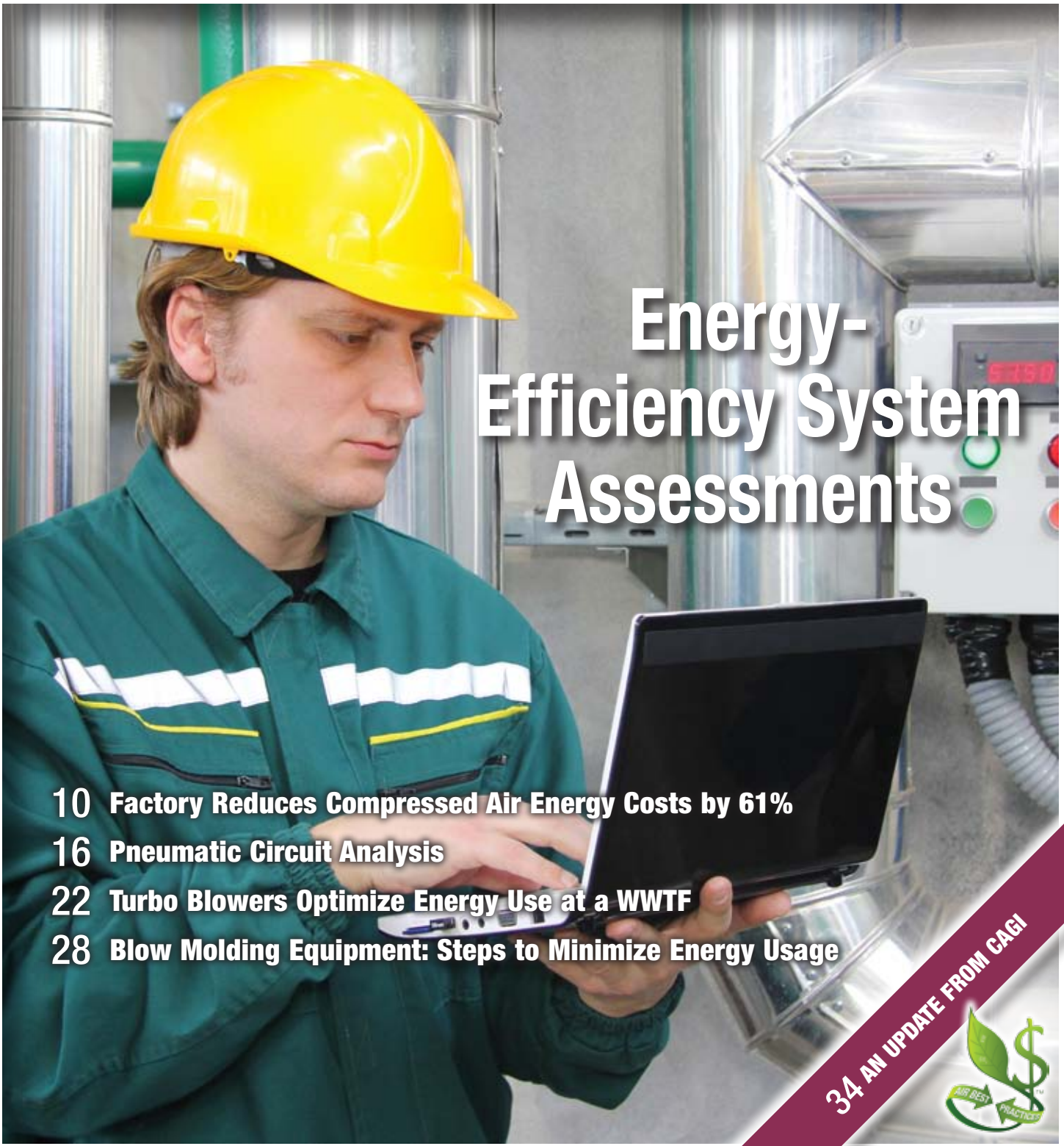
May 2013



Energy-Efficiency System Assessments

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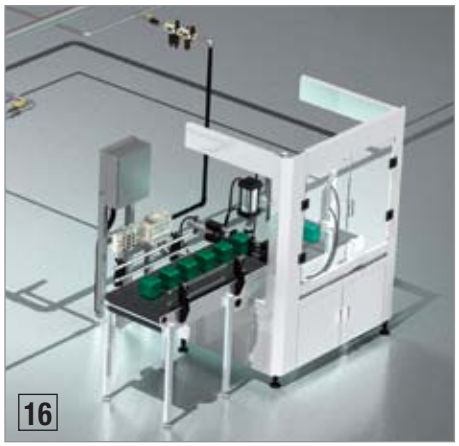

COLUMNS

FROM THE EDITOR | Energy-Efficiency System Assessments

This issue provides our readers with four distinctly different types of system assessments aimed at improving industrial energy efficiency.

This demand-side compressed air system assessment reduced air compressor discharge pressure by 20 psig and production average air flow from 693 to 240 cfm. Titled "Factory Reduces Compressed Air Energy Costs by 61%", this article is provided to us by Don van Ormer. The savings were verified by a third-party and triggered a $37,000 retrocommissioning energy rebate.

Pneumatic circuit assessments, of production equipment, require a high-level of expertise. Clint Hodge, from ASCO Numatics, provides us with a valuable article titled, "Pneumatic Circuit Analysis for Energy Efficiency."

Blower system assessments, in wastewater treatment plants, provide significant returns. The municipality of Billerica, MA, installed a new dissolved oxygen control system along with turbo blowers. Jack Troidl, P.E., provides us with an interesting account of this project.

End-use process system assessments take an integrated look at optimizing an entire process. Donald Miller, from Plastic Technologies, provides a very interesting example of this in his article, "Blow Molding Equipment: Review and Process Steps to Minimize Energy Usage."

We are pleased to provide an "Update from CAGI" through an interview with industry veteran and CAGI Technical Consultant, Rick Stasyshan. After prowling the trade show floor, for four days looking for innovations, I also hope you enjoy our Hannover Messe Report.

We thank the authors above for sharing their knowledge and thank you for your support and for investing in ***Compressed Air Best Practices®***. BP

ROD SMITH

Editor • Contact: 412-980-9901, rod@airbestpractices.com

In Memoriam — Scot Foss

Scot Foss passed recently and I wanted to try and salute this pioneer in compressed air system assessments. Auditing compressed air systems since 1969, Scot conducted 1700 complete system assessments. Later in his career, he focused on creating a new generation of auditors. He educated countless individuals and companies, in over 650 seminars and in many challenging conversations. I was lucky to be one such pupil. May Scot rest in peace knowing he made a significant difference in U.S. industrial energy useage.

– Rod Smith, Editor, Compressed Air Best Practices® Magazine

COMPRESSED AIR, PNEUMATICS, VACUUM & BLOWER INDUSTRY NEWS

New NASCAR Air Titan Track Drying System Features Sullair Air Compressors

In preparation for the 2013 Daytona 500, NASCAR unveiled a new track drying system called the Air Titan. The Air Titan featured Sullair 1600HAF portable air compressors and, in the event of a rain delay, was designed to dramatically reduce track drying time when compared to jet dryers used in previous years.

Following the challenges of rain delays at the 2012 Daytona 500, NASCAR Chairman and CEO Brian France challenged the NASCAR Research and Development Team to deliver a new track drying system that would ultimately reduce the drying time by as much as 80% — from 2½ hours to around 30 minutes. To accomplish this NASCAR pursued alternative technologies to the jet drying system. NASCAR's R&D Group was up for the challenge and contacted Ring Power Corporation, a Sullair distributor and a Caterpillar dealer located in St. Augustine, Florida to pursue the possibilities of using compressed air. In just six months, starting in August 2012 with the February 2013 Daytona 500 date in sight, the NASCAR Team and Ring Power worked together on a solution that not only reduced drying time to around 30 minutes, but was much more energy efficient. Jerry Kaproth, Special Projects Coordinator for NASCAR was very pleased with the results from the NASCAR R&D team and the professional support he received from both Ring Power and Sullair. Jerry emphasized the advantage of the new Air Titan is twofold, "one, it dries at a much faster rate than the jet dryers, and two, it's a lot more energy efficient than utilizing the jet dryers." Regarding the difference in fuel consumption, he went on to state "we figured that the ratio of the compressors compared to the jet dryers is about 9 to 1 in our favor now."

The system includes three side-by-side Air Titans, each enclosed in a six foot cart and towed behind a truck. The Air Titans are connected by a three inch air hose to three Sullair 1600HAF high pressure air compressors positioned on a flatbed truck that follows alongside the truck that is towing the Air Titans. Each Air Titan has a long, thin air nozzle that delivers high pressure air to the wet racetrack, forcing the water down to the apron where it is vacuumed up by another truck.

When asked about working with Ring Power and Sullair on the Air Titan project Jerry stated, "both organizations were extremely professional. Ring Power has been reliable, innovative, and responsive, as they met every challenge. Sullair provided a wonderful piece of equipment and provided professional support to us as well." Jerry believes that, "this system, in some form or fashion, could be utilized at every Cup event for NASCAR. But along with the Cup events, we also have an opportunity to look at other racing series." Whether the Air Titan is needed to dry the race track or not, the equipment is always there, ready to meet the challenge. Truly an innovative application for compressed air and Sullair was there!
www.sullair.com

"The Air Titan featured Sullair 1600HAF portable air compressors and, in the event of a rain delay, was designed to dramatically reduce track drying time when compared to jet dryers used in previous years."

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COMPRESSED AIR, PNEUMATICS, VACUUM & BLOWER INDUSTRY NEWS

Atlas Copco Listed Among World's Most Ethical Companies by Ethisphere Institute

Atlas Copco was named one of the World's Most Ethical Companies by the Ethisphere Institute. The prestigious ethical ranking, presented at the Global Ethics Summit in New York, recognizes companies that introduce best practices into corporate ethics.

"We are honored to have our business practices recognized by global organizations like the Ethisphere Institute," said Jim Levitt, president, Atlas Copco North America LLC. "In our value-based culture, we train our employees to work and think ethically and to prioritize long-term results and sustainable, profitable development."

Ethical business practices are a key element in Atlas Copco's operations. It starts with a culture of compliance to a clear policy governing its business practices, including a comprehensive education program for employees and web-based ethics classes for the company's suppliers. Atlas Copco also provides an annual corruption-awareness training program that thousands of employees participated in last year, and all company management is committed to compliance with the company's Business Code of Practice.

As part of the company's dedication to business ethics and standards, Atlas Copco is a signatory to the UN Global Compact, a strategic policy initiative for businesses that are committed to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labor, environment and anti-corruption. And earlier this year, in its report on the 20 largest Swedish companies, Transparency International awarded Atlas Copco a score of 100% for its anti-corruption efforts.

To learn more about the Ethisphere Institute and to see the full list of the 2013 World's Most Ethical Companies, visit www.ethisphere.com.

Learn more at www.atlascopco.com.

Manufacturing Sector Energy Use and Energy Intensity Down Since 2002

Total energy consumption in the manufacturing sector decreased by 17 percent from 2002 to 2010, according to data released today by the U.S. Energy Information Administration. Manufacturing gross output decreased by only 3 percent over the same period. Taken together, these data indicate a significant decline in the amount of energy used per unit of gross manufacturing output. The significant decline in energy intensity reflects both improvements in energy efficiency and changes in the manufacturing output mix. Consumption of every fuel used for manufacturing declined over this period.

The manufacturing sector comprised over 11 percent of gross domestic product (GDP) in 2010. The manufacturing base in the United States is broad, producing items as varied as the food we eat to the clothes we wear. Manufacturing includes energy-intensive industries (those that use relatively large amounts of energy) such as petroleum refining, chemicals, aluminum, iron and steel, paper, wood products, and food, as well as less energy-intensive industries such as textiles, leather, apparel, furniture, machinery, and electrical equipment.

Energy for manufacturing can be consumed in two ways: as a fuel or as a feedstock (material input to a final product). Energy consumed as a fuel includes all energy used for heat and power. Energy used as feedstock is the use of energy sources for raw material input or for any purpose other than the production of heat or power.

U.S. manufacturing used over 14 quadrillion Btu of energy as a fuel in 2010, a decrease of 13 percent from the 2002 level. Fuel consumption in the five most energy-intensive subsectors accounted for 81 percent of fuel use in manufacturing. Two energy-intensive subsectors (petroleum and coal products, and food) showed 3.5 percent increases in their fuel consumption from 2002 to 2010.

"In our value-based culture, we train our employees to work and think ethically and to prioritize long-term results and sustainable, profitable development."

— Jim Levitt, president, Atlas Copco North America LLC

Feedstock energy use in U.S. manufacturing accounts for more than 6 percent of all energy consumed in the country. Although nearly all manufacturers use energy as a fuel, 99 percent of feedstock energy use occurs in only three manufacturing subsectors: primary metals, chemicals, and petroleum and coal products.

Although overall manufacturing output declined by 3 percent between 2002 and 2010, some manufacturing industries grew over the period. The gross output for the petroleum and coal products subsector grew by about 3 percent, while the gross output for the food subsector increased by 5 percent. However, during this same period the number of employees in both subsectors fell, the petroleum and coal products subsector by 6,000 employees, and the food subsector by 115,000 employees. The reduction in employment, along with an increase in gross output signals an increase in labor productivity in these two subsectors.

These data, among others, are drawn from the detailed results of EIA's *2010 Manufacturing Energy Consumption Survey (MECS)*. The 2010 MECS is EIA's eighth survey of the manufacturing sector and covers the U.S. and four Census regions (Northeast, Midwest, South, and West). Previous surveys were conducted for 1985, 1988, 1991, 1994, 1998, 2002, and 2006, respectively. Future MECS are planned for every four years. Data collection for the 2014 MECS will begin in 2015.

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THE COMPRESSED AIR SYSTEM ASSESSMENT

Factory Reduces Compressed Air Energy Costs by 61%

By Don van Ormer, Air Power USA

Introduction

This factory, located in the U.S. northeast, spent an estimated $120,000 annually on energy to operate the compressed air system. The group of projects recommended below reduced these energy costs by $73,700 or 61% of current use. These estimates are based upon a blended electric rate of $0.114/kWh.

Estimated costs for completing the recommended projects total $53,600 — after receiving a $37,000 retrocommissioning rebate from the local utility. The retrocommissioning incentive program, from the local utility, was important in that it incented demand-side system assessment work and the project management required to not only identify savings but to execute the projects.

This system assessment reduced compressed air system pressure by 20 psig and demand by 453 cfm. The supply-side was then modified so that only one VSD air compressors was required. The project was implemented by the factory, and the energy savings were verified by a third party. This verification triggered the payment of the $37,000 utility incentive to the factory. Due to article length constraints, only selected energy-efficiency projects will be reviewed.

The Existing Compressed Air Installation

The compressed air system consists of three single-stage, air-cooled, Sullair 100-hp class,

PROJECT	SAVINGS PROFILE	ENERGY AND OTHER SAVINGS			TOTAL PROJECT COST ($)
		PEAK KW	KWH	SAVINGS ($)	
AIR COMPRESSOR SUPPLY					
1 (A & B). Reconfigure interconnecting piping from compressors to pre-filter and dryer; reduce discharge pressure from 120 psig to 100 psig	20 psig	16 kW	99,833	$11,381	$22,130
CAPACITY CONTROL					
2. Adjust air compressor alignment and pressure control system	31% gain in efficiency	49.6 kW	309,500	$35,283	$6,000
AIR TREATMENT					
3. Replace existing non-cycling dryer with larger cycling dryer due to high ambient temperatures	4.8 kW	4.8	29,702	$3,413	$20,000
4. Replace pre-filter with 2,000-scfm rated mist eliminator	Savings taken in Project #1	$4,000			
5. Replace three electronic timer drains w/level activated; remove two others	15 cfm	1.48	9,284	$1,054	$2,400
DEMAND-SIDE SYSTEM					
6. Repair identified leaks; continue leak detection, tagging and repairs	39 cfm	3.6	22,901	$2,739	$2,400
7. Remove listed open blows, utilize existing blowers; install venturi nozzles on others	399 cfm	39.5	164,640 (4,160 hrs)	$28,029	$10,930
8. Complete compressed air system audit	Audit needed to identify energy savings projects				$4,000
9. Provide project management	Oversight needed to deliver energy savings				$19,000
Total: Retro-commissioning Projects (Energy savings safety factor of 10%)	**453 cfm**	**114.9 kW**	**635,860 kWh**	**$73,710 per year (10% S.F.)**	**$53,660 (Rebate = $37,200)**

lubricated rotary screw compressors. There are two LS200-100H (115 Bhp), modulation-control units producing 477 acfm at 125 psig discharge pressure drawing 92.5 kW. The third compressor is a V200-100HA variable speed unit (122 Bhp) producing 454 acfm at full load. All compressors are running well and are located in the same compressor room.

Plant personnel report that the compressor room has some ventilation issues during the hot summer months. Compressor room ambient temperatures can get up to 115 °F. This affects air compressor and compressed air dryer performance.

All compressors feed a Sullair SR1000 air-cooled, non-cycling refrigerated dryer. The dryer operates well, most of the year, but was not sized for the high ambient temperatures (115 °F) and moisture is present in the system during the hot summer months. Next to the dryer is a 1 micron particulate pre-filter and a oil coalescing after-filter. The filters are performing well but pressure drops range between 5-10 psig

Establishing the Energy Baseline

Annual plant electric costs for compressed air production, as operating today, are $113,818 per year. If the electric costs of $6,025 associated with operating ancillary equipment such as dryers are included the total electric costs for operating the air system are $119,843 per year. These estimates are based upon a blended electric rate of $0.114/kWh.

Production hours are from 05:00 AM to 11:00 PM five days a week. Sanitation is from 11:00 PM to 05:00 AM. The air system is shut-off during weekends. Plant personnel rotate the two LS200's as the base-load machines. The V200 VSD unit acts as the trim unit.

The air system operates 6,240 hours per year. The load profile or air demand of this system is relatively stable during production then

THE COMPRESSED AIR SYSTEM ASSESSMENT I

Factory Reduces Compressed Air Energy Costs by 61%

decreases during sanitation shifts. Overall system flow ranges from 693 acfm during production to 340 acfm during sanitation.

The estimated savings potential of the projects related to operating the compressors totals $78,488 per year. Adding in the savings potential of $3,413 from other projects related to operating auxiliary equipment (e.g., dryers) provides a total savings estimate for the entire set of projects of $81,901. Together, these projects can be completed at a cost of $82,600 (there is a 10% energy savings safety factor in the project summary).

Supply-Side Projects — Reducing Compressor Discharge Pressure By Addressing Piping Issues

The current system has inlet valve modulation on units #1 and #2; unit #3 has variable speed control. The current units have capacity controls capable of translating "less air used" into a comparable reduction in electric cost. These controls will not work effectively with the current piping and air receiver storage situation.

During our site visit we observed a 7 psig drop from the compressors to the receiver. Pressure upstream of the dryer and filters could not be measured so panel gauge readings of 119 psig, 119 psig and 120 psig were used. The dryer and filters are rated for 1,000 scfm each and the system demand was around 700 cfm. We believe the high pressure loss is partly caused by the interconnecting piping "T" connections and small pipe for the compressor collection header.

When we design piping systems, we size for a total horsepower (cfm) installed full load velocity of approximately 20 fps. Currently, the pipeline velocity in the 3" header is 43 fps.

We recommended replacing the existing 3" header with a minimum of 4" to a preferred

TABLE 1. COMPRESSOR USE PROFILE – CURRENT SYSTEM

UNIT #	COMPRESSOR: MANUFACTURER/MODEL	FULL LOAD		ACTUAL ELEC DEMAND		ACTUAL AIR FLOW	
		DEMAND (KW)	AIR FLOW (ACFM)	% OF FULL KW	ACTUAL KW	% OF FULL FLOW	ACTUAL ACFM
Production: Operating at 100 psig discharge pressure for 4,160 hours							
1	Sullair LS200-100H AC	92.5	477	Load sharing with Compressor #2			
2	Sullair LS200-100H AC	92.5	477	85%	78	50%	239
3	Sullair V200-100H AC	95.4	454	100%	95	100%	454
			TOTAL (Actual):		**173 kW**		**693 acfm**
Sanitation: Operating at 100 psig discharge pressure and 2,080 hours							
1	Sullair LS200-100H AC	92.5	477	Load sharing with Compressor #2			
2	Sullair LS200-100H AC	92.5	477	66%	61	0%	0
3	Sullair V200-100H AC	95.4	454	76%	73	75%	340
			TOTAL (Actual):		**134 kW**		**340 acfm**

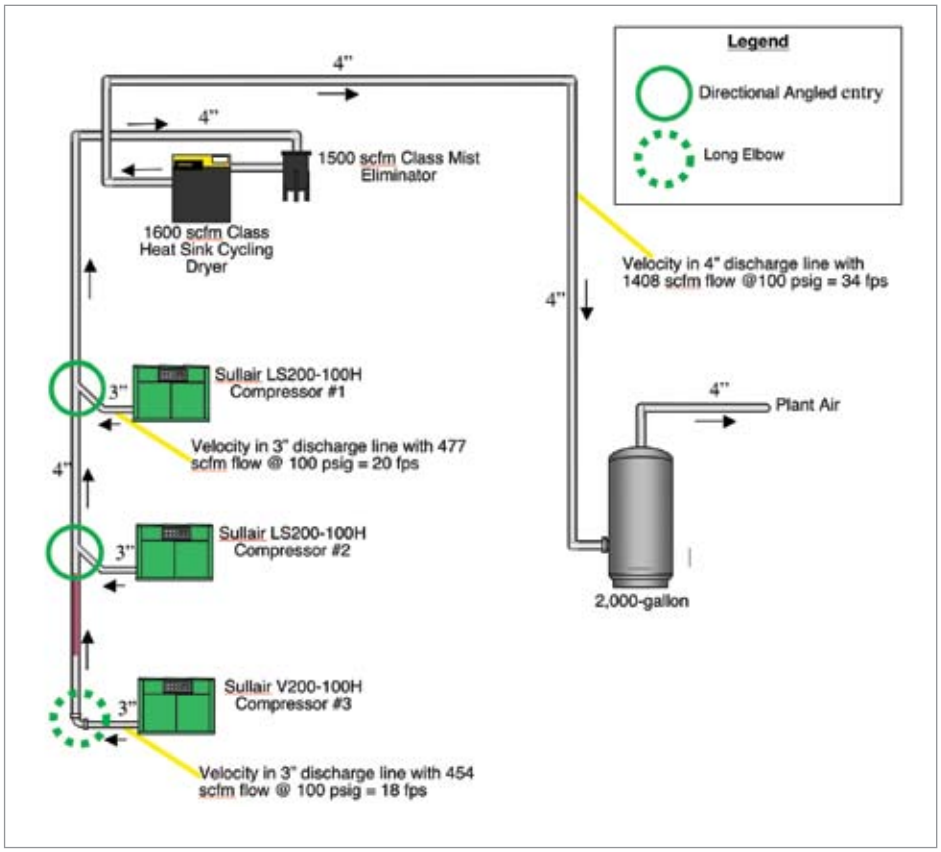

Figure 1. The Reconfigured Compressed Air System with New Piping.

TABLE 2. COMPRESSOR USE PROFILE – PROPOSED SYSTEM

UNIT #	COMPRESSOR: MANUFACTURER/MODEL	FULL LOAD		ACTUAL ELEC DEMAND		ACTUAL AIR FLOW	
		DEMAND (KW)	AIR FLOW (ACFM)	% OF FULL KW	ACTUAL KW	% OF FULL FLOW	ACTUAL ACFM
Production: Operating at 100 psig discharge pressure for 4,160 hours							
1	Sullair LS200-100H AC	83.7	477	Off			
2	Sullair LS200-100H AC	83.7	477				
3	Sullair V200-100H AC	85.5	454	55%	47	53%	240
			TOTAL (Actual):		**47 kW**		**240 acfm**
Sanitation: Operating at 100 psig discharge pressure and 2,080 hours							
1	Sullair LS200-100H AC	83.7	477	Off			
2	Sullair LS200-100H AC	83.7	477				
3	Sullair V200-100H AC	85.5	454	65%	55	63%	286
			TOTAL (Actual):		**55 kW**		**286 acfm**

THE COMPRESSED AIR SYSTEM ASSESSMENT | Factory Reduces Compressed Air Energy Costs by 61%

6" collection header with new discharge line size of 3" and angled directional entries. With the new 6" collection header and the new 3" discharge lines, all three compressors at full load velocity would be 34 fps.

If plant personnel believe they will need all three compressors in the future, the main collection header needs to be 6". However, with the flow reduction projects implemented, our expected flow should have a velocity of 7 fps. The 4" would be able to handle up to 1,000 cfm with a velocity of 24 fps. This flow is approximately 30% above current demand.

After the repiping work was done, we reduced the air compressor discharge settings to 100 psig.

Demand-Side Projects — Use "No Air-Loss" Level-Actuated Condensate Drains and Replace Air Blow-offs with Venturi Nozzles

There are five electronic timer drains installed in the compressor area. These condensate drains should be replaced with "no air-loss", level-actuated drains. This will save approximately 3 cfm per drain for a total savings of 15 cfm.

Electronic timer drains use an electronic timer to control the number of times per hour they open and the duration. In theory the frequency should be adjusted to ensure that condensate drains open fully and that the open time without water is minimized because compressed air is wasted. But in reality, cycles often aren't reset from original factory settings, resulting in condensate build-up during the summer and being set wide open during cooler weather. When they fail in "open position", they blow at a full flow rate of about 100 cfm.

Consider, for example, that the usual "factory setting" is 10 minutes with a 20-second duration. Some 1,500 scfm of compressed air will generate about 63 gallons of condensate a day in average weather or 2.63 gallons per hour. Each 10-minute cycle will have 0.44 gallons to discharge. This will blow through a 1/4-inch valve at 100 psig in approximately 1.37 seconds. Compressed air will then blow for 18.63 seconds each cycle, 6 cycles per hour, which will total 111.78 seconds per hour of flow or 1.86 minutes per hour of flow. A 1/4-inch valve will pass about 100

TABLE 3. VENTURI INDUCER NOZZLES IN PLACE OF OPEN BLOW

LOCATION	QTY	TYPE / SIZE	ESTIMATED CURRENT CFM USAGE	UTILIZATION %	NET AVG CFM	RECOMMEND VENTURI NOZZLE	NEW AVG NET CFM EACH	NET AVG CFM USAGE	EST NET AVG CFM SAVED
Line 1 Feed to filler	1	1/8"	20	100	20	48008	7	7	13
Line 2 Feed to filler	1	1/8"	20	100	20	48008	7	7	13
Line 3 Empty Can Reject	1	1/8"	20	100	20	48008	7	7	13
Line 3 Bottom Dry	19	1/8"	95	100	95	Remove -Use Blower	0	0	95
Line 3 Bottom Dry	20	1/8"	100	100	100	Remove -Use Blower	0	0	100
Line 2 Top Dry	2	2" Circle 6 1/8" Holes	30	100	30	48008	7	14	16
Line 3 Filtec	2	3/8"	30	100	30	48008	7	14	16
Line 1 Can Dry Bottom	10	1/8"	50	80	40	Remove -Use Blower	0	0	40
Line 2 Roll Over	1	1/8" V Nozzle	20	100	20	48008	7	7	13
Line 2 Top Dry	2	2" Circle 6 1/8" Holes	30	100	30	48008	7	14	16
Line 3 Bottom Dry	8	1/8"	40	100	40	Remove -Use Blower	0	0	40
Line 3 Filtec	1	¼"	30	100	30	48008	7	7	24
Total	**68**				**475**	**Proposed Usage**		**77**	**398**

TABLE 5. COMPRESSED AIR SYSTEM PROJECTED SAVINGS

	CURRENT SYSTEM		PROPOSED SYSTEM	
SYSTEM COMPARISON	PRODUCTION	SANITATION	PRODUCTION	SANITATION
Average Flow (cfm)	693	340	240	286
Compressor Discharge Pressure (psig)	120	120	100	100
Electric cost per cfm	$118.39/cfm/yr	$93.45/cfm/yr	$92.87/cfm/yr	$45.59/cfm/yr
Electric Demand	173 kW	134 kW	47 kW	55 kW
Total Energy Cost	**$120,000 /yr**		**$37,942 /yr**	

cfm. The total flow will be 100 x 1.86 = 186 cubic feet per hour, or 186 * 60 minutes = 3.1 cu ft/min on average. This 3 cfm would translate into an energy cost of $300 per year based on a typical air flow cost of $100 per cfm per year.

The drain locations are:

- Air compressor aftercooler separators — qty 3
- After-filter — qty 1 to be removed
- Dryer separator — qty 1 to be removed

Currently the plant has in place Paxton low-pressure blowers in selected locations, such as the bottom dryer on all three lines. The plant is also using the compressed air system for many open-blow drying applications. We recommend removing the compressed air blows in these areas and installing venturi nozzles on the locations listed. In the top dry locations, use a AiRTX nozzle #48008 with adjustable height to cover both can locations in current top-dry locations.

Estimated high pressure air used currently	475 cfm
Estimated high pressure air used after installation of venturi nozzles	77 cfm
Estimated compressed air savings with venturi nozzles and using blowers	399 cfm
Value of air reduction	$70.25/cfm yr
Total electrical energy cost recovery by installing venturi nozzles	$28,029/yr
Cost of nozzles and installation (68 nozzles x $100 each installed)	$10,930

Conclusion

This system assessment case study is important in that it took place in a plant where the significant energy-saving opportunities lay in time-consuming "demand-side" and piping system improvements. Many plants struggle to find resources to contract a system assessment for this type of work. They also find it difficult to find resources in project management to execute these projects. The retrocommission energy rebate, from the local utility, made it possible for this plant to contract this project. The results speak for themselves and are available in most manufacturing plants. BP

For more information contact Don van Ormer, Air Power USA, tel: 740-862-4112, email: don@airpowerusainc.com, www.airpowerusainc.com

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THE PNEUMATIC SYSTEM ASSESSMENT

Pneumatic Circuit Analysis for Energy Efficiency

By Clint Hodge, ASCO Numatics, EMERSON Industrial Automation

Currently, and for good reason, much attention is being focused on the conservation of energy. Compressed air, like electricity and gas, is an energy resource. It has often been referred to as the third utility. As with all energy sources, our global environment demands that it be conserved and used wisely.

In many plants that use compressed air, approximately 20% of all utility costs go to that expense alone. Plants with multiple shifts and high compressor horsepower levels report totals in the hundreds of thousands or even millions of dollars! Yet studies show that up to 55% of that expensive air is wasted or misapplied.

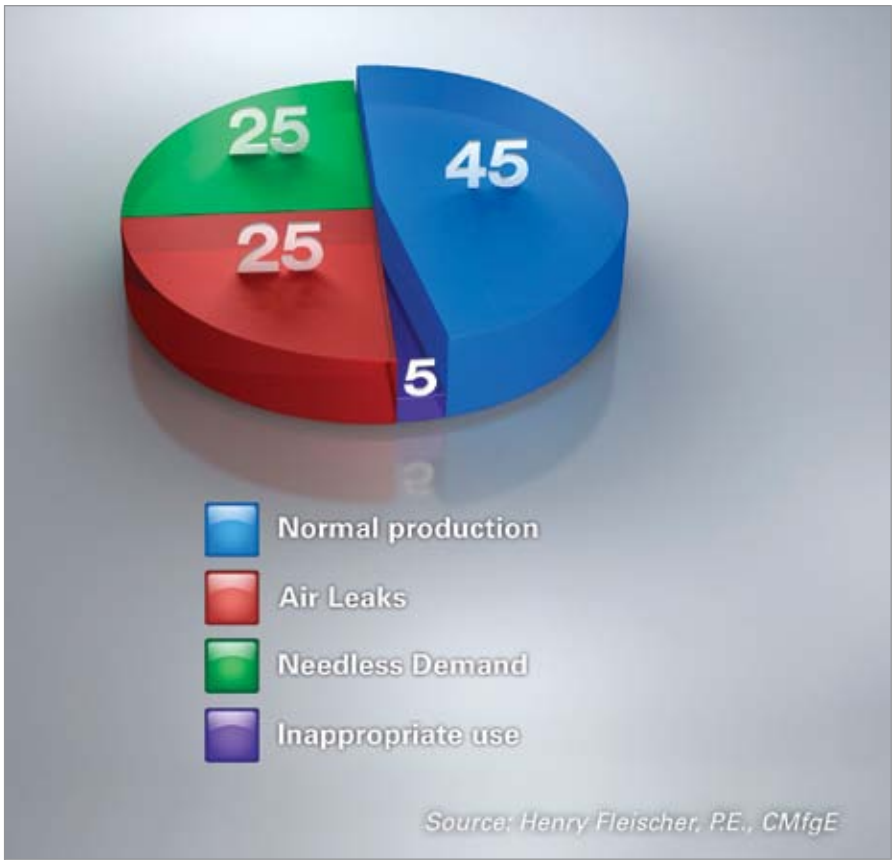
Component dimensions and operating pressures are very often wastefully oversized, creating needless demand and inflated operating costs. Blow-offs are continuous instead of intermittent forcing compressors to operate at excessive duty cycles or loads. Where dynamic seals are used, normal deterioration leads to air leaks. In our experience, we've found such examples of waste occurring in any given manufacturing facility many times over. The result is skyrocketing maintenance and energy costs.

One solution is to stop the "needless demand" by eliminating the practice of oversizing and over pressurizing pneumatic components and pneumatic circuits. With "energy conservation" being the primary objective, a typical pneumatic system (machine) that is optimized for component size and operating pressures can result in a 40-50% reduction in compressed air.

Many progressive companies looking for ways to address compressed air waste are conducting audits in their facilities. While numerous companies can be contracted to perform the service, the most comprehensive will include four key components:

- **Step 1: Evaluation of supply efficiency.** Establish a baseline. Identify the potential for energy savings starting with a complete evaluation of the compressor room. Determine the existing configuration, capacity, and condition of all existing compressor room equipment.
- **Step 2: Detection of air leaks.** Survey the air distribution system plant wide. Utilizing electronic leak detection instruments and flow meters, tag and quantify air leaks throughout the system. Pinpoint all leaks and estimate the total costs arising from leaks. Address inappropriate usage of compressed air.

Compressed Air Consumption for a Typical Manufacturing Site



Normal production — legitimate compressed air requirements
Air leaks — due to wear on cylinder and valve seals, piping and fittings also develop leaks
Needless demand — from overpressurization and oversized components
Inappropriate use — due to constant blow-offs, vacuum left on when not used, etc.

- **Step 3: Air quality analysis.** Concurrent with leak detection, conduct a uniquely comprehensive air quality analysis of the compressed air supply throughout the facility. Examine factors from dew points to particulates to oil saturation levels. Document existing air quality and recommend filtration as appropriate.
- **Step 4: Circuit analysis.** Utilize proprietary "Circuit Analysis" software to optimize applications down to the component/equipment level. The analysis will produce recommendations for processes and products to reduce compressed air consumption while maintaining and often improving equipment cycle times.

Circuit Analysis: The Key Audit Component

In our experience, the "Circuit Analysis" is critical. By sizing all the pneumatic components of the air system, as well as selecting pressures to optimize its usage, the circuit analysis can significantly improve how a company manages its compressed air as an energy resource.

Pneumatic components are often measured in terms of their conductance — or Cv — defined as the capability of fixed orifice pneumatic devices to move air under differential pressure. In other words, the greater the Cv, the better the flow. System conductance refers to the total conductance of all the various pneumatic-circuit components. To achieve ideal performance, system conductance must be able to allow pressurization and exhaust of all stored air within the allotted time. Although increasing conductor sizes between the valve and actuator can improve conductance, it also increases the volume and ultimately compressed air usage. Therefore, increasing conductor size has both beneficial and detrimental effects on actuator performance times. Finding the right balance between the two is the key.

THE PNEUMATIC SYSTEM ASSESSMENT

Pneumatic Circuit Analysis for Energy Efficiency

Case Study
Numasizing Surveys: Reducing the "Artificial Demand"

Numasizing® is a proprietary technique from Numatics which enables compressed air to be used more efficiently by sizing all the pneumatic components of an air system, as well as selecting pressures to optimize its usage. Numasizing negates the need to speculate on the stroke time of an actuator even when subjected to two different loads under two distinct pressures.

Unlike other sizing programs, Numasizing is not rooted in a theoretical approach or a mathematical model. It is instead based on actual results of over 250,000 test firings of pneumatic actuators. Included in the program are actuators from 3/8" to 14" bores, operating in conjunction with different diameter/length conductors and valve sizes. The actuators were subjected to every conceivable dual pressure/load combination feasible. Consequently, this "built-in experience" allows Numasizing to predict and recommend components and pressures with confidence.

The goal of any pneumatic design is to optimize components and fulfill customer objectives. Maximizing machine productivity may require larger valves operating at higher pressures. Whether the priority is reducing component size, maximizing productivity, or compressed air efficiency, proper component sizing and operating pressures can be determined. Unfortunately, there is not an ideal set of components or pressures capable of satisfying all objectives.

In one recent Numasizing survey, our team focused on a valve and cylinder application

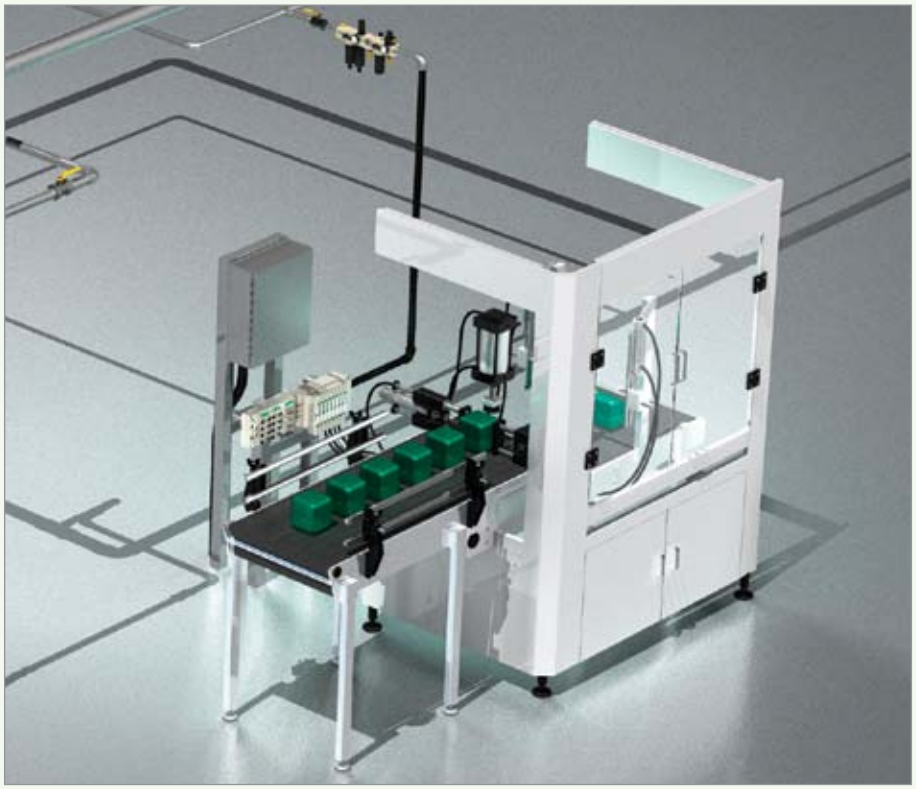


Figure 1 — Typical factory automation.

within a material handling system. The system operates two shifts per day. The valve controls a six-inch stroke cylinder mounted vertically lifting a 60 pound load sitting on top of 40 pounds of tooling — 100 pounds total. The cycle time breaks down as: 0.5 seconds lift, 0.2 seconds dwell, 0.5 seconds lower and another 1.0 second dwell before the next cycle. The valve is mounted 72 inches from the cylinder. Those are the "fixed" details; everything else is subject to proper sizing. The questions were: *What size cylinder? What size conductor (tubing or hose)? What operating pressure(s)?* And so forth.

The survey indicated that the existing design utilizes a Numatics MK15 valve, with a flow coefficient Cv=1.5, operating a two inch bore cylinder. The pressure is 60 psig extend and retract, and the conductor is 1/2 inch rubber hose. After Numasizing, we determined that the proper cylinder bore size (to conserve compressed air) is 1.75 inches operating at 64.7 psig extend and 0 psig retract. The optimal conductor is 5/16 inch O.D. nylon tubing. A smaller valve was also optimal — a Numatics 2005 series, flow coefficient Cv=0.5.

While the results showed that both scenarios satisfied the cycle time requirements, the Numasized arrangement predicted an annual consumption of $116 of compressed air, as compared to $209 for the original design — a 44% reduction in compressed air cost.

As compressed air is typically the highest utility expense in manufacturing facilities, reducing compressed air demand can generate a dramatic payback benefit. Numasizing can help by reducing the "artificial demand" present in most applications.

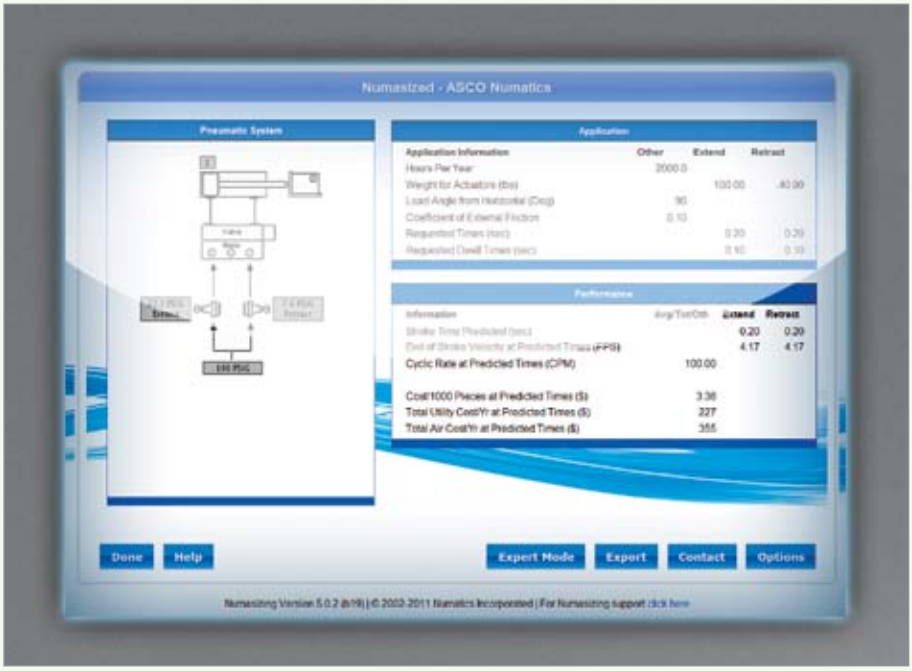


Figure 2 — Example of a Numasizing survey.

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THE PNEUMATIC SYSTEM ASSESSMENT |

Pneumatic Circuit Analysis for Energy Efficiency

In our observations, OEM circuit designs typically select products based solely on the end customer production demands, rarely considering component size or energy management. Depending on the objective (or objectives), conductor size will change. Fortunately, for every conductor length, there is one optimum conductor size that can be determined to maximize performance. If the objective is to minimize component sizes, the optimum conductor will likely be different than the optimum conductor for high productivity. The same can be stated if energy conservation is the goal.

Actuator sizing behaves similarly to those of conductors. At a given pressure, increasing bore size generates higher forces to move loads. Doing so, however, results in an increased volume that must be filled and evacuated. This could impede performance times. Operating actuators at different pressures based upon load direction could create significant savings. This is evidenced by one example that we have all witnessed many times over: A cylinder used in a vertical application where the same pressure is applied to both extend (raise) and retract (lower) the load. Although there could be one bore size that optimizes productivity, there's no rule of thumb for selecting bore sizes based on loads. In our recommendations, we rely on our own proprietary engineering tool — Numasizing® — to assist engineers in determining the optimum size.

More than 90% of factories around the world use compressed air. In a typical manufacturing plant, only about half of the compressed air generated is used productively. Undertaking the disciplined process of a pneumatic circuit analysis will return the best strategy for all departments within the plant, including Energy Management, Production, and Plant Engineering. BP

About the Author
Clint has been in the field of Fluid Power and employed by ASCO Numatics for over 30 years. During this tenure he has held positions in Manufacturing Engineering, Field Sales and Sales Management. Clint has worked with both OEM and end user customers providing recommendations to optimize equipment performance. Reach Clint Hodge, Pneumatic Specialist, ASCO Numatics by phone at 248-640-2225, or by email at clint.hodge@emerson.com. www.numatics.com

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THE BLOWER SYSTEM ASSESSMENT

DO Control System and Turbo Blowers Optimize Energy Use at a WWTF

By Jack Troidl, P.E., Woodard & Curran

Every municipality and utility is facing the reality of rising energy costs. In 2010, the Town of Billerica, MA, which is located 22 miles northwest of Boston with a population of just under 40,000 residents, engaged Process Energy Services and Woodard & Curran to conduct an energy evaluation of the Town's Wastewater Treatment Facility (WWTF) and pump station systems sponsored by National Grid. The objective of the evaluation was to provide an overview of each facility system to determine how electrical energy and natural gas were being used at the facility and to identify and develop potential cost-saving projects.

The evaluation recommended measures from upgrading thermostats to installing two new 100-horsepower blowers for the 5.4 MGD facility (ultimately 150-horsepower blowers were selected to improve operational flexibility). Building systems aside, these improvements would address the facility's two largest process electricity demands, the aeration system (55%) and plant water system (11%) (Shown in Figure 1). The Energy Conservation Measures (ECMs) were bundled into a single project and included high efficiency turbo blowers with a DO control system for the secondary aeration tanks, a post-aeration DO control system, and new Variable Frequency Drive (VFD)-operated plant water pumps. When including incentives from National Grid, this $591,000 construction project had an initial projected payback at less than 6.3 years. Ultimately, National Grid funded 28% of the construction work for this upgrade.

This article focuses solely on the turbo blowers and aeration control system portion of the project and how these improvements reduced energy consumption at the WWTF, provided substantial environmental benefits through the reduction of greenhouse gas emissions, enhanced treatment capabilities, and saved the Town money. The final equipment configuration with the upgrades is presented in Figure 2.

Letchworth Avenue Wastewater Treatment Facility

Location:	Town of Billerica, Massachusetts
Permitted Flow:	5.4 MGD (ADF)
Design Flow:	5.5 MGD (ADF); 16.5 MGD (PHF)
Average Daily Flow (ADF):	3.74 MGD
BOD Load:	2,642 lbs/day (average)
BOD Load:	4,171 lbs/day (max month)
BOD Load:	7,889 lbs/day (max day)
Existing Blowers:	(4) Two Speed PD 90/150 HP Blowers
New Blowers:	(2) 150 HP Turbo Blowers

Project Summary: Maintain two existing PD blowers for redundancy and install 2 new Turbo Blowers and DO Control Systems

Background and Preliminary Energy Use Evaluation

The Billerica WWTF was originally constructed in 1966 to treat a design flow of 0.8 million gallons per day (MGD). Upgrades were

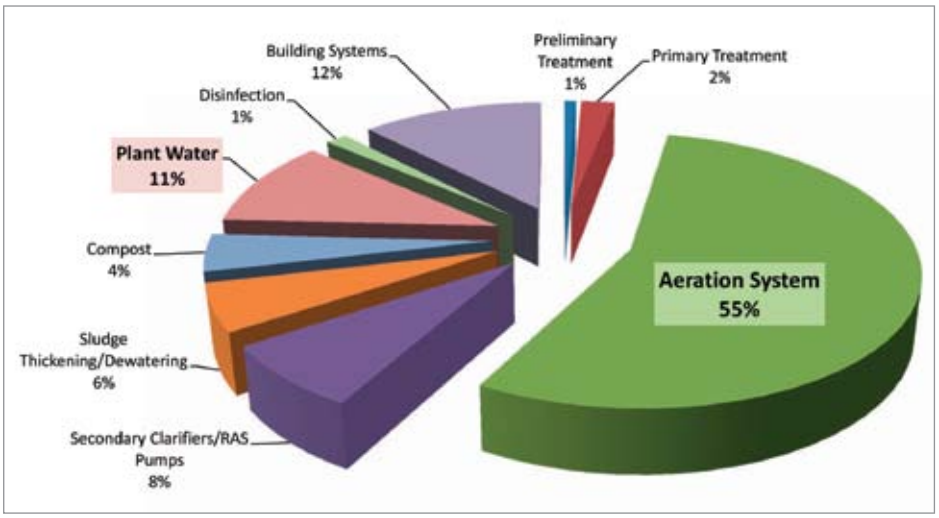

Figure 1: Annual WWTF Electricity Use Breakdown.

completed in 1975 and 1990, which increased the design capacity to 1.6 MGD and 5.5 MGD respectively. At the time of the evaluation in 2010, the Town provided wastewater services for approximately 75% of the community and anticipated to expand the system to service up to 90%.

Before any changes as a result of the study were implemented, the evaluation found that the WWTF staff had done an excellent job of operating the facility efficiently. Results from the EPA's Energy Star Portfolio Manager program for wastewater facilities showed a performance rating of 81. The national average was 50.

Prior to the improvements, aeration was provided by four, two-speed positive displacement blowers. This aeration system was the highest energy use operation at the facility, accounting for over 50% of the facility's energy use. Due to the energy use and blower reliability concerns, it was apparent that new blowers were in order as the existing positive displacement blowers dated back to 1987.

The WWTF's four tanks were equipped with ceramic diffusers that originally provided full floor coverage. Some diffusers, installed over 15 years ago as part of a complete aeration system upgrade that replaced surface mechanical aerators, had become clogged or had been removed. There were known leaks in the tank piping that certainly resulted in inefficiencies. As such, improvements to the blower and diffuser systems would be key factors to improving efficiency.

New Sensors, Turbo Blowers, and Efficiency Savings

Aeration system blowers installed more than 10 to 20 years ago typically have limited or no flow control capability. In fact, some systems blow off air when the demand is low. Billerica's system had utilized two-speed blowers to assist with matching demands. In 2009, the WWTF operated its blowers manually and set high enough to handle anticipated peak load. For example, after manual field DO measurements were taken on each tank, two blowers might be operated on low speed or one blower on high speed. At times this resulted in excessive DO values.

It was found that defunct DO sensors needed to be replaced with new low-maintenance Luminescent DO (LDO) probes. A cost-savings measure of installing 8 probes instead of 12 in zones A and C only of each train and calculating the DO in Zone B was employed with success (Figure 2). It was later determined that the average of the two zones was a good approximation of the middle zone B.

A new blower and control system would provide an increase in efficiency due to improved technology (attributed to turbo blowers) and real-time flow control (attributed to the turbo blower's VFD and the DO control systems). Based on Woodard & Curran's experiences, Billerica's WWTF is at the cusp of where Turbo Blower energy savings are able to provide a cost-effective project. At smaller facilities, the up to 20% increase in energy savings based on the improved technology can be outweighed by the cost increase of upgrading to a turbo blower. Most turbo blowers are package units containing the following key components: blower, motor, PLC/control system, blow-off

THE BLOWER SYSTEM ASSESSMENT | DO Control System and Turbo Blowers Optimize Energy Use at a WWTF

valve, harmonic filter, and a cooling system. A centrifugal or positive displacement blower is typically limited to a blower and motor and therefore can be obtained at a much lower cost. Still, it was clear that Billerica would save money over time with more efficient turbo blowers.

The majority of savings can be attributed to matching the blower output to the aeration demands of the system. The DO control system monitors DO levels in the process tanks and, via the SCADA system, adjusts blower output by adjusting the speed of the blower. The system distributes flow by opening or closing control valves on the air discharge pipes to the aeration tanks. In Billerica's case, four control valves were installed, one per each of three zone header pipes as well as the post-aeration tank. Air flow to the four trains of each zone is manually adjusted to evenly distribute air flow and is infrequently adjusted as needed. The post aeration tank typically does not require air for process demand and therefore can be turned off. However, Billerica frequently allows a small amount of air to be discharged to the post aeration tank to prevent any remaining solids from settling out in this tank.

An unexpected condition observed in distributing air flow to the process tanks was that the quantity/condition of aeration diffusers in each zone impacted the respective air flow. This was identified by observing the control valve position and resulting flow in each zone. Due to the limited throughput of the diffusers in zone C (the final zone), at higher air flow the diffusers controlled air flow and the valve position had little to no impact on adjusting flow. Fortunately, this is generally not a concern as most of the air is utilized in Zone A, significantly less in Zone B, and the least in Zone C, often on the order

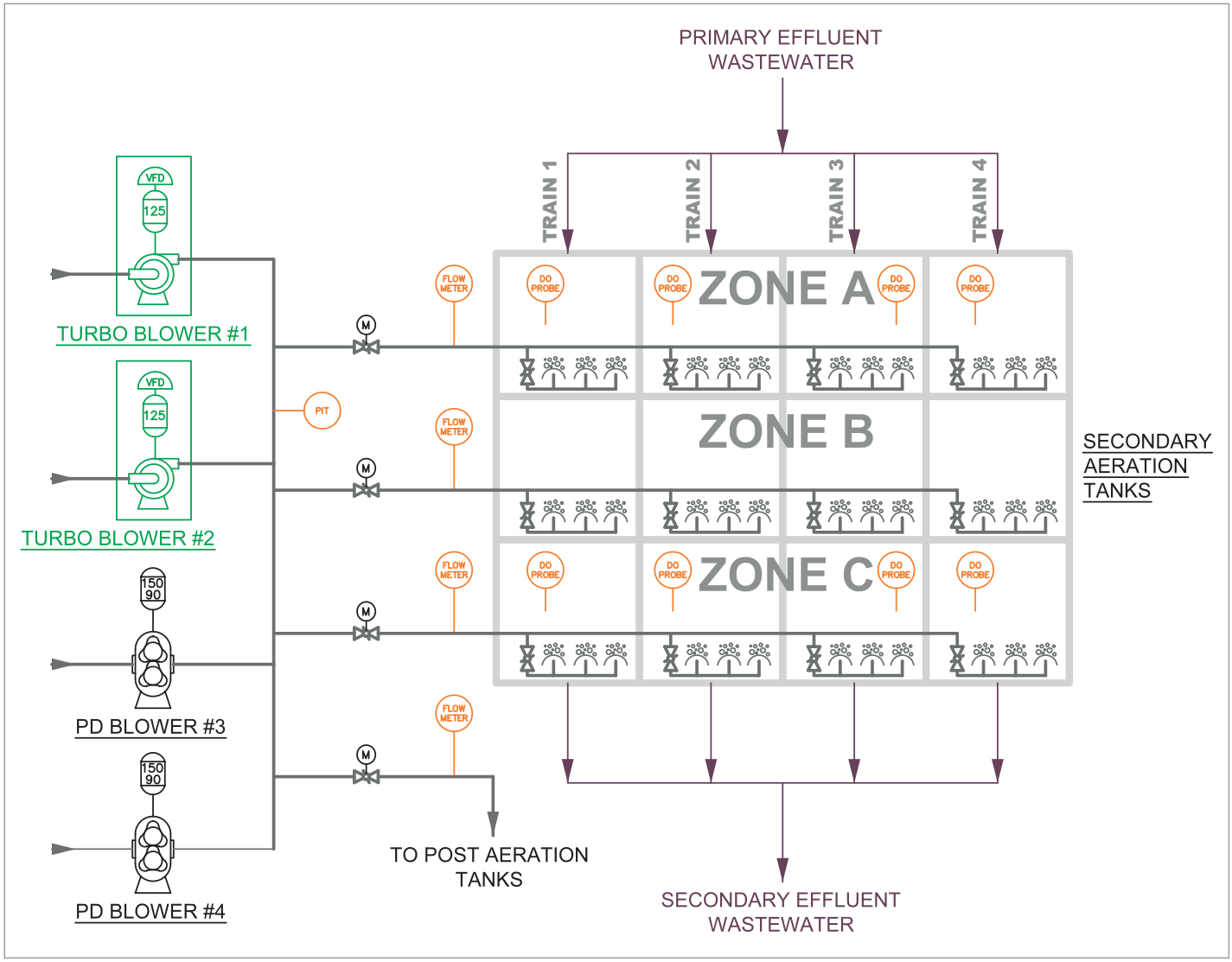

Figure 2: Process Schematic.

of magnitude of 2,200, 800, and 500 scfm respectively. Zones B and C require minimal process air to satisfy the oxygen demand, but they require aeration for mixing. Based on an EPA value of 0.12 SCFM/SF, each zone requires approximately 750 cfm for mixing purposes. Thus, Jeff Kalmes, the operator at the WWTF, is able to improve their energy savings by operating at a lower mixing air flow rate (periodically "goosing" a zone to flush out any solids that may have settled).

Construction

Construction began in late 2011 and was completed in the summer of 2012. Figure 4 presents both blowers installed during the construction phase. Construction included several site constraints, including: fitting the blowers through a 5'x5' opening in the ceiling and lowering them into the below-grade blower room, removing two of the existing blowers (which were discovered to be supported with welded rebar encased in concrete), and sequencing this work while maintaining existing plant operations. The contractor was able to successfully navigate these issues, which included dismantling the blowers to fit them through the ceiling opening. As with any construction project of this nature a period of troubleshooting and optimization was required to achieve reliable facility operation. Communication during this period is critical for a successful project. The manufacturer, Houston Services Incorporated (HSI), recently acquired by Atlas Copco, made a series of trips to the site throughout the construction period, each time making adjustments to the blowers and addressing concerns as they came up. Turbo blowers have become prevalent over the last five years, but it does need to be noted that this is still a newer technology and may take some effort to operate with optimal results.

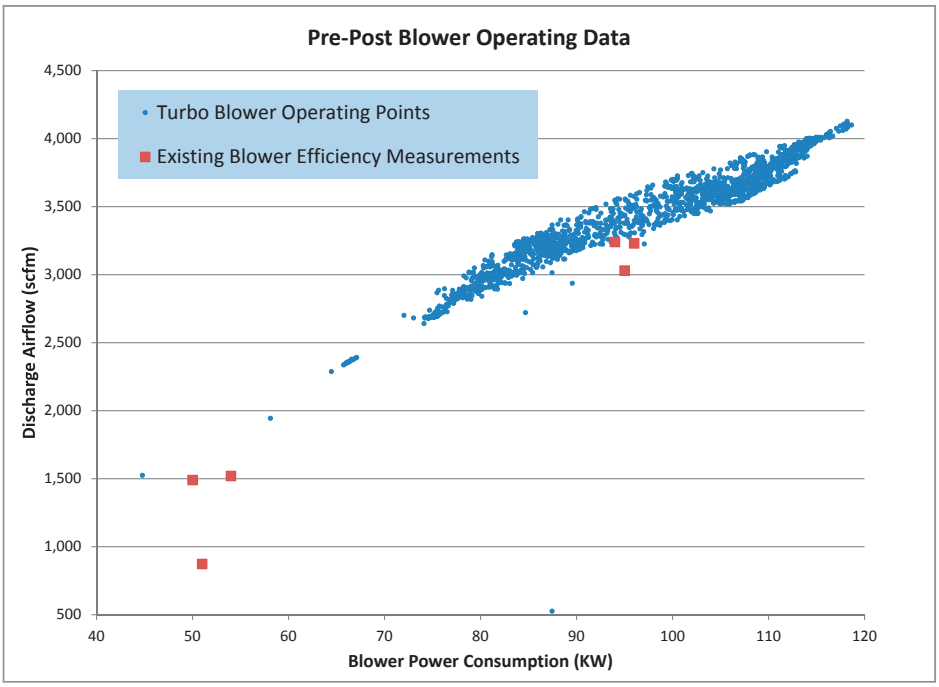

Figure 3: Pre vs. Post Blower Operating Data.

THE BLOWER SYSTEM ASSESSMENT | DO Control System and Turbo Blowers Optimize Energy Use at a WWTF

Woodard & Curran

Woodard & Curran was founded in 1979 by Frank Woodard, PhD, PE, and Al Curran, PE. An ideal team combining a passion for technical solutions and an intuitive sense of "the business of the business," Frank and Al built a firm that has grown to more than 700 employees at offices throughout the eastern U.S. and at plant facilities nationwide.

Woodard & Curran was founded with a simple business concept: if we provide an enjoyable place to work with opportunity, integrity, and commitment, we will attract talented people who thrive and excel at their work. It happened. At the heart of our company are talented people whose commitment and integrity drive results. Our clients experience this power every day in our actions, our solutions, and our promises kept.

The firm's growth over nearly three decades has been the result of responding to the needs of the marketplace. Beginning with challenges driven by Clean Water Act requirements, to the onset of CERCLA and RCRA, to the availability of funds to transform brownfield properties, to environmental health and safety regulations, and more recently, the focus on sustainable design and corporate responsibility, Woodard & Curran has anticipated needs and expanded our base of expertise accordingly. Whether helping clients meet demands mandated by regulations, or providing assistance rooted in greater control of their assets and budgets, we have grown to be responsive to our clients' needs.

Today the firm is led by CEO Doug McKeown and President Guy Vaillancourt.

Post Installation Comparison

The National Grid incentives required a post-installation inspection and two weeks of data collection to demonstrate the effectiveness of the installed ECMs. Since it has been about a year since installation, it's possible to review the annual electricity usage at the WWTF.

The Facility had undergone several significant upgrades over the last decade, which included discontinuing composting operations, replacing the belt filter press with a rotary press, and most recently the addition of the CoMag tertiary treatment process for phosphorus removal. These changes make it difficult to compare recent energy use figures with data prior to these improvements. In order to compare apples to apples, only the 2011 and 2012 data could be evaluated. The new turbo blowers became operational in February 2012, which allows the remaining 11 months of 2012 to be compared to the prior year. As presented in Figure 4, both years exhibit similar electricity use trends, but the 2012 data exhibits up to a 25% energy reduction with an average reduction of 20%. While a precise cost savings cannot be calculated because of the time of use billing employed at the facility, this

150 HP Turbo Blowers Installed.

project resulted in an approximate cost savings of $39,000 and a greenhouse gas emissions reduction of approximately 128 metric tons of carbon dioxide equivalent ($MtCO_2e$) annually.

Conclusions & Recommendations

The energy efficiency project was successful in meeting both process improvement and energy reductions. Furthermore, the environmental benefit of significantly reducing greenhouse gas emissions was achieved. Annual energy savings of $39,000 justified the cost of the improvements at the plant. These construction costs will be recouped in less than eight years in part due to the incentives from National Grid.

While a variety of startup issues were encountered, the turbo blowers have continued to run without interruption since the summer of 2012. The Town continues to optimize their control system and at times will "stress" their process systems to further develop their understanding of the treatment processes and how the system will respond. Jeff Kalmes indicates that an upcoming project to identify a replacement or cleaning strategy for the existing ceramic diffusers is currently under discussion. The current challenges would be taking a treatment train offline and emptying the tank for the inspection. Addressing the diffusers will be the final component of a successful project, which will provide an optimized aeration system at the Billerica WWTF while maximizing energy savings. BP

For more information contact Jack Troidl, P.E., Project Engineer, Woodard & Curran, tel:781-251-0200, email: jtroidl@woodardcurran.com, www.woodardcurran.com.

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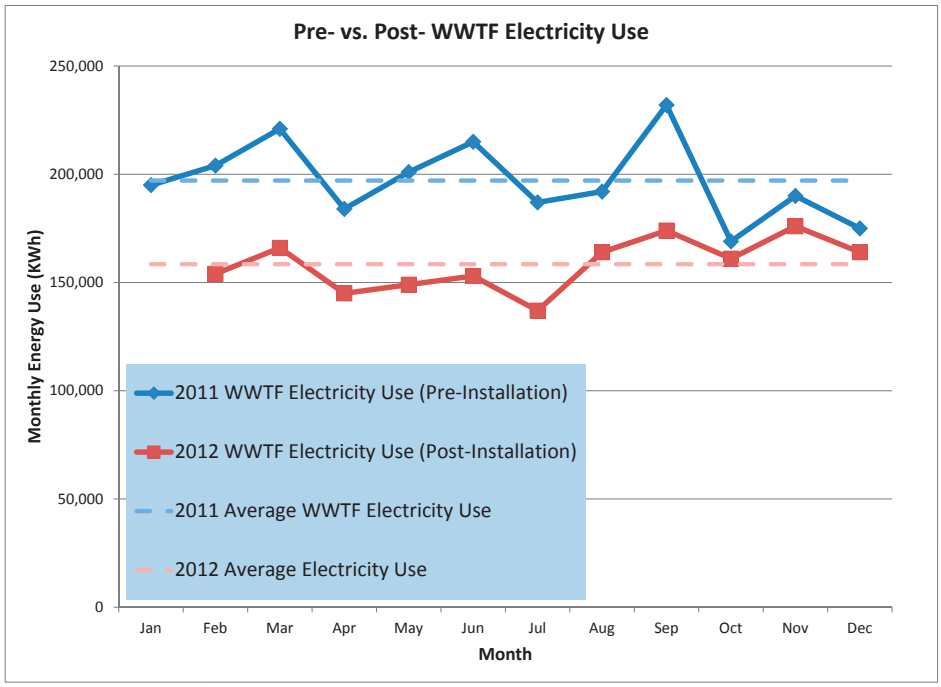


Figure 4: Pre- vs. Post- WWTF Electricity Use.

THE END-USE PROCESS SYSTEM ASSESSMENT

Blow Molding Equipment: Review and Process Steps to Minimize Energy Usage

By Donald Miller, Vice President, Technical Services, Plastic Technologies, Inc.

Stretch blow molding equipment requires a significant amount of energy — both compressed air and electrical — to produce bottles. Creating an effective and efficient process, as well as monitoring and maintaining optimal process settings, can result in significant energy cost reduction. These efforts will also help produce containers that meet all of the required quality standards.

Plastic Technologies, Inc., (PTI) Holland, Ohio, has more than 25 years experience in helping companies set up their own blow molding operations. Extensive working knowledge with a wide variety of equipment and production scenarios puts PTI in a perfect position to offer review and process guidelines to optimize operations.

To show how these objectives can be accomplished, we will break the process down into critical steps and discuss what analysis and action is required for each.

Review Package

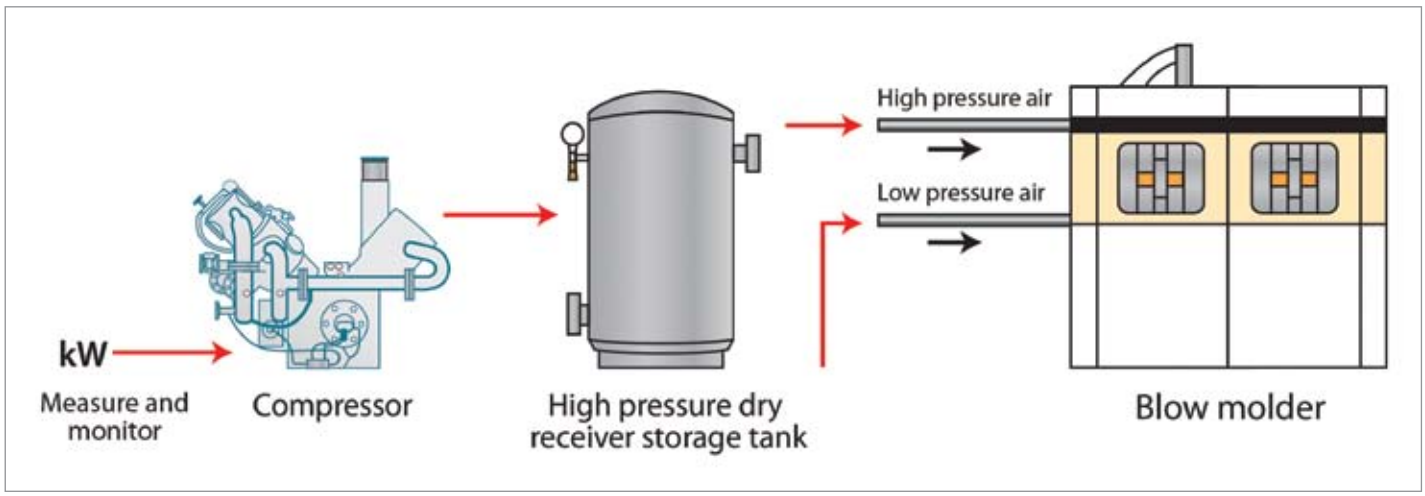
- Preform
- Bottle
- Relationships between the two
- Production platform

The first step is to review the container to understand the bottle/preform relationship — specifically how the two match up. That helps us understand how the machine should be setup and determine timing for the different process steps.

Next is a review of production platform. What are the machine's attributes, performance capabilities, etc.? What upgrades does it already have or what can be done to it to make it more efficient?

We also want to identify constraints that need to be considered. In addition to energy reduction objectives, what other blow molding issues exist including conditions specific to the customers' needs? Are bottles being made in a cost-effective manner?

At this point, we also want to look at quality records and performance data to help drive the changes that need to be made. Reviewing the bottles' desired performance attributes in conjunction with the machine capabilities is a key component.



Balancing the compressor loading to the air required reduces energy.

Identify Process Purpose

- New package
- Package quality
- Optimize process
- Optimize line efficiency

Next we want to look at package applications specifics. For example, what is the bottle's intended use? Is it for water, soft drinks, or another application which may require additional performance attributes. Answers to those questions will help identify which testing methodologies are needed. For example, a beer bottle would require barrier, material distribution and top load testing.

One of the objectives with optimizing the process is to create a process that is repeatable and sustainable. The machine needs to make "the same" bottle all the time, in an efficient manner. If possible, we also want to be able to use less heat, air pressure and electrical usage to reduce energy costs.

With more companies headed down the path of bottle self-manufacture, optimizing line efficiency is an important factor. In a typical self-manufacture production layout bottles are conveyed from the blow molder directly to the filler. Frequently, blow molder output speeds are set at maximum levels which contribute to energy waste. Typically, a different, slower production line operation will reduce the number of start and stops. This will also improve the overall quality because the entire line variation will be reduced. Doing so will contribute significantly to energy cost reduction.

Review Machine Conditions/Capabilities for Blowing Air

- Supply
- Quality of air

It's important to understand machine limitations and what needs to be addressed. Some modifications can be done immediately, while others will require more time. Modification objectives include improved part quality create a stable process and reduce the amount of energy required to produce bottles. The cost to make high-pressure air is three times greater than low pressure air. Blowing bottles with lower pressure equates to significant savings.

To that end, a review of the compressor room is required to ensure optimum compressed air efficiency is achieved. Key indicators for this area include scfm/kW, pressure, pressure drop and dew point. We need to make sure that there is an appropriate balance between the operation of the compressor room and the requirements of the blow molding area, as well as the balance of the plant.

Properly managing this area will minimize the chance that the operation will fall into a peak usage category which will have a dramatic effect on energy cost containment.

THE END-USE PROCESS SYSTEM ASSESSMENT | Blow Molding Equipment: Review and Process Steps to

Blowing Cycle Review

- Reference points for turning on turn on preblow/high blow
- Preblow delay
- Preblow time or start of high blow
- Air recover time
- Exhaust time

Next up is the blowing cycle review. There needs to be an understanding of when the two air stages (pre blow and high blow) are activated and the pressure required for both. Is the preblow coming on at the optimized time and does the high blow occur at the right time? Adjustments in this area contribute to better bottle quality and can reduce the amount of energy required to produce bottles.

The standard practice today is to recover the high pressure air at the end of the high blow cycle, instead of exhausting it, to help conserve energy. New machines have this option and aftermarket devices can be added to the blow molding machine for this purpose. The recovered air is used to create lower-pressure air used in other parts of the blow machine, produce preblow air and, in some cases, provide air to other parts of the plant. Ensuring these systems are working well is necessary to maintain the bottle quality and lower operation cost.

Oven Control Set Up Review

- Options review
  - Zones and lamps utilized during heating
  - Use of accelerated heat, and startup settings
  - Heat recover
- Oven control settings
  - Standby energy %
  - Heat recovery temp or %
  - Use and setting of ventilation hood
  - Oven ventilation %, condition and settings of the reflectors

At this stage of the process we look at the heat profile — particularly the quartz lamps used to heat the preform. You can turn lamps on or off, or alter the percent of power that is being applied. We look at all of usage aspects to make sure they are optimum.

The end game is to be able to put just the right amount of heat into the preform without overheating. Enough heat needs to be is added so that the force required to blow

Minimize Energy Usage

the bottle is reduced. Balancing all of these adjustments leads to minimizing the amount of energy and air pressure required to produce bottles.

Oven Lamp Configuration

- Identify the number of lamps required by preform for correct coverage
- Lamp position
- Oven reflective shields placement
- Cooling rail position

The actual set up of the oven will change the bottle performance and determine how efficiently the oven operates. A good continuous improvement program will include a reduction of wasted energy.

Process Development

- Identify or verify correct blowing points
- Optimum blowing times
- Optimum blowing pressures
- Optimum lamp configuration
- Optimum ventilation
- Identify needs for heat recovery
- Identify material heating requirements
- Establish a stable process by adjusting the start up requirements and those required to maintain stable performance.

Once all of the previously identified reviews have been made, the next step is to establish the process parameters in each of these areas.

Package Performance Verification

- In plant testing
  - Visual
  - Heights
  - Volumes
  - Material distribution checks
  - Top load test — if available
  - Burst test or expansion testing — if available

Refining these settings over the course of long runs will lead to an optimized process that will meet all of the objectives listed above.

Regarding testing specifics, the package type will determine what performance attributes

THE END-USE PROCESS SYSTEM ASSESSMENT | Blow Molding Equipment: Review and Process Steps to

need to be evaluated. Some tests can be performed onsite, while others require more extensive analysis. In addition to the tests listed above, PTI can offer:

- Thermal stability testing
- Stress crack testing
- Shelf live testing
- Others based on package requirements

If for some reason bottles don't meet performance parameters, going back to the design group for structural modification is usually advised. We continue to look for changes that can be made to optimize the preform and bottle through the manufacturing process.

Another tool that PTI can provide is a LeakMonitor™ device which is an online ultrasonic leak detector. Its main purpose is to reject bottles with holes, but it is also used to listen to the individual blow station to detect differences caused by air leaks.

The U.S. Department of Energy's Office of Industrial Technologies states: "The best way to detect leaks is to use an ultrasonic acoustic detector, which can recognize high-frequency hissing sounds associated with air leaks." The leak detector reports the noise level for each station which leads to improved machine maintenance and the reduction of costly air leaks.

With that as a good overview of the process, we'd also like to provide a couple of case history examples of real-life scenarios.

Case History #1

The customer was experiencing a considerable swing in quality between bottles made during startup and those made during a continuous run. This resulted in numerous starts and stops due to line jams and poor label application which significantly impacted line efficiencies. This problem was intensified due to fluctuations between bottles, and because the preform temperature was not constant. This poor heat control at the start of production affected how the preform blew into a bottle, resulting in material distribution variations.

The amount of heat applied before blowing the bottle was adjusted as were the start-up oven settings. Additional adjustments included lamp placement, oven height and opening. The conditions for other process settings were also optimized.

This resulted in an improvement in overall bottle quality and consistency. These changes also contributed to a significant reduction in

Oven lamp position is important to heat the preform correctly.

Minimize Energy Usage

energy usage as well as an improvement in overall line efficiencies.

The "immediate electrical consumption" during startup had been 230kW and was reduced to 88kW. The electrical consumption during a steady run state dropped to 88kW from 115kW. This large differential between startup and running kW not only caused the bottle quality to vary greatly during the run, but increased the energy operating costs and contributed to line inefficiencies.

Case History #2

A new process for was created for an existing bottle with the intent of optimizing the setting and improving quality.

Original setting required 65 lamps to be used and more air pressure to blow the bottle.

After the improvements were made two fewer 3000w lamps and seven fewer 2500w lamps were required. The air pressure used to blow the bottle was lowered to 28 bar compared to 32 bar. This changed the watt hours per bottle to 2.87 compared to 3.60. At the same time the performance of the bottle improved. The top load increased by 10 pounds, the burst pressure increased by 15psi and the expansion percentage was reduced by 5 1/2%.

This resulted in energy savings of $17,000 per year and an improved overall package quality. BP

About Plastic Technologies
Plastic Technologies, Inc. (PTI) is recognized worldwide as the preferred source for preform and package design, package development, rapid prototyping, pre-production prototyping, and material evaluation engineering for the plastic packaging industry. For more info: www.plastictechnologies.com.

To read more ***System Assessment*** articles, visit www.airbestpractices.com/system-assessments

PTI's LeakMonitor® uses an ultrasonic sensor to continuously monitor the blow molding process for air leaks.

AN UPDATE ON CAGI INITIATIVES

Compressed Air Best Practices® Magazine interviewed Rick Stasyshan, Technical Consultant, of the Compressed Air & Gas Institute

CAGI® Compressed Air & Gas Institute
www.cagi.org

➤ Compressed air is viewed as industry's fourth utility. Compressed air is frequently the only means of effectively, consistently, efficiently and safely powering certain machinery and processes. It enables users to perform critical work to manufacture, build and process the products we use every day. The world cannot function without compressed air. CABP recently caught up with Rick Stasyshan, the Compressed Air and Gas Institute's recently appointed Technical Consultant, to shed some light on CAGI's activities and industry involvement.

CABP: Good morning! Congratulations on assuming this newly created position at CAGI. Could you please describe your role?

Rick Stasyshan: The Compressed Air & Gas Institute Board of Directors created this position to assist them in fulfilling their mission by providing technical and marketing leadership to the CAGI Membership. Since my entire career was dedicated and focused on applying compressed air products and my involvement with CAGI in various positions, they asked me to accept this exciting position.

CABP: Perhaps you can review for our readers, exactly who CAGI is and what their mission is?

RWS: The Compressed Air and Gas Institute (CAGI) is a trade association with a long history of service to the manufacturers and users of compressed air. One of the nation's oldest trade associations — CAGI was formed in 1915. As it approaches its 100th anniversary, the members of CAGI are working diligently and aggressively to meet the ever-changing requirements of its served customer base.

As you would expect of any centenarian, CAGI has experienced many changes over its lifetime, but the institute and its members have never lost their focus on serving the industry and the users of compressed air. As a result of this focus, CAGI's efforts have assured that the organization remains the united voice of the compressed air industry, serving as the unbiased authority on technical, educational, promotional, and other matters that affect the compressed air and gas markets. Basically, with the combined expertise of our members, we are simplifying Compressed Air Decisions for our audience.

CABP: How does CAGI attack and fulfill that mission?

RWS: Let me start with a brief overview of CAGI and how its current activities provide the foundation for understanding the institute's exciting forward-looking strategic direction.

CAGI MEMBER COMPANIES:

Aircel · ALMiG since 1923 · APEX Tool Group · APG Neuros · Atlas Copco · BEKO · BOGE Compressed Air Systems · CAMERON · Chicago Pneumatic · Donaldson Filtration Solutions · DV Systems · Florida Pneumatic · CURTIS · ELLIOTT · Gardner Denver · GE Energy · Ingersoll Rand · KAESER COMPRESSORS Built for a lifetime.

CAGI fulfills its mission through the following key objectives:

- To promote cooperation among its members for the improved production, proper use and increased distribution of air and gas compressors and related equipment.
- To develop and publish standards and engineering data for air and gas compressors and related equipment.
- To increase the use of compressed air, to promote its safe use, and to improve the quality and efficiency of compressed air systems.
- To collect and distribute information of value to CAGI members and to the general public.
- To engage in cooperative educational and research activities.
- To cooperate with governmental departments and agencies and other bodies in matters affecting the industry.

CABP: How is CAGI structured and organized to function and work?

RWS: Many of the Compressed Air and Gas Institute's activities are carried out in several sections, which are categorized by product scope. Individual member companies may affiliate with one or more of these sections, depending upon their product lines.

Current active sections are Air Drying and Filtration, Blower, Centrifugal Compressor, Pneumatic Tool, Rotary Positive Compressor, Reciprocating Compressor, and System Assessment.

In addition, CAGI uses standing committees to carry out important work of the Institute. These committees, including the Educational and Promotional/Marketing Committee and the Standards Committee, carryout much of the important work of the Institute by addressing topics of broad concern to the industry.

CABP: Now you have whetted our appetites! With our reader's focus on improving the energy efficiency of their compressed air systems, can you elaborate a little more on the System Assessment Section? And could you give us an understanding as how you might interface with the Compressed Air Challenge?

RWS: Of course, it seems every interview and discussion in this industry quickly reveals that energy consumption and energy efficiency of compressed air systems will be the motivating driving force of any future strategy and committee work at CAGI. The beauty of CAGI is that its member companies understand and embrace the efficient and safe use of compressed air; therefore, the System Assessment Section is working across all the CAGI sections and standing committees to make sure of our involvement.

The System Assessment Section works to enhance the energy efficiency and performance of compressed air systems. CAGI is a founding sponsor of the Compressed Air Challenge (CAC) and a Department of Energy Allied Partner. The CAC, as your readers are aware, is a public/private initiative fostered by the Department of Energy to serve as a resource to help industry achieve energy savings and to increase the effectiveness of compressed air systems.

The System Assessment Section oversees CAGI's efforts to improve compressed air system effectiveness and efficiency and guides the

AN UPDATE ON CAGI INITIATIVES

institute's cooperative activities with DOE and CAC. These activities include development and organization of compressed air system training programs, production and distribution of educational materials, etc. to benefit compressed air system users.

CABP: It would seem that Education is key to assist the stakeholders in compressed air, whether it be the end users, distributors, system assessors or the manufacturers, in understanding how to safely and efficiently use their compressed air systems. How does CAGI help your audiences in this area?

RWS: The Educational and Promotional/ Marketing Committee coordinates with the individual product sections the preparation of literature and videos that provide the industry and public with information about the compressed air and gas industry. These materials help to stimulate the new and existing markets for member companies' products by communicating the capabilities and benefits of air and gas compressors, blowers, dryers and pneumatic tools. Among the responsibilities of the committee is the frequent review and updating of the Institute library of technical literature, including the industry's reference manual, the Compressed Air and Gas Handbook. This committee keeps the website up to date (www.cagi.org) and coordinates the update to CAGI's eLearning modules — the CAGI SmartSite.

CABP: Can you elaborate a little more on the CAGI SmartSite?

RWS: Of course, the CAGI SmartSite was a collaborative effort of our member companies that contributed to provide an on-line compressed air training tool. The SmartSite is targeted to multiple audiences that includes but is not limited to compressed air users, distributor support teams and the member company employees. The SmartSite is an introduction to the compressed air markets, applications and understanding how the basic elements of a compressed air system work together. It is a great starting tool to understand compressed air, industry's 4th utility.

The Introduction to Compressed Air Systems offers 8 modules that provide information on the various aspects of compressed air systems:

- Compressed Air Basics
- Types of Compressors
- Capacity Controls
- Distribution Systems
- Controlling Wastes
- Air Treatment
- Compressor Installation & Air System Maintenance
- Integrally Geared Centrifugal Compressors

CABP: What benefits does this training provide?

RWS: The benefits are numerous. First and foremost, it provides a foundation for users to better understand how to maximize their air system efficiency. They will quickly learn about the dos and don'ts of compressed air systems. Highlighted is the importance of maintenance tips to maximize the economic returns and reliability of the system. I should also highlight that it also allows the participant to review and progress through the various modules at a pace that accommodates today's busy individual schedules. The on-line training is available 24/7 and participants can choose to attend sessions at home or at the office and at your own pace. Finally registration allows for a full year access to use as a refresher or resource.

CABP: As CABP visits our reader's facilities; frequently we hear references to the various standards and regulatory organizations impacting the manufacture and use of compressed air systems. How is CAGI involved and influencing these activities?

RWS: Standards assure users of receiving equipment and components that are safe, efficient, and uniform throughout the world. The Standards Committee's objective is to coordinate the development of standards in each section and to participate in the review and publishing process. This process ensures that as products in CAGI's purview enter the market they are tested and perform to established uniform minimum levels for user satisfaction and protection. CAGI maintains close liaison with other bodies concerned with standards, including ISO, PNEUROP in Europe and ANSI, ASME and other industry groups in the United States.

CABP: CABP magazine has learned that CAGI has been applauded for your work in developing CAGI Performance Data Sheets and then embarked on a third party verification of these documents. Can you provide our readers with some more details?

RWS: This recognition excites us at CAGI, because it shows how the Product Sections, their engineering committees, Standards Committee and the System Assessment worked together to provide a total program to assist our user base and demonstrates fulfillment of our mission.

As a result of our market activities, including the Compressed Air Challenge involvement, CAGI's Air Drying and Filtration Section and the Rotary Positive Compressor Section focused on providing a fair and equitable comparison of the specific power package performance of these products — the ability to quickly compare "an apple-to-apple".

For displacement type compressors, including rotary screw compressors, ISO 1217 is the recognized performance standard, but it is too complex for performance testing in volume production. CAGI and PNEUROP developed Simplified Test Codes, which have been incorporated as appendices to ISO 1217. CAGI members agreed that published performance of their products would be based upon the Simplified Test Codes and data sheets were developed to provide a standardized method of presenting the performance data. The compressor data sheets allow a common basis for comparison of some relevant items.

The members then took an additional and unprecedented major strategic step forward and initiated a Third Party Verification Program to verify product performance.

CABP: Third Party verification? This seems like a bold step, how exactly does this program work and what if a manufacturer is not a member of CAGI?

RWS: Great points. Let me start by explaining the program.

Several times a year, the program administrator will randomly select and test samples of equipment to verify that they meet the manufacturers' published performance ratings.

The program verifies the information that participating manufacturers publish on the standard CAGI Data Sheets, which are also published on the participants' websites and in their product literature. The data sheets define operational and performance information used during the specification and application decision-making process.

Participation is voluntary and is open to all manufacturers, whether they are a CAGI member or not. The current program covers rotary compressors from 5-200 HP, and stand-alone refrigerated compressed air dryers from 200-1000 SCFM.

Participating manufacturers and the results of the verification tests are posted on the CAGI website. Participating manufacturers that pass the verification program test procedures are allowed to utilize the CAGI Program Verification label on the models' specification sheets and product literature. This is the Participant's public representation that their stated airflow capacities and efficiencies have been verified by an independent laboratory.

CAGI members are providing users with a neutral means of comparison to select the most efficient equipment to meet their production needs.

CABP: Thanks for this insight and overview. I am sure that we can expect future inputs from CAGI as the Institute continues its strategic activities forward. For more detailed information about CAGI, its members, compressed air applications or answers to any of your compressed air questions, please contact the Compressed Air and Gas Institute. CAGI educational resources include e-learning coursework on the SmartSite, selection guides, videos and the Compressed Air & Gas Handbook. BP

For more information, contact the Compressed Air & Gas Institute, tel: 216-241-7333, email: cagi@cagi.org, www.cagi.org

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The 2013 HANNOVER MESSE REPORT

By Rod Smith, Compressed Air Best Practices® Magazine

HANNOVER MESSE

Hannover Messe 2013 attracted 225,000 visitors — matching the strong performance of the 2011 event. One in every four visitors came from abroad, making it the definition of an international trade fair. This year's Hannover Messe featured 6,550 exhibitors from 62 nations, the strongest showing in the past ten years. This year, Russia was featured as the show's official Partner Country. German Chancellor Angela Merkel and Russian President Vladimir Putin opened the show at a function attended by more than 3,000 invited guests. The Messe ran from April 7 to April 12.

Frank Mueller, from Kaeser Compressors, next to the new Secotec cycling refrigerated dryer — one of five technologies nominated for a Hermes Award at the Hannover Messe.

The keynote theme of the Hannover Messe was "integrated industry." Exhibitors demonstrated the power of integration as the key to greater cost-effectiveness, product quality and sustainability. Many experts agreed that integrated approaches to manufacturing are going to have a sweeping impact on global industry over the next 10 to 15 years, and beyond. I read an example of this at a german factory that was designed without a dedicated natural gas heating system. All heating needs were anticipated and designed to use expected "waste-heat" sources such as the lubrication oil in the rotary screw air compressors. This "integrated industry" concept is truly a next-step in factory design.

I spent four full days walking the COMVAC (Compressed Air & Vacuum) Halle and was very impressed by the innovations in compressed air system technologies. It is clear our sector is investing in true product

Koen Lauwers displays the new space and energy-saving variable speed drive GA30VSD+ featuring a new oil-cooled, permanent-magnet motor patented by Atlas Copco.

Ayhan Dalgakiran, Adnan Dalgakiran and Yakup Tufekci (left to right), from Dalgakiran Compressors, next to their VSD air compressor.

Innovations Everywhere in the COMVAC Halle

enhancements. The goal of this article is to highlight new technologies that caught my eye.

New Variable Speed Compressors and Monitoring Technologies

The new Kaeser BSD Line of frequency controlled rotary screw air compressors feature a 6% improvement in energy efficiency and a 20% improvement in FAD (free air delivery). The compressors feature a new airend profile, an IE4 motor, reduced compression losses and a new ETM thermal management system. This ETM system controls oil temperature in the cooling system to improve efficiency.

A significant product introduction, at Kaeser, is the new Sigma Air Manager 2. This advanced master controller (for multiple air compressors) uses advanced software programs based upon P&I drawings. This visual organization allows end users to then monitor and operate (with separate log-in authorizations) the air compressors. The SAM2 can operate as a data logger for multiple air compressors, a dewpoint monitor after the dryers, and any other function in a compressed air system to be monitored. The system also uses the new visual green/yellow/red "street light" system designed to simplify monitoring for end users.

Kaeser also introduced a new Secotec cycling dryer featuring an innovative PCM phase-change thermal mass material allowing for a fifty percent reduction in weight and size. The 17 m^3/min to 34 m^3/min models, using R-134a, will be launched by the first quarter of 2014.

Scott Woodward, from BOGE Compressors, shows the new Bluekat screw compressor offering TUV-Certified Class Zero oil-free air with an integrated catalytic converter.

Giulio Contaldi, Silvia Contaldi, and Jay Hedges (left to right), from Mattei Compressors, with the world premiere of the new BLADE belt-driven rotary vane air compressor.

Stephan Brand, from Aerzen, in front of the new water-injected, VFD, oil-free rotary screw air compressor.

THE 2013 HANNOVER MESSE REPORT

Nitin Shanbhag, from Hitachi Compressors, with the new DSP NEXT Generation of single-stage oil-free rotary screw compressors.

Jan de Bie, from JORC, displays the new compact Puro-CT oil-water separator line featuring injection-molded housings.

Kaeser also introduced a new line of proprietary compressed air filters featuring pleated elements with patented end caps, a depressurization vent and zero air-loss drains with a "street-light" filter change-out indicator. The filters (models 1 to 14 m^3/min) are launching in August while the larger models will launch in August of 2014.

Atlas Copco celebrated its 140th Anniversary by introducing a new range of variable speed drive air compressors. The new GA VSD Plus Series features a new IP67 permanent-magnet motor patented by Atlas Copco and designed in-house specifically for the VSD air compressor application. This compact IE-4 rated motor is oil-cooled (instead of the traditional air-cooled design) allowing for the elimination of air-cooled components like a motor fan. Combined with a newly designed airend element, the new design features a significantly smaller unit footprint, lower noise levels, and an average 15% reduction in energy consumption. A 50 kW unit was displayed, in a restricted-access room inside the booth, and I was amazed by how small the unit was. Strikingly, the unit consumes less energy at full load than fixed speed units — allowing the GA VSD Plus to claim energy savings capabilities (vs. fixed speed) in 20-100% load profiles. The company is introducing 10-20 hp units as we go to press and plans to launch 25-50 horsepower models after the summer.

A new range of Atlas Copco GA 160 to GA315 (kW) oil-injected screw compressors was also introduced at the show. New airend elements and single-stage designs (replacing the prior two-stage design 200 kW and up) provide 10% improvements in free air delivery and up to 7% efficiency increases over prior models. A new "angled" air-cooler

Paolo Nardi, from Teseo, announced an industry-first 20-year warranty for their new AP Series aluminum piping system.

Augusto Ferri and Valentina Sardi, from Aircom, displayed their aluminum compressed air piping systems

also allows for higher maximum ambient temperatures to 46 ˚C (115 ˚F) — up from 40 ˚C (104 ˚F).

Atlas Copco also announced that all rotary screw air compressor models (30 kW and above) will now begin shipping with a new SmartLink monitoring capability. Offering three web-based monitoring levels, the first is a no-cost service aimed at service monitoring. The second and third levels will provide full uptime and energy monitoring capabilities for a monthly fee. I was excited by this step to make data-logging of air compressors a standard feature. This can make supply-side system assessments easier to get done and more accurate (since users won't have to rely on a one-week data-logging snapshot).

A growing company, that caught my eye, is Dalgakiran Compressors. The leading manufacturer in Turkey, the company had a huge booth and told me they were growing their export business significantly. The company manufactures a full line of fixed-speed and variable speed drive air compressors.

New Turbo and Rotary Vane Air Compressors

Mattei Compressors introduced the new BLADE series of belt-driven rotary vane air compressors. This line will complement the direct-drive ERC Series and run at 1200 rpm using over-sized bearings, double-belts on some models, and standard motors. Mattei claims the design will be 30% more efficient and provide 30% more FAD (free air delivery) than comparable rotary screw models. The first 4 kW, 5 kW, and 7 kW units were introduced at the show and the plan is to introduce up to 30 kW models by year-end 2013.

Tamturbo introduced a new turbo air compressor with no gearbox. The company is looking for global partners for the 50-250 kW range of two and three-stage centrifugal models. The units run at less than 60,000 rpm and use magnetic or mechanical bearings.

New Oil-Free Compressed Air Systems

Aerzen continues to innovate new airends. The company introduced a new single-stage oil-free screw compressor range delivering 160 to 880 cfm. Intake air is taken from outside the canopy and a new closed-loop oil mist system featuring a vacuum generator has been added. Featuring a new IE3 motor and new proprietary silencers the units improve efficiencies by 6% over the prior design. Aerzen also introduced their new "biggest" airend for the Delta Hybrid Blower, designed for 2 bar (22-30 psig) applications. The new D1525 airend is designed for 5,364 cfm at 22 psig.

Aerzen also introduced their new VMW Series of water-injected, VFD, oil-free, 13 bar (191 psig), rotary screw air compressors. The design uses stainless steel rotors in bronze-casted airend housings. After the initial water-charge, the units continually refresh the water in the closed loop cooling system by taking condensate from the integrated refrigerated air dryer. The cooling water is purified by a water filter and an in-line anode filter (a type of corrosion filter).

Boge Compressors displayed the new BLUEKAT screw compressor that provides oil-free air. Available in 40 hp and 50 hp models, the design uses an integrated catalytic converter able to remove hydrocarbons from the compressed air stream — no matter what

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Heiko Fleischhacker, from Festo, described multiple successful demand-side system assessments focusing on pneumatics.

Volkan Ayhan, from Mikropor, next to the new MK Series refrigerated dryer.

the quality of intake air is. The units carry TUV Certification for ISO 8573.1 Class Zero air quality.

Boge has begun a significant new chapter in their history as they now manufacture their own airends, for compressor models up to 150 hp, at a new factory in Grossenheim, Germany. They expect to be manufacturing up to 480 hp in 2014. Also on display at the Boge booth was a full range of direct-drive, oil-free air compressors with models from 60 to 480 horsepower. Models from 60 to 125 hp are air-cooled while the larger units are water-cooled.

Hitachi America displayed their scroll compressors and the new DSP *NEXT* Generation of single-stage 100 psig, oil-free rotary screw compressors. The product line has new airends for 3-8% greater energy efficiency and a patented oil mist recovery system preventing gear-case oil mists from being vented to atmosphere.

Innovations in Compressed Air Treatment, Piping and Pneumatics

Jorc continues to build upon their niche of focusing exclusively on condensate management products. They introduced a new line of oil water separators called the Puro-CT featuring injection-molded housings and in-house treated polypropylene fibers — all which have allowed for a smaller and more cost-effective product. The company also announced that the Sepremium line of oil-water separators has received the "Bauartzulassung Gepruft" Certification in Germany. Lastly they also announced a new 750 psi zero air-loss condensate drain called the Smart Guard Ultra.

Tilo Fruth, from BEKO, showing the new Metpoint® MMA monitoring system for breathing air and medical systems.

Pascal Van Puten, from VP Instruments, shows the new VPFlowScope in-line flow meter.

Teseo introduced their new AP Series aluminum piping that is 20% lighter than the prior line. The new design is an upgrade for robustness as the actual pipe wall was thickened. To support the new product line, the company announced a new 20-year warranty and added a 2 ¾" pipe diameter size.

I had an interesting and encouraging conversation with Festo. They are beginning to really see traction, in Germany, with their energy efficiency services where they optimize pneumatic components on machinery, reduce pressure losses and eliminate leaks in compressed air systems. Pneumatics experts have a unique competency in their ability to reduce the pressure requirements of a system.

Mikropor introduced a new line of direct expansion and cycling refrigerated air dryers. I was impressed by the attention to detail in the dryer designs. The non-cycling dryer line offers optional integrated prefilters and afterfilters. They have 122 ˚F (50 ˚C) ambient and 140 ˚F (60 ˚C) inlet temperature ratings.

Innovations in Compressed Air Instrumentation

BEKO has introduced new instrumentation products including a new Metpoint® DPM dewpoint meter and a Metpoint® PRM pressure sensor. They are manufacturing both products themselves. In an effort to help end users gain visibility to what is happening in their compressed air lines, they have also introduced a range of new monitors and data loggers. The new Metpoint® UD01 is a single-point display able to monitor the measured values of different sensors. The Metpoint® BDL is a data logger able to collect data from up to 12 locations in the plant. Lastly, the company has introduced the Metpoint® MMA master data logger and monitor designed for medical air and breathing systems. All pharmacopia requirements can be measured and monitored including residual oil content, water vapor, carbon monoxide, carbon dioxide, sulfur dioxide, and nitrogen monoxide and dioxide. The system also auto-calibrates the sensors in a 24-hour cycle.

VP Instruments has introduced a new flow meter for ½", 1", and 2" pipe sizes. The VPFlowScope in-line measures mass flow, temperature and pressure in a compressed air system. The unit also has a built-in two-million point data logger.

There were a number of brands of ultrasonic leak-detection guns. One technology that jumped out at me is manufactured by Leakshooter — a French company. I liked how it allows users to take photos of the leak and provides a visual targeting system similar to what one sees with infrared technologies.

Conclusion

I'm already looking forward to the 2015 Edition of the Hannover Messe. The compressed air industry never fails to impress me with the innovations and the progressive thinking. The integrated factory will surely be one step closer to reality at the next Messe. Hope to see you there. BP

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

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Compressed Air Best Practices® is a technical magazine dedicated to discovering **Energy Savings** in compressed air systems. Each edition outlines **Best Practice System Assessments** for industrial compressed air users — particularly those **managing energy costs in multi-factory companies.**

"Retrofitting the 8 case packing machines with 3-position valves reduced our idle cfm from 80 to 15 cfm – on each case packer. With the right air compressor controls allowing the electric motors to turn down, the annual energy savings from one case packer paid for the whole project."

– Gregory Rhames, Asset Reliability Manager/Site Energy Manager, Verallia Glass, Jan/Feb 2012 Edition of Compressed Air Best Practices®

"Demand Side" and "Supply Side" information on compressed air technologies and system assessments is delivered to readers to help them save energy. For this reason, we feature Best Practice articles on when/how to correctly apply **air compressor, air treatment, measurement and control, pneumatic, blower and vacuum technology.**

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RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Tamturbo Introduces a Next-Generation Oil-Free Air Turbo Compressor

Direct drive from high-speed motor to turbo impeller means significantly fewer parts in mechanical contact, i.e. less energy loss and less wear compared to conventional ways of producing oil-free air. It also means that energy efficiency does not deteriorate over the life cycle of the compressor. Furthermore, simplicity means less need for maintenance. All these together result in remarkable savings in the life cycle costs of the compressor.

The environmental benefits of producing oil-free air with a high-speed turbo compressor are clear. In addition to energy savings there is, for example, no need to change oil filters and throw them into the waste bin. Lastly, Tamturbo has developed and patented a new capacity control method that extends the efficient control range of turbo compressor by dozens of percentage points, which again translates into lower electricity bills.

Timo Pulkki, head of sales at Tamturbo, is confident that their release is going to be a milestone in the development of compressed air technology. "It will be fun to rock the boat a little," he admits. "The more we discuss with the leading compressor manufacturers around the world about licensing our technology, the more we get the feeling that we have the right product at the right time."

Negotiations are currently underway with many major compressor manufacturers, but Timo is inviting others to join in. "The biggest technological change for decades is on in the industry. The world's leading compressor manufacturers have already launched, or are developing, their first products with similar technologies, so this is definitely something you don't want to miss," he says. "Tamturbo technology simply gives you the competitive edge."

It's fair to say that not many people in this world know more about high-speed technology and turbo compressors than the managing director of Tamturbo, Jaakko Säiläkivi. He is also very pleased with the technological advances they have achieved. "We have managed to root out most of the drawbacks previously associated with turbo compressors," states Jaakko. "Our bearing solutions guarantee a long life, the new capacity control is unprecedented, and we have several other patents pending on the details of improving turbo compressor efficiency and capacity control."

Tamturbo is going to offer its new products both as a Tamturbo-branded compressor directly for end users in Scandinavia, and also as an OEM package together with a license for the technology for other compressor manufacturers worldwide. In the business field, cooperation between major corporations and smaller technology suppliers is standard. "We cannot conquer the world alone," says Jaakko Säiläkivi. "Thus, we need strong partners globally to license our technology."

www.tamturbo.fi

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Cam Replacement of Crankshaft Offers Advantages for Reciprocating Compressors

A new rotary to linear transfer mechanism has the potential to bring numerous advantages to reciprocating piston compressors. Benefits arise from the substitution of a multi-lobe cam and yoke/follower assembly as replacement for the traditional crankshaft. The mechanism, patented by Campressor Corporation, has advantages for compressors, engines, and pumps. Campressor Corp. has chosen to attack the compressor option first, having built a three lobe cam working prototype. (See diagram)

The three lobe cam produces three forward compressions for each revolution of the drive shaft for each piston. The action of the pistons and rods is straight line allowing for compression in front and rear of each piston when the base of the cylinder is sealed. Using this approach, a two piston compressor produces twelve compression strokes with each shaft revolution. With no lateral forces on the pistons, they can be thin enough to only support the rings. The design allows sealing the central power transfer mechanism from the compression chambers results in cleaner air.

Using sophisticated computer programming to design the cam profile allows the profile to be optimized for the requirements of each unique application. These benefits are not possible with a crankshaft approach, which is limited to a single rigid cycle for each shaft revolution. Crankshafts also require heavier skirted pistons and articulating rods open to the oil of the crankcase.

The cam approach offers engineers multiple possibilities for customized compression while retaining the sealing capabilities of round rings and pistons. More compression can be generated from a smaller and lighter unit; be it a compressor, pump, or engine. Weight and size benefits should result in manufacturing simplicity and cost savings.

Campressor Corporation welcomes your inquiries and interest. Send comments or inquiries to W. Parker Ragain, President & CEO at email: wpragain@gmail.com

Robust Gripper with High Sprue Control

High process reliability, compact construction: FIPA's new Sprue Gripper GR04.101A now offers the optimal solution for the removal of injection-molded parts. "Our newest gripper not only identifies work pieces with high reliability and regardless of the position of the sprue, it also guarantees a maximum gripping force even at high cycle times," says Rainer Mehrer, FIPA President and Owner. "We're pleased to bring this newest addition to FIPA's comprehensive selection of grippers to the U.S. market."

New GR04.101A Sprue Gripper at a Glance:

- **High Process Reliability:** Large area sprue control for the detection of the sprue in the gripper regardless of position.
- **Maximum Reliability:** High gripping force of 22 N guarantees a secure grip of the sprue.

TECHNOLOGY PICKS

- **Large Area of Application:** Large jaw opening and compact construction allow for flexible integration into gripper systems.
- **High Wear Resistance Due to Hartcoat® Treated Surface:** A special coating on the gripper ensures high reliability and a long cycle life.
- **Easy Integration:** Thanks to its compact construction and low weight the new gripper is easily integrated with other FIPA gripper modules.

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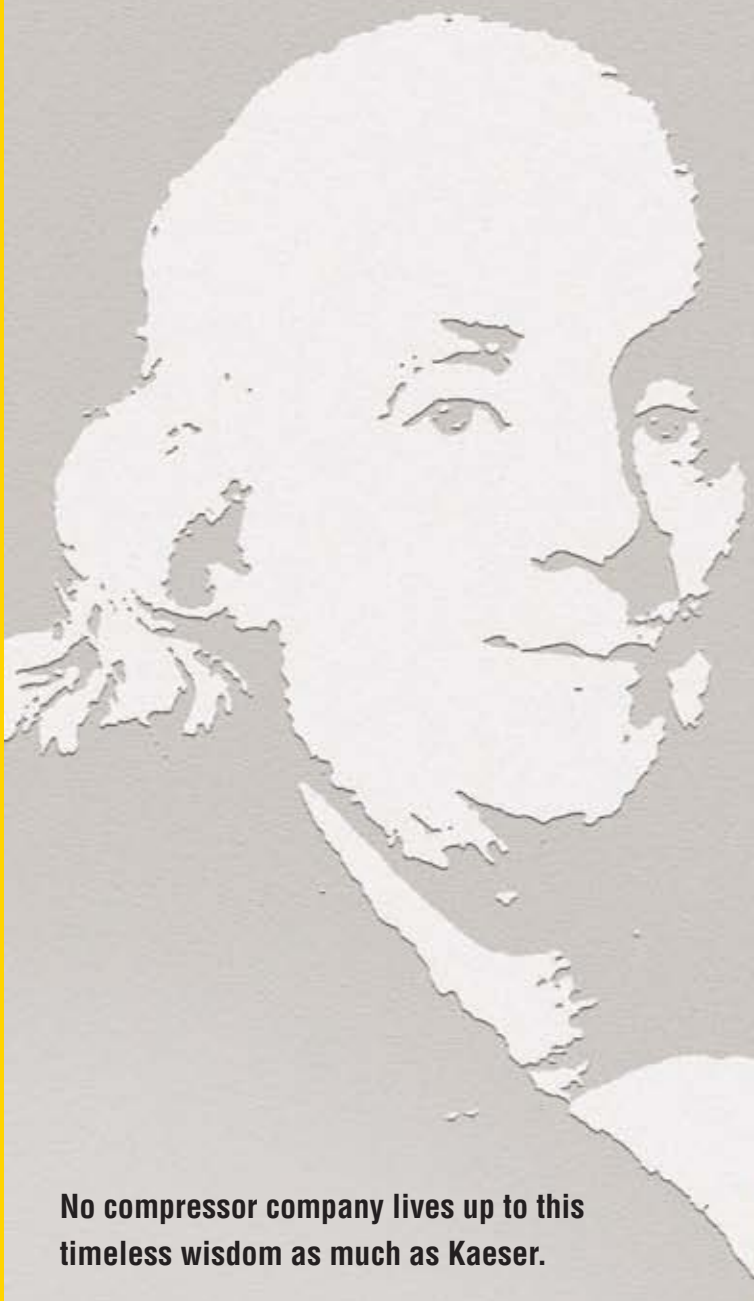

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