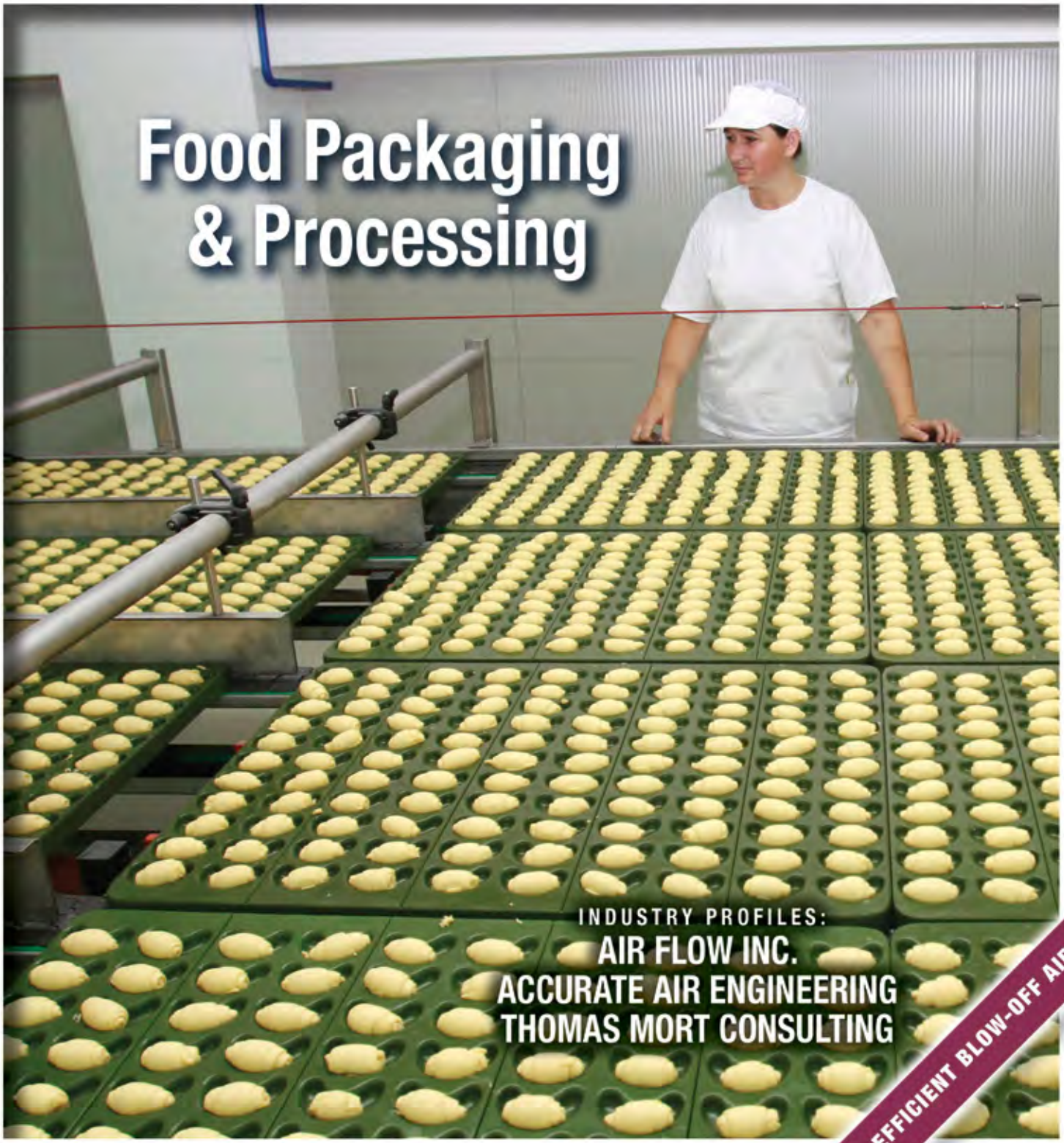
Food-Grade Specs | Food Industry Audit | Pepperidge Farm®

September 2008

COMPRESSED AIR BEST PRACTICES™



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FROM THE EDITOR

Food Processing & Packaging

According to the 2008 EIA International Energy Outlook Report, industrial electricity consumption in the United States will increase from 3.5 to 3.6 quadrillion btu from 2005 to 2030 — only 0.1% per year. Over the same time period, residential electricity consumption is forecast to increase 1% per year from 4.6 to 5.9 quadrillion btu and commercial electricity consumption is forecast to increase 1.7% per year from 4.4 to 6.6 million btu.

It's no wonder the utility companies are providing incentive programs to industry to reduce energy consumption. Utilities are faced with quite a challenge to supply the forecasted electricity consumption of the U.S. residential and commercial segments.

The compressed air industry is doing its part. In this edition, we outline the energy reduction programs being installed into food-processing and packaging facilities. Mr. Lane Hollar of Air Flow Inc. shares an audit story with us of a food processor where the installed horsepower was reduced significantly, by going with a Variable Capacity Control air compressor.

Accurate Air Engineering shares some "Bakery Best Practices" with us as they focus on the inefficiencies of blow-off air using compressed air. They also provide interesting advice on how they have reduced energy costs in vineyards and major food processors in California.

Thomas Mort Consulting is profiled this month because of their ability to implement energy-saving projects in multiple industrial processes including compressed air. Mr. Thomas Mort is a highly recognized Energy Engineer in the automotive manufacturing industry and is a gifted communicator and teacher. His techniques and materials focus on teaching the maintenance departments to implement energy-saving projects themselves.

Last but not least, I'd like to congratulate President Tom Russell and the members of the ICDA (Industrial Compressor Distributor Association) for their success over the past few years and their unbridled optimism looking at 2009. They are 100% onboard with the view that business will be fine in 2009 as long as we all stay focused on reducing energy costs for our customers!

Thank you again for your support.

ROD SMITH
Editor
rod@airbestpractices.com

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UTILITY-AIR NEWS

Gardner Denver Acquires CompAir

Gardner Denver announced it has entered into separate share purchase agreements with the holders of 100% of the outstanding shares of CompAir, a leading global manufacturer of compressed air and gas solutions. The acquisition places a total enterprise value of the business at GBP $197.5 million (approximately $395 million), to be paid through a combination of cash and the assumption of existing CompAir debt. The transaction is expected to close in the fourth quarter of 2008.

GARDNER DENVER
Experience Proven Results

CompAir, headquartered in Redditch, U.K., operates through three business divisions: Industrial, Hydrovane and Reavell. The Industrial division manufactures an extensive range of products, including oil-injected and oil-free rotary screw compressors, piston compressors and portable rotary screw compressors. These products are used in oil and gas exploration, mining and construction, power plants and general industrial applications. The Hydrovane division is a leading manufacturer of rotary vane compressors used in OEM applications such as snow-making and mass transit, and general industrial applications. The third division, Reavell, is a leading manufacturer of high-pressure reciprocating compressors producing air at delivery pressures in excess of 400 bar. Reavell's compressors are used in applications such as compressed natural gas, industrial gases, breathing air and in naval, marine and defense market segments.

"CompAir is an exciting strategic acquisition for Gardner Denver. The company has a reputation for high-quality, innovative products and best-in-class customer service, which strongly complements Gardner Denver's existing operations," said Barry L. Pennypacker, Gardner Denver's President and Chief Executive Officer. "With more than three-quarters of CompAir's sales in Europe and Asia, this transaction extends the geographic availability of Gardner Denver's products and significantly enhances our channels of distribution to serve the global market. By blending the complementary product lines and geographical reach of CompAir and Gardner Denver, the combined business will be well positioned to take advantage of future growth opportunities for its products, services and people."

CompAir's primary manufacturing facilities are located in Simmern, Germany; Ipswich and Redditch, U.K.; Ocala, Florida and Shanghai, China.

CompAir's audited financial statements for the twelve-month period ended March 31, 2008; report consolidated operating profit of GBP $16.1 million on revenues of GBP $265.1 million.

"Over the past several years, CompAir has achieved numerous successes in product development and operational improvements, which has provided a solid platform for growth," said Mr. Pennypacker. "We believe there is more opportunity to grow the profitability of this business post-transaction through lean enterprise techniques, low-cost country sourcing and capturing integration synergies."

For more information, visit www.gardnerdenver.com

Atlas Copco Acquires Distributors

Atlas Copco Compressors has purchased Gulf Atlantic Equipment Company (GAE), Florida, and Compressed Air Products (CAP), Georgia. Both companies have been successful Atlas Copco compressor distributors for many years.

"We see great potential to grow the Atlas Copco Compressor business from the strong base both distributors have developed," says Ronnie Leten, Business Area President, Atlas Copco Compressor Technique. "The acquisitions will clearly bring us closer to our customers in this region and improve our ability to offer them the support that they demand."

Both companies' product offer consists mainly of stationary Atlas Copco compressors. The distributors will keep their names for an interim period and will become part of the southern region within Atlas Copco Compressors LLC, USA.

The companies have a combined workforce of some 60 employees and are both privately owned. The parties have agreed not to disclose the purchase price.

For further information, please contact: Ronnie Leten, Business Area President, Compressor Technique, tel: +32 (0)3 870 2938 or +32 (0)477 222 685 www.atlascopco.com

Atlas Copco

Electricity constitutes on average 82% of compressed air system operating costs over a ten year period.

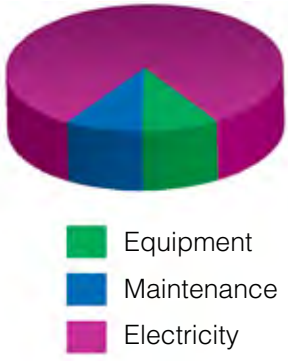
Energy savings are derived from Sullair's two-stage tandem air-end and spiral valve technology. At a power cost of $.08/kW/hr, a tandem two-stage compressor will save $14,373 per 1,000 cfm over a single-stage compressor operating for 8,000 hours at 100 psig.

Energy savings built In.

- Full load – up to 13%
- Part load – up to 30%

Tandem compressors are also available with variable speed drive. The use of a variable speed drive can provide additional part load and unload savings.

Compressor life cycle costs



SULLAIR®

For more information on how Sullair's tandem air compressors can reduce your operating cost, please contact your local Sullair distributor. Call Sullair at **(800) SULLAIR** or **(219) 879-5451,** or visit us on the web at **www.sullairinfo.com.**

ENERGY STAR PARTNER

UTILITY-AIR NEWS

TESEO Celebrates 20th Anniversary

TESEO SRL, specializing in the design, production and sale of aluminum piping and fittings for compressed air, vacuum and nitrogen systems is celebrating its 20th anniversary since the foundation in 1988. Celebrations will start in the second half of the year and will close officially at the Hannover Messe at the end of April 2009.

"We are very proud of what we have achieved in these twenty years," said Gianfranco Guzzoni, Managing Director of TESEO. In the 90s, we were the first one to develop a modular aluminum profile for compressed air distribution; today, these systems have become a global standard for fluid power distribution and many companies have followed us, developing technologies based on our model."

To celebrate this important date, in early October TESEO is organizing a convention at its headquarters in Desenzano del Garda, Italy.

"And finally, as evidence of the continuing growth of the company after 20 years in business, the new subsidiary TESEO Deutschland GmbH will start operating officially in the second half of 2008; it will be in charge of the distribution of TESEO products in Germany, expanding our sales organization that currently includes three foreign branches: Teseo Iberica, Teseo Nederland and Teseo UK," concluded Guzzoni.

For more information, visit www.teseoair.com

Teseo Headquarters in Italy.


18
CDI 5400 Flowmeter
scfm
Made in USA
This flowmeter cost $495 and took 15 minutes to install.
It revealed leakage costing $3800 per year in a cluster of forming machines.
It pays to meter your compressed air.
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Compressed Air Audit of the Month

Auditing a Food Packager & Processor

By Lane Hollar

September Audit of the Month

Where: Southern U.S.
Industry: Food Processing & Packaging
Issues: Energy Cost and Air Quality
Audit Type: Compressed Air Supply Side

Financial Summary

Investment: $57,200
Energy Cost Before Investment: $64,545
Energy Cost After Investment: $35,045
Energy Savings/Year: $29,500
Power Cost/kWh (blended): $0.05
Operating Hours/Year: 8,736
Simple Payback: 1.9 years

System Before Audit

Air Flow Min/Avg/Max: 36/350/459 scfm
Air Pressure Min/Avg/Max: 65/100/107 psig
Compressor HP Min/Avg/Max: 28/157/194 bhp
Contaminant Removal System: 10–12 psig pressure drop. Potential oil carryover

A. Introduction

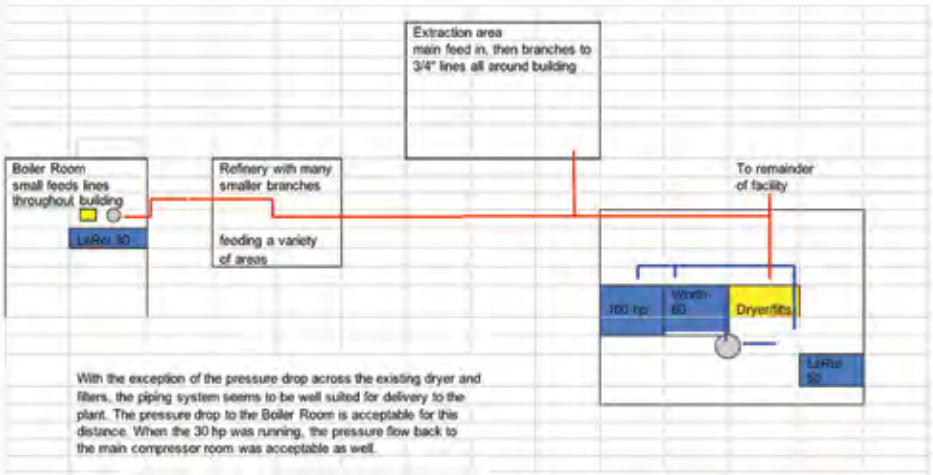
This food processor and packager is planning an expansion in the next couple of years. Details are unknown as to the future compressed air demands — but expansion is certain. The facility has excellent maintenance procedures but wanted to know if energy costs could be reduced in the compressed air system, while still keeping an eye on the prospects of future growth.

The compressed air system in use at this food processor is a dated system. The average age of the air compressors is 15–20 years old. While these machines are old, they appear to be in good operating condition due to good maintenance practices. The control systems, however, of these machines do not allow energy costs to be managed.

The facility is also concerned about the potential presence of oil in the compressed air system. The contaminant removal system (CRS) is old and appears to be undersized. The facility has compressed air come into "indirect contact" with their food products on a regular basis.

B. Compressed Air Piping/Distribution Issues

The piping system of the plant is adequately sized for the current demand. It is a straight line run from the compressor room to the various points of the facility. A large feed line enters into the individual buildings and then multiple smaller feed lines branch off and go to various air users within each building or site. While this seems to be delivering pressure adequately, all air systems can be improved if they are changed to a loop system. A loop system allows flow from both directions in the event that there is a heavy air user "hoarding the air" before it can reach more distant users. With the boiler room being located so far from the compressor room, this area would be virtually impossible to loop. Initial thoughts would be to use a separate small compressor just for this area, however since there has been additional equipment installed toward the lower end of the system, there is a demand for the air closer to the boiler room and the current configuration will work ok.



C. Air Compressor Configuration

The three air compressors in the compressor room are supporting the plant. All are using food-grade lubricants. The 30-hp air compressor in the boiler room only kicked on once during the audit period — due to some scheduled maintenance of the 100-hp machine. This audit therefore focuses on the three air compressors in the compressor room.

The Compressor Room

The 100-hp air compressor is a lubricated, single-stage rotary screw. It is controlled by an inlet modulation valve and has a sump blowdown. The machine can deliver 440 acfm and is running between 20–50% of its capacity. The annual cost of energy consumption of this machine is $28,617.

The 60-hp air compressor is a lubricated, single-stage rotary screw. It has a load/unload control system. The machine can deliver 251 acfm and is running between 21–50% of its capacity. The annual cost of energy consumption of this machine is $19,760.

The 50-hp air compressor is a lubricated, single-stage rotary screw. It is controlled by an inlet modulation valve and has a sump blowdown. The machine can deliver 200 acfm and is running between 20–50% of its capacity. The annual cost of energy consumption of this machine is $16,168.

The manner in which the compressors are being operated does need to be addressed. For the majority of the audit period, three of the air compressors were running (the 100-hp, the 60-hp and the 50-hp units). This equates to 210 hp of air compressors in use and a combined cfm delivery capacity of 931 cfm. The air compressors do not have the ability to unload and shutdown when not needed, nor can they modulate back to lower hp levels when the plant demand is low.

COMPRESSED AIR AUDIT OF THE MONTH

Auditing a Food Packager & Processor

Mr. Lane Hollar, of Air Flow, Inc., programming a data logger.

The average cfm usage of the system was recorded at 349.5 and the maximum cfm usage was 459. These numbers are far below the rated capacity of these machines. In actuality, the 100-hp air compressor should have been able to carry the load by itself for the entire audit period. The air compressor did in fact carry the plant load at the end of the audit period when the other compressors were turned off.

With the maximum-recorded hp of 193.9, this would mean that there is approximately 90+ hp being wasted. This audit will recommend how to reduce the use of air compressor hp.

Contaminant Removal System (CRS):

Plant management has asked that a review be done to evaluate the potential of oil carryover into the air system. The audit has discovered the potential for oil carryover to exist as well as dew point and pressure drop concerns.

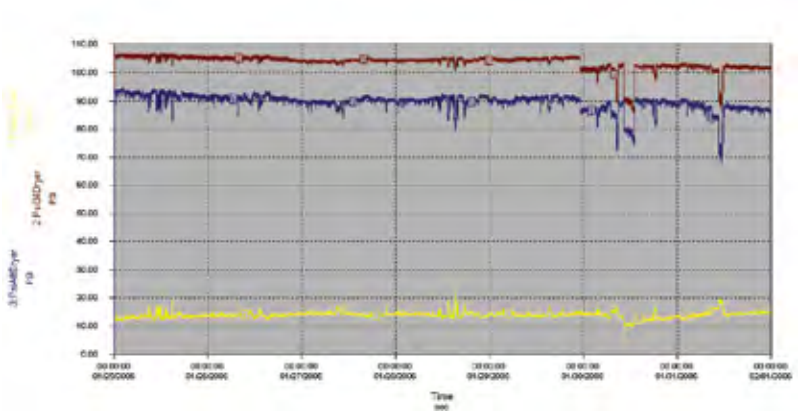
The 50-hp air compressor ran just barely above the loaded point for the majority of the audit week. When a rotary screw air compressor runs unloaded, for extended periods of time, it is very common for them to pass oil from the separator. In looking at the moisture separator and the area around it, there seems to have been a large amount of oil being carried over. The moisture separator may not have been functioning correctly, based on visual observation only.

This excessive oil carryover from the air compressors will greatly reduce the life span of an in-line oil coalescing filter. In addition to causing premature failure of the filter elements, there is an increased risk of oil contamination in the regenerative dryer. Oil contamination of a regenerative air dryer is a death sentence for the dryer. The principle of a regenerative dryer is the adsorptive properties of the desiccant. The moisture in the air system is not absorbed into the desiccant but instead is adsorbed onto the surface of the beads. When oil enters the dryer, the desiccant beads are coated over and lose all adsorptive abilities and require replacement.

As seen by the following graph, there is a definite problem in the pressure delivery across the CRS. The pressure drop across a regenerative dryer and filter system should be seen in the 5–7 psig range, rather than the 12–20 psig range seen in this installation, as indicated by the yellow line.

This is occurring because the dryer and filtration system is undersized. The dryer and filters are sized for 500 cfm maximum air flow. This air compressor configuration is capable of delivering over 900 cfm. The in-line filters could and probably are contributing to the problem as well. They appear to have been sized for a much smaller system. The pressure drop across this section is extremely costly as for every two psig of differential pressure increase there is an increase of 1% in the electrical energy cost to overcome this differential.

The air dryer in use in the boiler room is currently out of service. It appears to be a very old deliquescent dryer. We recommend it be taken out of the system.



The Contaminant Removal System has a high pressure drop of 12–20 psig.

COMPRESSED AIR AUDIT OF THE MONTH

Auditing a Food Packager & Processor

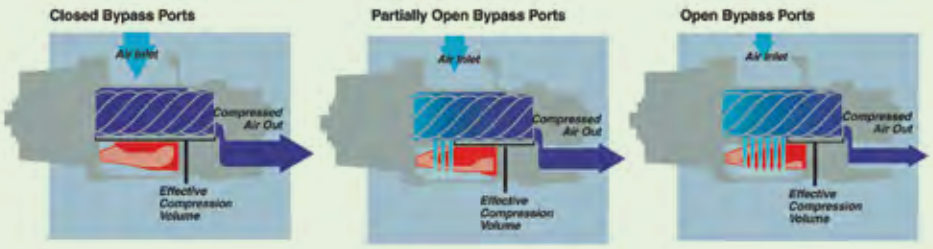
D. Recommendations and Actions

The following recommendations and actions were implemented at this food processing and packaging facility.

With an eye for future growth and optimizing energy efficiency and air quality, the decision was made to upgrade the facility to a new system. Rather than retrofit the aging air compressors with newer control systems, the decision was made to install a new 150-hp variable capacity control (spiral-valve) air compressor. The existing air compressors will be used as stand-by capacity and/or one or two may be sold.

The new 150-hp variable capacity control (spiral valve) air compressor is a lubricated, single-stage rotary screw. The machine will be using food-grade lubricant. It is controlled by a spiral control valve which reduces energy consumption as the load is reduced. The machine is capable of delivering 752 acfm. Until the planned expansion occurs, it is expected to be running between 45–55% of its capacity. The annual cost of energy consumption of this machine will only be $35,045 vs. the current level of $64,545.

Sullair's Variable Capacity Control (VCC)



How the Spiral Valve Operation Works

The compression volume varies to suit the air demand by progressively opening or closing internal bypass ports on the air-end. Capacity is matched to system demand, reducing cycling time and extending component life. Part load capacity and efficiency can produce energy savings up to 17%.

Variable Displacement Air-End

Sullair's variable displacement air-end maintains constant system pressure to the plant. Since the VCC compressors use large, efficient, slow-running rotors, lower power consumption is achieved at the top end of capacity. Oil foaming does not occur, air is not wasted to atmosphere and bearings last longer. The motor and air-end run at optimum speed and therefore maintain optimum efficiency throughout the full variable output range. Sullair VCC compressors react instantly to rapid changes in demand. The effective rotor length is progressively reduced as the demand is reduced which provides the most efficient part load control system to 50% output. This system is extremely simple and provides a cost-effective, energy-efficient control alternative.

www.sullair.com

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Always air. Always there.

A new contaminant removal system will be installed which matches the maximum output of the new air compressor. This will include an oil- coalescing pre-filter, a regenerative desiccant air dryer and a solid particulate after filter. We will have eliminated the potential oil carryover problem from the existing air compressors and have an appropriately sized contaminant removal system which can remove oil to 0.01 ppm and provide a pressure dew point of -40 °F. The new pressure drop on this system will be 5–7 psig (including filters) rather than the current 12–20 psig.

System	Total hp	Total acfm	Energy Cost	10-Year Life Cycle Cost
Audited System	210 hp	891 acfm	$64,545	$640,545
New System*	150 hp	752 acfm	$35,045	$350,045

**Investment required of $57,200. Yearly energy savings of $29,500. Simple payback of 1.9 years.*

E. Summary

As a result of the audit, the facility has found a way to plan for the future while optimizing current energy costs and air quality. The older yet well-maintained air compressors are now on stand-by. The new air compressor is able to produce energy savings of $29,500 per year due to its ability to perform efficiently at partial loads. The new air compressor also has the capacity to handle planned future expansion.

Air quality concerns over dew point and oil contamination have been resolved with properly sized coalescing filters and a desiccant air dryer. The pressure drop across the air dryer has also been reduced by up to 8 psig. These pressure-drop savings (of approximately 4%) are not factored into the audit ROI financials. BP

For more information, please contact Mr. Lane Hollar, Senior Systems Auditor, Air Flow Inc., tel: 336-605-9622, email: lhollar@airflowinc.com, www.airflowinc.com

Food-Grade
COMPRESSED AIR SPECIFICATIONS

BY ROD SMITH

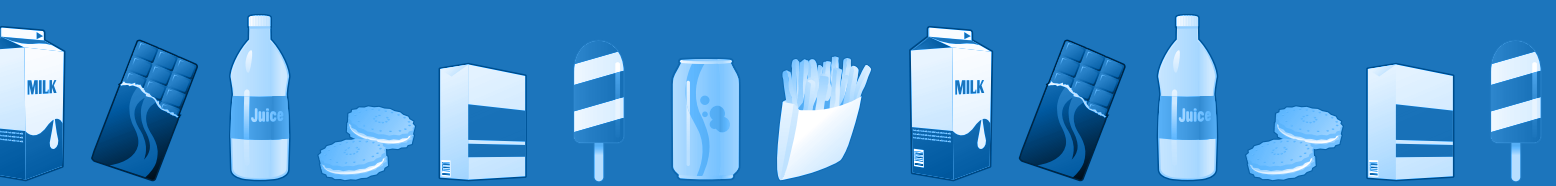
Compressed air systems play an important role in food processing and packaging. Compressed air can come into DIRECT or INDIRECT contact with food products and/or ingredients. Contaminants (notably oil, bacteria carried by moisture and solid particulates) may be present in the compressed air if not removed before contact with the food application occurs.

The objective of this article is to encourage food-processing and packaging corporations to create a compressed air specification for their process. The article will provide a review of some "Codes of Practice" in existence. As each situation is unique, the objective of this article is not to recommend any certain specification.

United States Code

The only current code in the U.S. applicable to compressed air is centered upon what lubricants are permitted to be used — namely by the air compressor. The Food and Drug Administration (FDA) specification is identified under "Lubricants with incidental food contact". The specification is summarized as allowing:

1. "0" ppm non food-grade lubricant
2. "10 ppm" food-grade lubricant
3. Food-grade lubricants are identified as "H1 lubricants" by the United States Department of Agriculture (USDA) for use on equipment where the possibility of incidental contact exists
4. Non food-grade lubricants are identified as "H2 lubricants" by the USDA for use on equipment where there is no possibility of contact



There is no U.S. code for particulate filtration (which is the category for bacteria) or for pressure dew point (moisture creates the environment for bacterial growth). Methods to ensure the removal of potential vapors and gases present in the ambient are also not covered. Guidance for factories with old piping vs. new installations is also not present. Guidance for these issues is covered by voluntary codes of practice in the U.K. and Germany — constructed to assist the food industry.

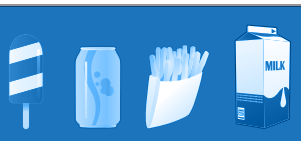
The United Kingdom Code of Practice for Food Grade Air

A more comprehensive recommendation/code is the U.K. Code of Practice for Food Grade Air. The Code was jointly developed in 2006 by the British Retail Consortium (BRC) and the British Compressed Air Society (BCAS). Mr. Greg Bordiak, the Technical Officer of the BCAS and a Secretary in ISO and PNEUROP Committees dealing with compressed air standards, commented, "Discussions with the BRC revealed concerns primarily centered on potential bacterial contamination and the minimization of other contaminants — particularly oil." For more information on acquiring a copy of the Code, visit www.bcas.org.uk.

The Code provides three specific food grade purity recommendations for three categories:

1. Contact
2. Non-Contact High Risk
3. Non-Contact Low Risk

FOOD-GRADE COMPRESSED AIR SPECIFICATIONS



In each category, the recommendations center on the recommended air quality levels relating to the removal of three contaminants:

1. Solid particulates including bacteria
2. Humidity (water vapor) in terms of pressure dew point
3. Total permissible oil (aerosols and vapor) covering the potential ingestion of hydrocarbons or other ambient gases by the compressor intake

BCAS & BRC FOOD GRADE PURITY RECOMMENDATIONS:

CONTACT RECOMMENDATION	DIRT (SOLID PARTICULATE) MAX NUMBER OF PARTICLES PER M^3			HUMIDITY (WATER VAPOUR)	TOTAL OIL (AEROSOL + VAPOUR)	ISO8573.1 EQUIVALENT
	0.1–0.5 MICRON	0.5–1 MICRON	1–5 MICRON			
Contact	100,000	1,000	10	-40 °C PDP	0.01 mg/m^3	Class 2.2.1
Non-Contact — Low Risk	100,000	1,000	10	+3 °C PDP	0.01 mg/m^3	Class 2.4.1
Non-Contact — High Risk	100,000	1,000	10	-40 °C PDP	0.01 mg/m^3	Class 2.2.1

Reference Conditions from ISO8573.1: Absolute atmospheric pressure 1 bar, Temperature = 20 °C.
Humidity is measured at air line pressure.
Chart provided courtesy of Parker domnick Hunter.

The Contact and Non-Contact — High-Risk Categories

Contact is defined in the Code as "the process where compressed air is used as a part of the production and processing including packaging and transportation of safe food production." Compressed air can be in direct contact with food or mixed with it. In packaging machines, compressed air can come into contact with the packaging material, which in turn is directly in contact with the food product.

Compressed air can come into direct and indirect contact with food products.

The food industry also has applications where there should not be compressed air contact with food — but there is a high risk that it will occur. For this reason, the U.K. Code created a category called "Non-Contact High Risk." This category calls for the same air purity levels as the "Contact" category. Referencing the above table, the Code recommends for both categories:

1. Solid particulate filtration to 1 micron: This includes bacterial filtration if the presence of bacteria is established. Mr. Bordiak said, "the presence of bacteria is established by the use of ISO 8573-7."
2. Pressure dew point of -40 °F (-40 °C): meaning the use of desiccant or membrane dryers. Mr. Bordiak commented, "the humidity class chosen needed to be below that at which bacteria are likely to be propagated, namely below a -18 °F (-28 °C) pressure dew point."
3. Total Oil Removal to 0.008 ppm (0.01 mg/m^3): "Total Oil Removal" signals the required use of both oil-coalescing filters and oil vapor (particularly hydrocarbon) removal filters.

The Non-Contact Low-Risk Category

This category specifies the same levels of filtration as the Contact and High-Risk categories. The difference lies with the pressure dew point specification. This category allows for a +38 °F (+3 °C) pressure dew point. This means that a refrigerated air dryer is permissible for this category.

Observation on Air Dryers

A desiccant or membrane dryer will, as a general rule, consume more energy than a refrigerated air dryer. This is due to the energy required to regenerate the desiccant beds of the dryer. Many installations use desiccant dryers for 100% of their compressed air system due to 30% of the system coming into "contact" with the food process. If it is possible to isolate the compressed air supply to these areas, the use of a refrigerated dryer for the rest of the plant can reduce energy costs.

Observations on Filtration and ISO 12500.1

The use of oil-free air compressors does not eliminate the need for filtration. Compressor intakes may be located in areas where hydrocarbons, solid particulates and other gases like hydrocarbons may be ingested into the air compressor and sent downstream. Particulate, oil-coalescing and oil vapor filters are required to ensure air quality. The use of an oil-free air compressor does, however, reduce the pressure on maintenance to change filter elements in a timely manner.

When purchasing compressed air filters, it is recommended by the author that the user find out if the filters have been tested and are rated to ISO 12500.1. In the past, a filter could state that it provided oil aerosol filtration to 0.01 ppm BUT it did not have to say under what kind of INLET challenge. This new ISO test procedure specifies two inlet challenges by which filters must be tested:

1. 40 ppm inlet challenge for 1–5 micron rated filters
2. 10 ppm inlet challenge for 0.01 ppm rated filters

Conclusion

Establishing a compressed air specification is a recommended practice for a food packager and processor. Each situation is unique and one should work with a compressed air professional to build a specification. The U.K. Code of Practice for Food Grade Air is a very good reference to use when building the specification. BP

For more information on this article, contact Rod Smith, Compressed Air Best Practices Magazine, tel: 251-680-9154, email: rod@airbestpractices.com, www.airbestpractices.com

For more information on the U.K. Code of Practice for Food Grade Air, please contact Mr. Greg Bordiak, British Compressed Air Society, email: greg@bcas.org.uk, www.bcas.org.uk

For more information on the German "Recommendation for Compressed Air Quality in the Food Industry" published in 1997, visit www.vdma.org

Good Bread, Less Energy:

Reducing Energy Consumption at Pepperidge Farm®

BY COMPRESSED AIR BEST PRACTICES™

Mankind may not live on bread alone, but bread plays an important role in our diet. It plays such an important role, in fact, that bread baking is a critical component of the economy. Not surprisingly, baking bread has grown to become a major, round-the-clock operation for commercial bakeries that supply restaurants, institutions and homes with an enormous assortment of breads and rolls.

Even as economies of scale enter the picture, one major commercial baker remembers to keep the big picture in mind. "At Pepperidge Farm we think of ourselves as bakers, not manufacturers," says Noel Skwiot. "We just bake a lot of bread."

Skwiot, Project Engineer at the Pepperidge Farm bakery in Bloomfield, Connecticut U.S.A., works to ensure that the baking operation runs smoothly and efficiently. "I work with everything from environmental and safety issues to specifying new equipment to any project that comes in the door, really," he explains. Among his responsibilities is the facility's compressed air system.

"Our compressed air is a utility, just like electricity or natural gas," says Skwiot. "We need air to run, and we need a good robust system that works reliably. Primarily we use compressed air for fluid power applications. For example, we have a system of flour conveyors that move flour from silos outside to various mixers. Giant diverter valves, the size of a five-gallon pail, open to allow flour to flow to the appropriate mixer. These diverter valves are powered by compressed air pilot valves. We also have a lot of cylinders that use compressed air to move mechanical linkages for the different bakery machinery, such as conveyors and packaging equipment."

Pepperidge Farm Bakery uses compressed air for fluid power applications in the flour conveyors.

Nationwide, Pepperidge Farm has eight main baking facilities producing bread, cookie and cracker products and frozen goods. The bread plants are designed for regional distribution.

The 265,000 square foot bread-baking facility in Bloomfield is an impressive sight to visitors. "We produce nearly one million loaves of bread a week," according to Skwiot. "We operate two bread lines and one roll line. Our fastest line makes rye bread and swirl varieties. It's truly state-of-the-art bread baking and our plant has won the bakery plant of the year award."

A facility of this size and scope has significant energy needs, so improving energy efficiency is an ongoing concern. Currently, Skwiot is communicating with Connecticut Light and Power (CL&P) and lighting vendors as Pepperidge Farm works on an energy- efficient lighting project. Pepperidge Farm is also working with Atlas Copco Compressors to take advantage of a CL&P incentive program focused on reducing energy costs for compressed air systems.

> "It's truly state-of-the-art bread baking and our plant has won the bakery plant of the year award."

GOOD BREAD, LESS ENERGY: REDUCING ENERGY CONSUMPTION AT PEPPERIDGE FARM®

"We are conducting an energy audit at Pepperidge Farm's Bloomfield facility," according to Marlon Contreras, Sales Engineer with Atlas Copco New England Compressor Center. "We are evaluating the entire compressed air system, from measuring and recording electrical usage to identifying air leaks throughout the plant that waste energy. All this information gets combined in a report that outlines any recommendations for equipment or operational changes. Any recommendations for cost-saving improvements may also include monetary assistance by CL&P to encourage Pepperidge Farm to make those improvements."

The compressor room at Pepperidge Farm.

The air compressors in use at Pepperidge Farm bakeries nationwide are all Atlas Copco. At the Bloomfield facility, there are two ZR110 (150 hp) oil-free water-cooled air compressors, each with its own FD refrigerated drier, and one ZR45 (60 hp) oil-free water-cooled air compressor with an FD refrigerated drier. "We generally run both the 150s and add the 60 when there's high demand," says Skwiot. "We don't currently have a variable speed drive compressor, but we're looking into the potential energy savings it could provide."

Pepperidge Farm is currently evaluating upgrading their system to a variable speed drive air compressor.

Energy savings is something Pepperidge Farm is always looking into.

In response to the question, "How likely is it that you will recommend Atlas Copco equipment to a friend or a colleague," Skwiot replies: "Highly likely. We use Atlas Copco pretty much exclusively throughout the Pepperidge Farm environment. We have good service whenever there's an issue. Should the compressor system ever go offline, we have it plumbed to the outside so that an Atlas Copco mobile unit can just hook up and get us going."

Though we may not live on bread alone, Noel Skwiot and the people of Pepperidge Farm continue to ensure that good, fresh bread is available, whenever it's on our menu. BP

> "We use Atlas Copco pretty much exclusively throughout the Pepperidge Farm environment. We have good service whenever there's an issue."

Accurate Air Engineering and California's Food Industry

Compressed Air Best Practices™ spoke with Creg Fenwick (Corporate Sales Manager), Kyle Harris (Energy Efficiency Manager) and John Portzer (Northern California Branch Manager & Company Engineer) of Accurate Air Engineering.

Good morning. Please describe Accurate Air Engineering (AAE).

Good morning. Accurate Air Engineering (AAE) began operation in 1961 selling and servicing compressed air systems. The company grew throughout Southern California and was purchased in 1989 by John Lague (and family). Mr. Lague is the current President and CEO and in 1992 expanded AAE's presence into Northern California through an acquisition. Today, AAE is the largest distributor of compressed air, vacuum and PD blower equipment in the State of California.

How does having statewide coverage in California help your customers?

AAE has five locations in California (San Diego, Cerritos, Bakersfield, Fresno and Lodi). We have over 8,000 existing customers in California. Many customers have multiple locations and they like dealing with a single unified company statewide — rather than having a patchwork of smaller compressed air vendors.

Our size has also allowed us to invest in several programs, which add value to our customers. One has been the Preventative Maintenance Program, which features "online computer monitoring" of the customer's compressed air system. Both AAE and the customer are able to monitor the compressed air system's operational status in "real time" from a computer. Some of the features include the ability to monitor maintenance intervals, check system efficiency and receive alert notices if there is an alarm or shutdown condition. The focus on preventative maintenance allows the customer to take measures before a costly disruption occurs in their manufacturing process.

The "Online Computer Monitoring" Preventative Maintenance Program helps customers avoid costly disruptions in their manufacturing processes.

How is industry doing in Los Angeles and Orange Counties?

Industrial activity in all of Southern California has been strong for us. Accurate Air has experienced record sales and service levels over the past two years. This year has been just as good and we are forecasting strong 3rd and 4th quarters in 2008. The economists, of course, will continue to forecast a recession in 2009. We will just keep focusing on what we do best and we are optimistic about 2009. AAE continues to grow market share due to our investment in customer service and our execution of solid business strategy.

Cerritos (bordering LA and Orange counties) is the location of our corporate offices and also our primary material inventory hub for all branches. Most vendors are not located in California and so our Cerritos warehouse operates as a west coast inventory hub for our products. We can get products out to our branches in one to two hours. The Parts Department maintains over $1 million worth of inventory of spare parts. Cerritos also houses full sales and service departments. Our service team is capable of working on all makes and models of air compressors, vacuum systems and blowers.

AAE can overhaul and repair large reciprocating, rotary screw, centrifugal, high-pressure and oil-free air compressors.

How is AAE's business in San Diego?

It is also very strong. The San Diego area offers a unique blend of industrial and military applications. We support industrial applications including shipyards, biomedical, food and beverage manufacturers, pharmaceutical, electronics and healthcare facilities. Military applications include high-pressure deep submergence, aircraft frame and engine overhaul and testing, base air and onboard ship systems. Imperial County also has vast quantities of agricultural industry, geothermal power generation and mineral mining.

The AAE San Diego branch is a full-blown sales and service operation which can overhaul and repair large air compressors of every type. The branch can also do trouble-shooting and repair of complex automation and control panels. The sales department is a very veteran group with a reputation locally for being able to handle the most "technically" demanding projects. The application engineering specialties in San Diego include MILSPEC design and conformance, material fluidization, high purity gas processes, high pressure and breathing air compression and purification, sparging and waste gas compression.

ACCURATE AIR ENGINEERING AND CALIFORNIA'S FOOD INDUSTRY

Air compressors with automated sequencers and air storage save energy at a farm in central California.

Oil-Free air compressors at a food processing plant.

Please describe Central California.

Food processing in the upper/central valley (the "salad bowl" of the nation) is growing. We are seeing both new plants and upgrades of current systems. One of the issues reviewed in system upgrades is cleanliness including compressed air quality levels. Older rotary screw compressors are being upgraded to food grade lubricant and there is more focus on downstream filtration. Factories are moving away from in-line coalescing filters and going to low pressure-drop oil mist eliminators in the compressor room.

AAE serves this market out of our Bakersfield, Fresno and Lodi branch operations. All branches are very experienced with optimizing compressed air systems for the diverse local industries like agriculture, oil production, food processing and packaging, family and corporate farms, food and beverage manufacturers, packaging material manufacturers, glass plants, printing and bottle manufacturers. Both branches have fully staffed factory-trained sales and service departments.

Has Northern California recovered?

Northern California still hasn't recovered completely from the "off-shoring" of Silicone Valley and the bursting of the tech bubble. We have, however, seen some new industries come into the empty buildings left behind. We are active with CDA systems and upgrade many installations into more energy-efficient systems. The Lodi branch works actively with the engineering firms in the region in the application and design of instrument air compressors, methane gas recovery compressors and blower systems for municipal wastewater.

AAE's Lodi branch serves as our northern material inventory hub as well as our "Engineered Packaging Center" which provides custom compressed air and process gas packaging for all AAE locations. This is a 17,000-square-foot facility with complete overhaul, service and packaging capabilities.

Please describe your work with bakeries.

Accurate Air Engineering works with some of the largest bakeries in the nation. We have not seen bakeries adopt any kind of specification. Many bakeries still use oil-flooded air compressors with limited integral filtration. Others do use oil-free or oil-less air compressors. Every installation is different, like in general industry. They then use oil mist eliminators or in-line coalescing filters. We don't see many standards being used yet.

At bakeries we focus on eliminating open blowing applications so we can create some back-up capability and redundancy. We are currently working on this at six bakeries for one specific customer.

Does Accurate Air recommend any "Bakery Best Practices?"

We are trying to establish some "Best Practices" with bakeries. For example:

1. Bakeries have many open-blowing applications. Most are using a ¾-inch pipe with 32 holes drilled in it to blow compressed air onto the application. Some do have an air knife with some sort of nozzle, but most use inefficient drilled pipe. The bakery blow-off applications include;
   - **a.** Open blowing to de-pan the buns from the pans. Air lifts the bread off of the pan when it comes out of the oven. Sometimes the glazing of the pan wears off and some buns stick — so the practice has been to use compressed air to blow them off the pan.
   - **b.** Blow the flour off the bread and get it airborne. Vacuum then reclaims the flour in a flour-reclaim system.
   - **c.** After a bread loaf is sliced, they don't want remaining breadcrumbs in the package (after the slicer). Crumbs are blown off — usually with unregulated choking valves.
   - **d.** Pan cleaning after the bread is out. No one wants burnt pieces of bread on their hamburger bun. Blow the pans clean with air before they are loaded with dough again. Sometimes they'll blow it three times.
   - **e.** If a bakery is doing powdered or glazed doughnuts, they'll lay a long piece of pipe across the conveyor line and shoot the air down onto the product.
2. The solution is a low-pressure blower. We recommend a centrifugal Vortron blower because we get more air volume from them.
   - **a.** Installation cost is lower using two or three units for the whole system — rather than installing high unit quantities of positive displacement or regenerative point-of-use blowers.
   - **b.** Centralized blowers reduce the noise in the plant created by many individual point-of-use blowers.
   - **c.** Less maintenance — just two inlet filters.
   - **d.** In general you are shutting down a full air compressor. Usually they are running two air compressors fully loaded. We usually shut down one of the two air compressors.
   - **e.** The final advantage is that you don't need compressed air treatment equipment at the open blowing locations because the centrifugal blower is oil-free.

Centrifugal oil-free blowers are recommended for bakeries.

ACCURATE AIR ENGINEERING AND CALIFORNIA'S FOOD INDUSTRY

A food processing plant in Los Angeles saves energy with VSD compressors.

Vineyards are reducing energy costs with variable speed drive air compressors.

What other efficiency opportunities do you see in the food industry?

We see many, many installations with multiple partially loaded air compressors. We install compressor control automation systems at these plants and are invariably able to turn off at least one air compressor at each site. Implementing air storage strategies is also very effective.

So much auditing has been done on supply side. The idea now is to really look at the demand side for best practices in the total plant. We also continue to preach managing air leaks out there in the plant. There's no doubt it makes sense to fix leaks.

What kind of auditing services does Accurate Air offer?

AAE's Compressed Air Efficiency Division is managed by Kyle Harris and has earned a strong reputation in California. AAE was one of the first to promote energy reduction practices and has built a strong relationship with the U.S. Department of Energy (DOE) and with the various utility companies in the State of California. Through comprehensive data logging and analysis, AAE is assisting our customers with their goals to significantly reduce the energy costs of their compressed air systems. We are also able to seamlessly get the power company involved with rebate incentives.

California has a lot of industry where the average horsepower (hp) of the system is 100 to 200 hp. This is the core of our industry. Each branch operation at Accurate Air Engineering is set up to do System Assessments for these types of installations. The Assessments last a minimum of seven days and include kW measurement and data logging. The Assessment will also help the user make the applications for energy-efficiency rebates with the local utility company.

Full-blown demand-side and supply-side audits are done by Kyle Harris and will normally last one full week. We usually do them for customers who have a total installed hp of 800 to 1,000 hp.

Does the California food industry have any compressed air dew point standards?

We haven't seen any standards used across the board. Some corporations specify desiccant air dryers at all their facilities. Others have standardized on oil-free air compressors. It's all over the map.

Our climate here is not like in the Eastern U.S. where a -40 °F dew point is necessary. We have areas where an outdoor installation can use a refrigerated air dryer with no problem because of our higher ambient temperatures.

In the San Joaquin Valley we have two of the largest carrot processors in the world. They have a mix of refrigerated and desiccant air dryers. They have huge ammonia compression and cold storage where the packaging room is at 38 °F. They modified their system to run the required dew points to different parts of the facility. This is also done in some tomato facilities. We upgrade them from "desiccant only" to use refrigerated dryers for different parts of the facility. This will reduce the energy costs associated with air drying.

How about the bottling and beverage industry?

Soft drink plants also have open blowing applications. A facility in San Diego tends to use compressed air to blow water off of the top of the cans before they are boxed. The cans are sanitized and cleaned with soapy water and compressed air is used to blow the water off the cans. This again is an open-blowing application, which we will review for efficiency opportunities.

Wineries in California often have too much installed hp. Smaller wineries use compressed air as a cycling bladder press during the crush/press season in August. They will only have this higher level of air demand for three months. In the 1990s, many wineries purchased enough hp to get them through the crush season. We have gone into a lot of these facilities and recommend much smaller 15-hp air compressors for their year-round demand and then a rental air compressor for the month of August. The customer comes out ahead in this scenario.

Large wineries like Gallo, Woodbridge and Mondavi have huge facilities operating nine months per year. We treat them like a normal industrial installation.

ACCURATE AIR ENGINEERING AND CALIFORNIA'S FOOD INDUSTRY

> "If a bakery is doing powdered or glazed doughnuts, they'll lay a long piece of pipe across the conveyor line and shoot the air down onto the product."

What techniques do you use to measure a compressed air system?

We fundamentally follow the three-steps outlined by the DOE:

1. We collect true power data, using Veris kW transducers whenever possible.
2. We measure pressure using multiple pressure point readings. Before any dryers and filtration and also downstream after the clean-up equipment. Then if there is pressure drop in the plant, we may put one downstream at the far end of the plant. We will spot check at different points like at open blowing.
3. We use CECOMP gauges 4-20 milliamp with 2-channel loggers with an integral display. If it's connected to a multi-channel data logger, we use Westronic Ranger or Monarch data loggers. They vary from 2 to 12 channel data loggers for large compressor rooms. We use Dixon loggers for single-point pressure readings, along with AEMC amp loggers for smaller systems or when only amp data is required.
4. We use Airmaster+ software to develop baseline profiles and to run energy efficiency profiles.
5. I (Kyle Harris) use flow meters in all centrifugal applications. Sometimes you have units at part load or minimal load conditions but your actual delivered energy is not similar. We like using flow meters in most audits and assessments but the reality is that it is not always possible. Flow meters can be intrusive to systems and can add costs to the project. We use them when the customer will permit it.

Anything new from the California utilities regarding incentives?

California's utilities have been very aggressive promoting energy efficient retrofits for many years. Since 1999, the Standard Performance Contract Program (SPC) has been offering 8 cents per kWH saved on compressed air energy reduction projects — up to 50% of the Project cost. They no longer require measurement verification when they use an engineering firm to review projects.

Most of the California Utilities use Airmaster+ to model and verify the systems as well as third-party energy companies and technical review firms. This is why we (AAE) use Airmaster+ as a standard procedure. It is a quick seamless process that the utility company is comfortable with and applications go quickly. We will also provide a written overview of what is happening. BP

Thank you, Accurate Air, for your insights.

For more information, please contact Creg Fenwick, Accurate Air Engineering, tel: 562-484-6370 x134, email: cfenwick@accurateair.com, www.accurateair.com

SAVING WITH ENERGY:

THOMAS MORT CONSULTING

Compressed Air Best Practices™ interviewed Thomas Mort (Director) of Thomas Mort Consulting.

Saving with Energy
Thomas Mort Consulting, LLC

Good morning. Please describe your consulting firm.

Good morning. We are an international consulting company which provides training and project support for energy cost reduction at industrial facilities. I have personally performed energy management training and project development for more than 400 industrial facilities in 22 countries. We coach our clients on how to identify and quantify cost reduction opportunities, pick the most effective solutions and to quickly implement projects. Utilizing this structured process typically results in the reduction of energy costs by 10% with an average <1-year payback.

How has your background in nuclear power helped you today?

I worked at the Big Rock Nuclear Power Plant in Charlevoix, Michigan for sixteen years. I started working in the Control Room Operations Group and finished working as the Reactor Engineering Supervisor. It was an invaluable experience.

The good thing about a nuclear plant is that you get intense training. You receive system and process training. A nuclear plant is like one huge machine — pumps, motors, pressure, steam, electricity are all operating simultaneously and we had to understand all of the systems. Each part of the facility affects another part. To handle this, the plant provided intensive procedures training, operations practice on simulators and memorization of the systems. We received up to 10 weeks of training per year. Over my 16 years in nuclear engineering, I had three one-year training courses as well.

Tier 1 and Tier 2 automotive suppliers work extensively with Thomas Mort Consulting.

SAVING WITH ENERGY: THOMAS MORT CONSULTING

Compressed air was an energy-saving project we were able to replicate internationally.

The other good thing we did was exhaustive tracking and measurement of processes. We had to know how things were working and how to identify malfunctions or identify potential problems. We had to learn how to use all the different types of measurement instruments and took manual readings and records. This allowed us to develop processes that were simpler and faster.

How did your background at Delphi Automotive help you?

As an Energy Management Engineer at Delphi Automotive, I was given the opportunity to see the world. Delphi has plants all over the world with different types of manufacturing processes. It was interesting to see which energy management concepts could be turned into real-life working projects. We were able to discover which projects actually work and which don't work. Also we were able to see which energy-saving projects could be replicated over many plants. Compressed air projects were a type of energy-saving project we were able to replicate internationally.

Learning styles were discovered to be very different during the international training sessions we conducted at Delphi. The training I conducted in Germany had to be different from the same session in Italy. The Germans wanted a very technical session. All of the numbers and calculations had to be explained and justified. We were able to work off of process diagrams and technical drawings. In Italy the preference was "hands-on" with the machines in the factory. We would go out to their factory and explain the process with the machines in front of us. They wanted to open and close the valves.

Thomas Mort received the 2003 Society of Automotive Engineers International Environmental Award.

Writing styles also needed to be adapted to the country we were in. We found that in China, most of the operators had not grown up with mechanical equipment. The instructions, therefore, had to be very detailed and step-by-step on how to do something. In the U.S., we find many operators who grew up mechanically oriented. Our writing for them does not have to be as detailed. Operating procedures should be written differently for different cultures. We found it very important that all of the training be presented in the participant's native language. For this we often use simultaneous translators and we always translate the manuals and lesson plans.

What industries do you work with the most?

Tier 1 and Tier 2 automotive suppliers represent 60% of our business. Compressed air can represent 10–30% of their total energy costs. If painting is involved, it can be a larger percentage. Some Tier 1 and Tier 2 applications for compressed air are:

1. Bag house filtration systems which use compressed air to remove the particles from the bag filters
2. Sorting/moving/adjusting parts on assembly lines using blow-off nozzles
3. Air actuating cylinders used to position or lift something
4. Blowing air into venturis which in turn can make vacuum used by robots to lift up and move parts
5. To release products from injection molds with bursts of air
6. Powder painting
7. Air-powered sludge pumps to move slurries from one place to another

Where is the low-hanging fruit for compressed air energy-savings?

Lack of measurement is the low-hanging fruit with compressed air. Very few facilities have measurement in place based upon energy consumption (profiling of electrical interval data). They have odometers (hour meters) on the air compressors and nothing else. You can't control what you can't measure. The facilities do not understand their compressed because they don't have enough measurements and training of how to understand the measurements.

The rudimentary units of measure tend to be the number of air compressors they are running. When people attend the training classes we ask, "Where are you right now?" They will often reply, "We used to run two but now have three 100 hp air compressors operating."

SAVING WITH ENERGY: THOMAS MORT CONSULTING

Out of 300 plants, 280 will find significant energy-saving projects with compressed air.

It's ironic because when we ask them, 'What is your most expensive energy source?' They will usually answer 'compressed air.' They also know it's one of their biggest energy users. They also know air leaks are a big problem. Yet they simply haven't addressed the total issue.

> "Out of 300 plants, 280 will find significant energy-saving projects with compressed air."

Do you discuss compressed air leaks?

We see that many facilities do have compressed air leak maintenance programs. But they don't understand that leaks are just one part of a larger system. We tell people, if you have 10 leaks and you fix four of them, you won't reduce the load on the air compressor — the remaining leaks will just leak faster!

What are the most common issues at factories you visit?

We find they run with partially loaded compressors along with fully loaded compressors. They need 1.2 compressors for example. They don't realize that the extra compressor is more expensive to run than taking that money to repair things in the system — which would allow the compressor to go back to being a stand-by air compressor. You have to do something downstream to turn it off.

Please describe your Energy Solutions Seminars for Industrial Facilities

They help provide a structured approach to help people review things at their facility and target the most effective areas for reducing energy costs. Our clients use their own resources to the extent possible and we provide coaching and support. When they learn it, they can continue on with the process after we are gone.

There is very little theory in the course. We focus on what are the most important things to measure in a factory. We give them data loggers and other measurement instruments and give them a set of homework assignments involving taking measurements.

We provide them with examples of projects we have done in similar situations. The project documents include step-by-step project instructions. They see these examples of projects they can copy and do in their facility. That's what they like so much.

Can you review some areas of energy management your firm works on?

Sure. I'll try to give a rough overview for you.

1. Demand Control — Using electricity at cheaper times and managing peak demand.
2. Lighting — Not the most important, but can still be significant. Have the right amount of light, turn them off when not in use and use higher efficiency fixtures.

3. HVAC — Factories exchange a lot of air. They bring in a lot of fresh air and pump out bad air. They use a lot of energy to heat the air. This is an expensive part of operating a factory. Learning how to manage this carefully is important.

4. Compressed Air — Demand and supply-side audits

5. Chillers, Heat Pumps, Hot Water — These systems are similar to compressed air in that there is little measurement and a lot of energy waste. Hot water going down the drain or running two chillers when you just need one, for example.

6. Heat Recovery Solutions are the number one energy saving opportunity. Almost all plants in U.S. have winter heating provided by purchasing expensive natural gas. Simultaneously the same plants have cooling towers used to reject the heat in the machines they are operating. Capturing and using the waste heat is the opportunity.

7. Solar and wind power generation is a topic we field a lot of questions on. Many facilities want to know if they should use these renewable energy sources to generate their own power. We provide them training to understand the elevated costs per kW these technologies currently have. We compare these costs to the much-lower costs per kW they can achieve by reducing energy consumption in their plants.

Please describe your new Energy Solutions Center in San Antonio.

The idea is to have a small working factory. We are creating an environment familiar to the people coming to the workshop. In the center of the factory is the classroom. We can show them the before and after for the projects and concepts we teach. This will strengthen the students' belief and motivation that they can also do these energy-saving projects themselves.

We have purchased the land and the architectural drawings are finished. The list of vendors is growing daily of who would like to have their equipment in this training facility. We are scheduled to start construction in the first quarter of 2009. BP

Thank you for your time.

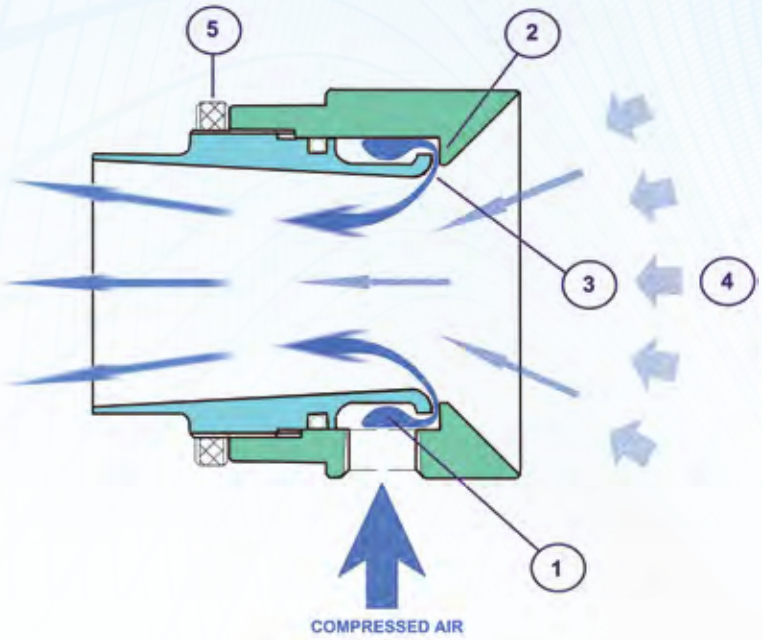
For more information, please contact Thomas Mort, Thomas Mort Consulting, tel: 210-858-8454, email: tcmort@savingwithenergy.com, www.savingwithenergy.com

Eight Factors

to Consider for Efficient Blow-Off Air

BY LES RAPCHAK

In industrial facilities, blow-off of water, dust, coolant, etc. is achieved using either compressed air amplifiers (flow amplifiers) or by blower-operated systems. Many facilities use both types of systems. The classic energy-cost improvement opportunity exists when a facility is using open jets and copper tubing or pipe with drilled holes or open slots for blow-off air. In this situation, both compressed air amplifiers and blower-operated systems will be more efficient alternatives. Choosing which type has created both claims and counter-claims by suppliers of these technologies. The objective of this article is to provide a list of factors to be considered in order to choose the most efficient, while practical technology to provide blow-off air.



How the amp works: (1) Compressed air enters the unit from the side, (2) goes around the coanda angle, (3) exits into the body, (4) draws in atmospheric air amplifying the air flow dramatically. (5) An adjustable lock ring sets the air gap to control overall flow and force needed.

The Eight Factors to be Considered

Over the past ten years, much has been made about the elevated energy costs associated with compressed air. Each facility has unique applications for blow-off air and unique working conditions. Below is a list of factors that should be considered when deciding whether to use compressed air amplifiers or blower-operated systems for a blow-off application. Each factor may have a greater or lesser weight over the other depending upon each factory's unique set of circumstances.

1. Availability of energy
2. Space and weight
3. Noise level
4. Application particulars
5. Reliability
6. Energy cost
7. System cost
8. Maintenance and operating costs

1. Availability of Energy

When choosing between a compressed air amplifier and a blower-operated system, the availability of energy can be a factor. With a blower-operated system, the cost to bring electrical power to the unit must be evaluated. For the amplifier, one must see what the piping will cost and what impact this will have on the compressed air system. If a new air compressor is required, the costs may be prohibitive.

The air knife produces a narrow, sharp flow of amplified air providing adequate shear force for blow-off. The air knife is compact and has an on-off control so it is used only when needed.

EIGHT FACTORS TO CONSIDER FOR EFFICIENT BLOW-OFF AIR

This air nozzle design is popular on blow guns because it conserves compressed air while converting the pressure to flow and maintains a strong blow-off force with dead-end pressure still under 30 psi for safety.

2 & 3. Space, Weight and Noise Level

Space limitations can automatically discount the use of one technology over the other. Blower-operated systems (like air knives) require far more space and weigh more than compressed air amplifiers.

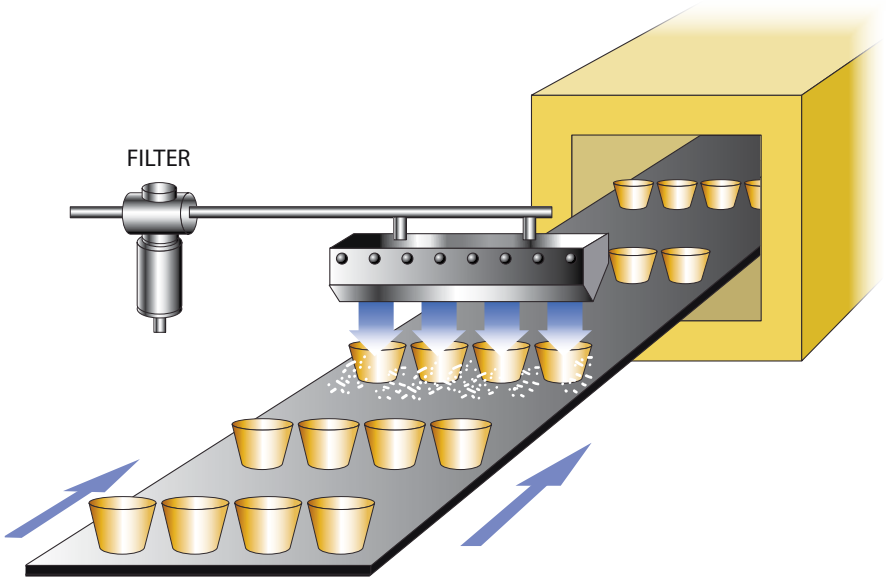
Blower-operated systems create more noise than compressed air amplifier systems. Silencers can be added to blower systems, but this adds to the cost.

4. Application Particulars

Applications where the blow-off must be continuous tend to favor blower-operated systems above 12" in length. Blower systems are typically constant running systems.

If the application calls for intermittent use of blow-off air, compressed air amplifier systems become much more economical. For example, if an item is on a conveyor, a compressed air operated air amplifier air blade (air knife) may be cycled on and off ONLY when the item is there to be dried. A blower-operated system, on the other hand, is constantly running. If the requirement for drying is intermittent, a blower system may actually use more energy than an amplifier.

The distance between points in a blow-off system is important as to which technology is best. Blowers may have heated air and one must examine the product being dried — some do not allow the presence of heat (like packaged meat products). Some metals may have stains if the moisture is evaporated-off rather than blown-off.



A compressed air operated air knife is used to blow off the extra sugar on muffins before it goes into an oven. The application uses very little compressed air at low pressure and is tightly controlled to blow off the extra sugar. This eliminates the presence of burnt sugar in the oven and makes for perfect muffins.

5 & 6. Reliability & Energy Cost

If the blower motor or the blower goes down, the production line goes down in a blower-operated system. Therefore spare parts and service response becomes a critical factor. Compressed air amplifier systems have no spare parts and run off stored compressed air and are intrinsically more reliable as a result. Smaller-size applications which are critical tend to use compressed air amplifiers for this reason.

Blower-operated systems, used for constant-duty systems, are far more energy efficient than compressed air amplifiers.

7. System Cost

Blower systems cost more than compressed air amplifier systems simply because a blower is required. Larger systems may cost significantly more if a separate location is required for the blower due to noise level concerns. Blowers also carry costs for spare parts.

8. Maintenance and Operating Cost

Compressed air operated amplifier blow-off systems have no real maintenance cost as long as there is proper oil and particulate filtration of the compressed air. One must also maintain the automatic drains on the filters. Blower systems must ensure that the blower is maintained in good working order and spare parts are on hand just in case.

The operating cost for amplifiers is the cost of compressed air. Compressed air amplifying units use small gaps to allow a small amount of compressed air to be used and their special-designed profile and shape entrains ambient air, essentially converting pressure to flow. They can go on and off as required using solenoid valves and pressure switches or other sensors to minimize the operating cost.

Summary

In deciding on a blow-off method, one cannot consider only energy costs. Each application must be considered on its own merits. It depends upon what is important in each situation. The recommendation is to consider all the factors listed in this article and then make a decision. BP

For more information, please contact Les Rapchack, at email: lesr@nex-flow.com, www.nex-flow.com

The 2008 ICDA Conference

BY COMPRESSED AIR BEST PRACTICES™

The President and First Lady of the ICDA, Tom and Marie Russell.

Left to Right: Jack and Scott Bertelsmeyer (Power Supply Industries) and Bryan Fasano (GD) with a rotary screw compressor product.

The 2008 Industrial Compressor Distributor Association (ICDA) held their 29th annual Conference and Exhibition June 15–18 in Keystone, Colorado at the Keystone Resort. The postcard setting was matched by a very well-attended Exhibition and an educational Conference. The overall atmosphere was of optimism as almost all participants had positive outlooks on the upcoming year.

The President of the ICDA, Tom Russell, outlined the following points as some of the objectives of the ICDA Conference and Exhibition.

1. Provide a look beyond our daily business of "supply side" compressed air systems
2. Get a "mountain-top" view of our industry and how our own companies contribute within our local business communities
3. Techniques to convert our "line card" to a solutions-based mission statement
4. Set the standard as the industries largest networking model
5. Introduce real-time solutions throughout our distributor network which translate to efficiencies that directly impact our own customers' bottom line

Left to Right: Gary Gillespie (GD), Kirk Kaczmarek (Best Aire) and Phil Hildebrand (GD) with GD's new Variable Speed Drive air compressor.

Center to Right: Dean Chew (GD) describes the air treatment products to Gordon Gunning (Arizona Pneumatic Systems).

The Conference

The Conference portion had the economist, Alan Beaulieu speak in his usual dynamic manner. He showed the Conference the multiple metrics his team has used to forecast economic upturns and downturns. Despite the optimism in the room, Mr. Beaulieu's models did point to a deceleration of the economy in 2009.

The second speaker was Mr. Bob DeStefano of SVM E-Business Solutions. His presentation centered on how to build a Web site which impacts your business. A presentation which was very focused on ROI, Mr. DeStefano also outlined techniques used to excel in Search Engine Optimizations (SEO).

The remaining portion of the Conference was conducted by Gardner Denver managers, presenting current and future strategies. **Note to readers:** all ICDA members are Gardner Denver Distributors and Gardner Denver is the anchor exhibitor and conference partner of the ICDA.

The Exhibition

The Exhibition had a very strong turnout with many different vendor booths displaying all kinds of compressed air and vacuum related equipment. Gardner Denver's booth, of course, was the largest and focused on showing the vast product offering GD now has. The acquisitions and organic product development at GD has given Gardner Distributors access to quite an

THE 2008 ICDA CONFERENCE

Left to Right: Chris Brooks and Mike Zarif demonstrated the new Ultra-Filter™ filter designs.

Left to Right: Luigi Vaccaro (Friulair), Bill Thomas and Mike Troyer (Belair), and Andrea Fabris (Friulair).

Left to Right: John Lowe and Doug Lux (UE Compression) and Ed Ball (Process Air Solutions).

Left to Right: Dan Keilitz (Arrow by McIntire), Mark Shaffer (Cummins-Wagner) and Chad Sauter (Pennington & Associates).

array of new technologies from GD Elmo Rietschle vacuum and blowers to full feature, variable speed drive air compressors, to a complete air treatment program. Gardner Denver's presence was impressive at the ICDA as was their enthusiastic support of the entire event.

Compressed air filtration technology was represented by numerous firms. Donaldson is launching a completely new Ultra-Filter™ coalescing filter line on a global basis. I didn't realize that the new product line represented a completely new technology until I visited the booth. The new design features pleated elements for extended surface areas and all designs meet ISO 12500.1 and 12500.2 testing processes for coalescing and adsorption filters. The housings can be connected modularly (without interconnecting piping) and they feature a new magnet-based gauge technology able to predict the most energy-efficient moment to change the filter element.

There were many new products for the ICDA members to look at. To name a few technologies on display; McIntire displayed their new Arrow cycling refrigerated air dryers, Belair showed their complete air treatment line-up with Friulair dryers, Hitachi displayed oil-free scroll air compressors, BEKO displayed their new oil measurement instruments and Process Air Solutions showed their new Vortron blowers.

Colorado was a pleasure to visit as was the ICDA Conference. The ICDA also held a golf outing and a cowboy-themed barbecue dinner out at the horse corral. The only thing better than the mountain valley setting, was the upbeat attitude of all the attendees. I can assure you that the ICDA members are looking forward to 2009! BP

EXPERT SERVICE FOR TOBACCO ROAD

Compressed Air Best Practices™ spoke with David Vanhoy (Sales Manager) and Lane Hollar (Senior Systems Auditor) of Air Flow, Inc.

Good morning. How did Air Flow, Inc. get started?

Good morning. My two partners (Glenn Schenk, Ted Allen) and I (David Vanhoy) worked for a large corporation in the air compressor business and we got tired of being told our branch was going to close and we were going to get transferred to the end of the earth. We also got tired of the policy of very expensive service after the sale. So in 1985, we decided to set up Air Flow, Inc., with the strategy based solely upon providing the best technical service. I sold service contracts and my two partners did the service work.

What region do you cover and how many employees do you have?

We met Jack Sloan, who was the Vice President of Sales for Sullair Compressors, in 1988 and we agreed to represent Sullair. Over time our territory representing Sullair has grown to include all of Central and Eastern North Carolina.

Our business has grown to include a total of 32 employees. The service group now numbers 14 factory-trained service technicians. Our sales force includes one full-time, expert systems auditor (Lane Hollar). In 2002 a venture capital group bought into Air Flow and Glenn and Ted retired from the company.

Air Flow Inc. represents Sullair Compressors in Central and Eastern North Carolina

EXPERT SERVICE FOR TOBACCO ROAD

What capabilities does Air Flow have?

Our objective is that our customers will not experience downtime due to their compressed air system. Our company is structured around making this happen. We focus on preventative maintenance programs and also have an emergency service group. The ability to rapidly rent machines has also helped some customers make it through a crisis. We offer expert air energy system audits and analysis and new machine sales.

Our primary administrative office is in Greensboro. In Woodleaf, North Carolina we have our rebuild center where we can overhaul and rebuild any brand and any type of air compressor. Many of our technicians are also North Carolina-licensed refrigeration technicians who can get refrigerated compressed air dryers up and running on those hot summer days. We also have service based in Rocky Mount and Fayetteville, North Carolina. We have our service technicians positioned throughout our service area and are proud to be available 24/7 — 365 days a year!

We also think education is key for our customers. For this reason we do many "lunch and learns" at engineering firms and large customers. In addition to this, we conduct formal compressed air seminars on a regular basis.

How's the Tobacco Industry doing for you?

Food processing and packaging facilities are a significant industry in North Carolina. The tobacco industry is one of our largest customers. We are currently, for example, the service provider under contract at a top-three tobacco manufacturer. Under this contract it is our job to keep nearly 10,000 horsepower in centrifugal air compressors running in good order at their eight building complex!

Air Flow has a service contract for 10,000 horsepower in centrifugal air compressors.

We represent FS Elliott oil-free centrifugal air compressors in North Carolina and southwest Virginia. Our service technicians are factory-trained by FS Elliott and capable on these big systems.

When we are auditing, we benefit from the fact that Air Flow represents such a wide range of compressed air technologies. With the Sullair product line, which I personally believe is the premium line of rotary screw air compressors in the world, we can offer single- and two- stage air compressors, variable capacity controls, demand controllers as well as variable frequency drives and virtually all technologies in compressed air drying. With the FS Elliott line of centrifugal air compressors, which is the highest quality centrifugal air compressor built; we can accommodate oil-free and large cfm applications. And for the special and very large dryer applications we call on Airtek. Our customers know that our audits recommend the best equipment for their application, rather than recommending the equipment we have to sell.

How about Meat Processing?

Meat processing and packaging is very important to us. We work with a pork processing plant that processes 33,000 pigs a day. Poultry plants are common here and we have the top two turkey processing plants in the country as our customers. We also have a huge hamburger processing and packaging plant we work with.

Is the Textile Industry hanging in there?

We see the textile industry rebounding in North Carolina. We have seen textile firms come back to North Carolina after having "given it a try" in Mexico, Vietnam, Guatemala, Pakistan, and China — to name a few. We have an air-jet weaving plant which is re-opening after having been offshore. The yarn, yarn dyeing, and high-tech textile industries all seem to be coming back. We do know one large corporation continuing to try to get out as fast as they can — but we are seeing an overall rebound for textile. North Carolina has a long history with textile, meaning a trained labor force and modern infrastructures to support it.

What other industries are in North Carolina?

There are many of course. Microelectronics has grown in the Raleigh-Durham-Chapel Hill triangle. The automotive (Tier 2 and 3) industry is also growing here. Factories are going in on county roads with no sign out front but with a lot of trucks coming and going. It's difficult to find out what's going on in there but invariably we discover it's a parts manufacturer for the automotive industry.

What's the #1 piece of advice you'd give a plant manager.

We always advise our customers to get an understanding of what their compressed air system is costing them. For those of us in the industry, the topic has been there for a lot of years. For our industrial air users, very few understand the energy costs associated with their compressed air system. One time after a walk-through of a facility, I gave a Plant Manager a very conservative estimate of what his compressed air system was costing him in energy usage. The Plant Manager became so upset at the number I gave him he refused to believe me. When I insisted (it was a very straight-forward installation) he showed me the door to his facility!

Air Flow, Inc., has an Airend Rebuild Shop in Woodleaf, North Carolina.

During our seminars we usually ask the attendees if they know what they energy cost of their compressed air system is. Usually one out of twenty attendees is close with his estimate. Many have no idea at all. We always give out a free Starbucks card to the winner!

Few industrial users understand the energy costs associated with their compressed air system.

EXPERT SERVICE FOR TOBACCO ROAD

Is industry open to examining the energy costs of compressed air?

Absolutely. That Plant Manager I mentioned was the exception to the rule — it's always a fun story to tell though! We field a lot of inquiries from Plant Managers, Plant Engineers and Utility/Energy Managers wanting to know how they can reduce their electrical energy costs. With our auditing expertise, this demand for knowledge coming from industry is helping to grow our business. These Engineers are now purchasing compressed air systems to reduce their energy costs. In the past, they only purchased air compressors when they needed more air pressure.

The great thing about these projects is that they pay for themselves in typically one to two years. They also afford the corporation the ability to talk about environmental responsibility and its efforts to reduce their carbon footprint and GHG emissions.

Please describe your auditing program.

We offer three levels of audits but focus on the first and last level. The entry-level audit is a no-charge walk-through. We will take a look at the supply-side of the system and note what types of air compressors and dryers they have. We'll look at the position of the inlet valve on the air compressor. We'll look at the types of controls the air compressors have and from this we can generally give the customer an idea of whether it is worth a more detailed investigation/audit.

The second level (the one we don't do often) is a two to three day audit where data logging is done on the system and a recommendation is generated. We don't feel that two to three days is a long enough period of time to be representative of a compressed air system — and for this reason we discourage the use of this audit.

The third level (and our most popular audit) is the in-depth audit, which is done over seven days. We will measure kW and numerous other variables. Pressure readings are taken at the compressor discharge and before and after the air treatment equipment. Our equipment (like the LogAir System from Sullair) is designed for the compressed air industry and is not an off-the-shelf model that will do air also. We have the memory available that we can log for up to two weeks and we take a reading every three seconds. Other systems only take a reading every two to three minutes. A lot can happen with an air system in this time period. No one else in the industry can record as many data points as we can. A typical audit will record over 350,000 data points. From this data we can build the profile of what a system is truly doing. We will also go into the plant and look for low-pressure areas and inappropriate uses.

What inappropriate uses of compressed air do you run into?

There are a number of inappropriate uses, which keep popping up. A big one in the summer continues to be "personal cooling." We continue to find air hoses with the trigger taped open and positioned in a manner so it can act as a fan. Management never believes us when we find this! Blow-off air continues to be a great opportunity for improvement as well. Compressed air leaks continue to be prevalent and we offer ultrasonic leak detection services to conduct leak audits. Our leak detection system allows us to not only locate and tag a leak, but to assign a cfm value and annual cost as well.

What is the biggest efficiency opportunity?

The biggest opportunity is in compressor controls. We consistently find older installations with multiple air compressors that cannot work together. The air system is supplied by this collection of inefficiently working equipment. When these facilities grow, they often just add another air compressor. Usually when we see one of these compressor rooms with three machines running, we estimate it should only be 1½ machines in operation. Usually these systems deliver only 3½ cfm per horsepower. We are able to get them between 5 and 5½ cfm per hp!

What advice do you have for the food industry?

When using food-grade coolant (as is required), be sure to change it at the 1,000-hour point as specified. We sometimes see a lack of timely maintenance in the food industry on the lubricant because it is expensive. Not changing the lubricant, however, can result in a build-up of varnish, which in turn can cause the premature failure of an airend. We have our own airend rebuild shop, which is always happy for more business but we know that the best thing for our customer is to simply maintain their equipment appropriately. And in some applications, the processor may want to consider oil free.

How are power costs and the energy rebate programs in North Carolina?

A typical blended rate here is $0.05 per kWh. Our two main utilities are Duke Energy and Progress Energy. They run incentives on and off and it's just a matter of keeping up with their current incentive programs. The State also has a low interest rate loan program for industry based upon the size of the projects' energy reduction.

There are some co-ops who buy bulk energy from Duke Energy and Progress Energy. During the summer or during peak periods, the co-ops will give a two-hour warning to their industrial customers that the price will go from $0.05 to $0.15 per kWh. Many of our customers have turned to us to see how they can go offline during these peak usage periods. We have seen Liquefied Propane Air Compressors as rental units and some will purchase their own bulk load generators.

The systems are all pre-piped and ready to go so that when the customer gets the phone call from the co-op, they can just walk down and fire up the stand-by air compressors. The customers are excited when we can supply them a rental solution to this energy crisis! BP

Thank you, Air Flow, for your insights.

For more information, please contact David Vanhoy, Air Flow, Inc., tel: 336-605-9622, email: dvanhoy@airflowinc.com

VACUUM PUMP OIL CARRYOVER

BY DOCTOR VACUUM

It is a fact that oil-sealed vacuum pumps are prone to oil carryover. Residual oil makes its way through internal separation systems and is found at the discharge of these types of pumps. If oil accumulates in great enough quantities, it becomes an environmental issue or safety hazard. It is therefore the responsibility of vacuum pump owners to maintain clean work areas. However, this is not always easy to do given the dynamics of how vacuum pumps operate within ever-changing vacuum systems. In addition, some pump designs do an excellent job of attenuation while others allow for significant contamination.

Oil carryover is easy to spot. If a vacuum pump is exhausting directly into the local area, there will be an oily film on the vacuum pump itself, on interior walls and on close proximity equipment. Some vacuum pumps will actually "smoke" oil from the exhaust port. This is an extreme condition that was more common historically. New separation designs have reduced the number of these occurrences but they are still to be found in some applications. Where there is a discharge pipe venting vacuum pump exhaust to an outside wall or ceiling, there will be oil dripping down the exterior wall or pooling on the roof. Oil can also be leaking from pipe joints and dropping onto the floor or back onto the vacuum pump.

The mechanics of why oil is present at the exhaust of a vacuum pump is not difficult to understand. Most separation systems can effectively remove discharge oil contamination down to 1 ppm to 4 ppm (parts per million). This may seem to be an insignificant amount, but consider what happens over time. A vacuum pump that is running 24/7 will be discharging oil continuously in small amounts. Eventually, the buildup becomes a problem. A good example of this is a 40-horsepower (hp) vacuum pump operating continuously at 20" HgV. At a carryover rate of 3 ppm there will be approximately one quart of oil per month that makes its way past the separation system. That is more than three gallons of oil per year that will end up somewhere — on the roof, on the walls, out to the environment or on top of production equipment. Some separation systems are so loose that carryover is measured in pints per day.

Solving this issue is not always easy and other factors must be considered. The type of oil used will have an effect on the carryover rate. Some oils vaporize more easily than others and if oil particles are small enough, they will travel right through most separation media with the exhaust air. The discharge temperature of the vacuum pump also plays a critical role in many applications. With some oils, a higher discharge temperature will increase the carryover rate. If discharge temperature is lowered, separation will be better but there is also the risk of water (or other

vapor) condensation in the pump oil reservoir. Discharge temperature must therefore be balanced between the risk of condensation in the oil reservoir and excessive oil carryover. Another important factor is how well the coalesced oil can be removed from the "dry" side of the separator element. If coalesced oil cannot be removed quickly enough, the separator element will begin to fill up with liquid oil. As it fills with oil, there is less media surface area available for air flow resulting in an increase in velocity and higher oil bypass.

The most common method of reducing excess oil carryover is to install an external oil mist filter, also called a demister, at the discharge port of a vacuum pump. These filters utilize specialty elements that coalesce most of the excess oil and provide for much cleaner discharge air. Installing the correct size filter is important so that air velocities remain low enough for effective separation. A good rule of thumb is to size the external exhaust filter for the nominal rating of the vacuum pump. A 40-hp vacuum pump rated for 500 acfm will need an exhaust filter rated for 500 scfm. Downsizing the demister is acceptable in some applications where the system is operating at a steady vacuum and there is little chance of fluctuations. Liquid oil that is collected in an external oil mist filter can be drained to a separate collection system for proper disposal. A lot of research has been done on improving auxiliary oil mist filters over the last several years. The designs in use today are effective and worth the investment. Note that even with an external exhaust filter there will still be some oil carryover from the vacuum system but the amount of carryover from a vacuum system with an exhaust demister is significantly less than a vacuum system without one.

One other point to note is that in systems with discharge piping to the outdoors or other areas it is important to install drip legs in the vertical run of pipe so that particulate or dirty oil does not drain back down into the vacuum pump. This arrangement will create a spiraling contamination loop by keeping all non-desirables in the vacuum pump. Water is of particular concern because it is very likely to condense in the relatively cool vertical discharge piping.

Keep your work environment green by maintaining a clean air discharge from your vacuum pumps. It is easy to obtain and install oil mist exhaust filters that will provide for years of clean operation. BP

For more information, contact Dan Bott, Dan Bott Consulting LLC, tel: 251-609-1429, email: dan@dbott.com, www.danbottconsulting.com

"Keep your work environment green by maintaining a clean air discharge from your vacuum pumps."

Real World Best Practices

by Hank Van Ormer

UTILIZING VENTURI VACUUM GENERATORS

When the 18th Century Italian physicist Giovanni Venturi discovered that when air is forced through a conical nozzle its velocity increases and the pressure decreases, neither he nor anyone could conceive that it would ultimately "spawn" one of the **most used** and **most highly controversial** products used in industry today — the Venturi vacuum generator (also called ejectors).

Many people, through misunderstanding, do not fully understand the benefits of this product; and, more importantly, the limitations. To further confuse the issue, various manufacturers call them different names — "pump," "ejectors," "vacuum transducer pumps," etc. The most accepted general category name, in our opinion, is "Venturi vacuum generators," which describes exactly what it does.

To some, it is the "greatest thing since sliced bread." To others, it is a constant waste of air. In the real world, the truth lies "somewhere in between" and "at the extremes" depending on the application.

How it Works:

In its simplest form, the single-stage Venturi generator flows air through the conical Venturi orifice. As the conical orifice opens in size, the pressure falls and the velocity increases. The intensity is such that a vacuum (lower pressure than ambient air pressure) is formed and air to be evacuated from the process is pulled into the flowing air stream and blown out.

The Venturi vacuum generator has many advantages:

- No vibration
- No heat generation
- No moving parts
- Vacuum on and off immediately with the air supply
- Will tolerate aggressive conditions very well; low cost; quick to repair or replace
- Can be located very close to the process, reducing the amount of evacuation air and offering fast cycle times
- Lightweight and mobile
- No electricity required
- Quick changeover time for service and/or component change

The Venturi vacuum, however, does have some disadvantages:

- Uses more air to pull a higher degree of vacuum
- Standard units use compressed air whenever turned on
- 100 psig class compressed air is more energy expensive to produce than vacuum
- Performance can be sensitive to compressed air supply pressure

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BENEFITS

As part of the technology and specialty pavilions at NPE2009, Compressed Air World will be in "Technology Central" in the West Hall and co-located with the NPE Educational Program that will feature ANTEC@NPE2009 produced by SPE and the SPI Business of Plastics conference.

The Compressed Air World pavilion will be the hub of activity for the compressed-air segment of the plastics industry. An exhibit in the pavilion can be your main set-up at NPE2009 or a satellite of your full display, elsewhere, to highlight a specialty of your company.

FEATURES

West Hall, Booth #115025

Size: 4,000 square feet total with two options for exhibiting.

Option 1: 1,500 square foot display area for turnkey kiosks. A station within a kiosk includes graphic header, stool and lockable cabinet.

Option 2: Sixteen 10x10 traditional booths or combinations.

This space includes a 1,500-square-foot display area where individual turnkey kiosks will be located around an Information Center and a lounge area. The remaining 1,600 square feet is set aside for traditional booths.

Commercial Participation Package

SPI Members: turnkey kiosk, $2,250
exhibit space, $22.50/sf
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spi Produced by the plastics industry trade association

REAL WORLD BEST PRACTICES

UTILIZING VENTURI VACUUM GENERATORS

Basic Vacuum Pressure Measurement Units

NEGATIVE GAUGE PRESSURE PSIG	ABSOLUTE PRESSURE PSIA	INCHES OF MERCURY IN HG
0	14.7	0
ATMOSPHERIC PRESSURE AT SEA LEVEL		
-1.5	13.2	3
-3.0	11.7	6
-4.5	10.2	9
TYPICAL POROUS VACUUM LEVEL		
-6.0	8.7	12
-7.5	7.2	15
-9.0	5.7	18
-10.5	4.2	21
TYPICAL NON-POROUS VACUUM LEVEL		
-12.0	2.7	24
-13.5	1.2	27
-14.7	0	29.92
PERFECT VACUUM (ZERO REFERENCE PRESSURE)		

Central Vacuum System

If the vacuum using processes are all located in an area which appears to be more effectively better served by a separate central system, an evaluation is in order. Items to consider are:

- Are you tying into an existing central vacuum system with available capacity or do you need to add a new system or expand the existing system?
- The cost and risk of effective piping to the process areas eliminating reduced performance due to restrictive piping valves, filters, leaks, fittings, etc.
- Can the central vacuum system react quickly enough to optimize the production cycle time?

When conditions call for replacement of a large group of Venturi vacuum generators, the result can be very energy effective — for example:

At a recent plant utilizing 30 Venturi vacuum generators of various brands, they were flowing 150 cfm of compressed air (32 kW) to remove 200 cfm of evacuation air to an 18" HgV on a continuing basis with a relatively porous material. These units were replaced with a 10-hp single-stage, rotary screw vacuum pump (7.8 kW) at 18" of vacuum. The actual input power fell to about 5 kW where it remained most of the time.

In this case, the average electric power rate was $.095 kWh and the operating hours were 6,240 per year; a net savings of 27 kW x .095 x 6240 = $16,000 per year with a $15,000 cost of the rotary screw pump system.

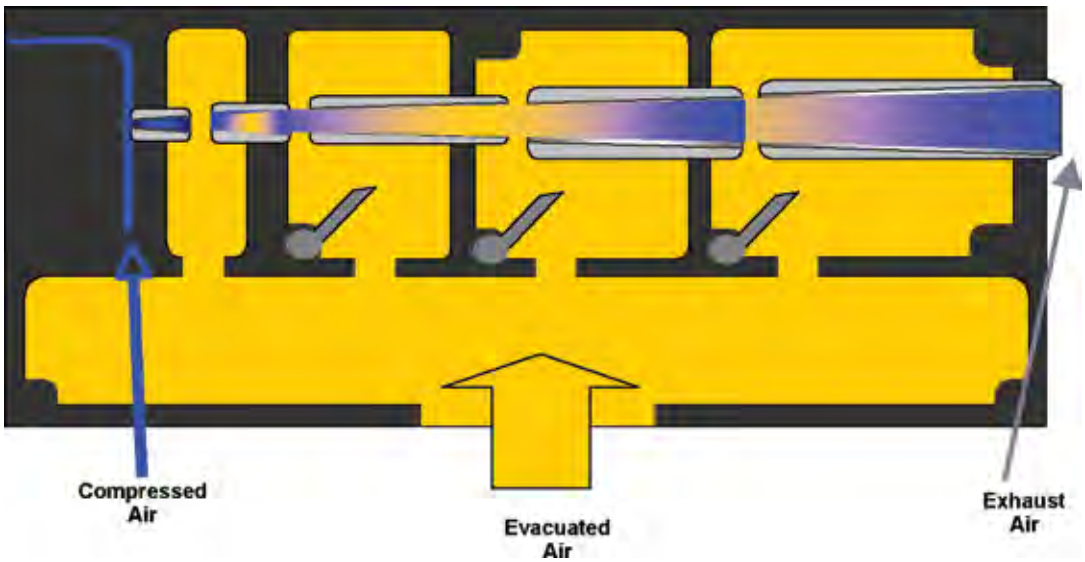
Venturi Vacuum Generators should generally be located as close to the actual process as possible.

- An effective Venturi vacuum generator offers great flexibility in a decentralized system and when well-controlled
- With a decentralized system and Venturi vacuum generators mounted close to the suction cups, losses caused by long, small hoses, bends, fittings, valves, filters, etc., are eliminated
- When proper system design strategy is implemented, it will take advantage of the ability of the Venturi vacuum generator located near the process to react quickly and pull the required vacuum quickly; then shut off the supply to refill the vacuum
- Most of the newer Venturi vacuum generators are much less sensitive to varying inlet pressures

New Changes in Vacuum Generators Lending to Better Productivity and Lower Operating Cost:

The multi-stage Venturi vacuum generator utilizes built-in flapper type valves to increase the avenues of evacuation and significantly reduce the evacuation time; therefore, possibly increasing the "cycle time." Appropriately applied "multi-stage" design is reputed to reach the target vacuum up to twice as fast as similar sized single-stage units with the same or almost the same compressed air usage. If the cycle time can be economically increased, this can be a significant gain in production, but not necessarily any reduction in compressed air energy cost.

Typical Multi-Stage Venturi Vacuum Generator



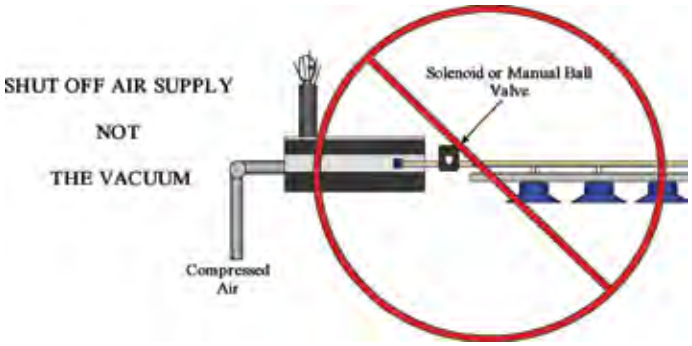
REAL WORLD BEST PRACTICES

UTILIZING VENTURI VACUUM GENERATORS

Automatic Controls:

Anytime you have to run the vacuum generator, it uses compressed air. Conversely, once the full vacuum is reached, it is very energy efficient to shut off the airline to the vacuum and, with proper valving, hold the vacuum without using any air. Some porous materials will of course not allow this; however, many, many materials do.

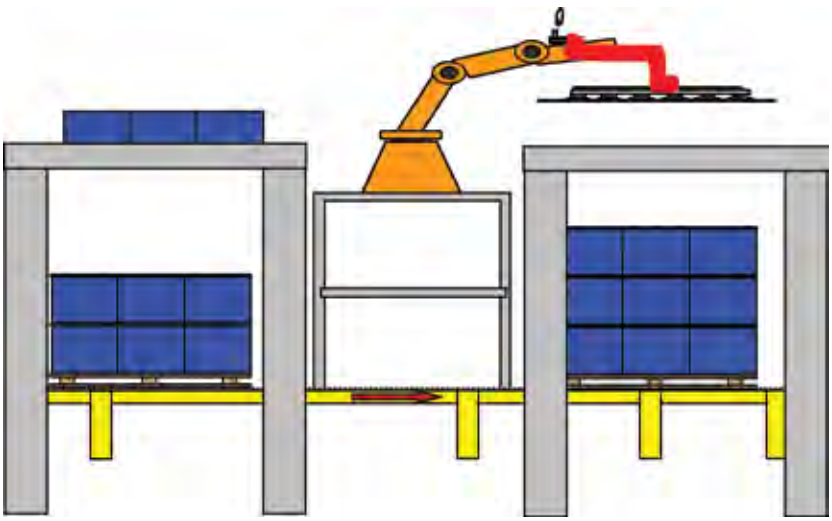
Many times these controls are through a PLC software program supplied by the machine manufacturer.



On a recent plant audit, a set of six palletizers at the end of packaging lines were reviewed. Each palletizer has a robotic arm with six suction cups and two Venturi vacuum generators, both running, drawing six scfm each at 60 psig.

The software program had the robotic arm pickup the slip sheet from the side and hold until the signal from the pallet activated and then the slip sheet was then set down and released. The air was then shut off. The robotic arm then went immediately to the stack and picked up another slip sheet and held it until the next release signal.

The result of this was an average taken over an hour of holding and movement with the air on of 52 seconds and an hourly average of 9.3 seconds of movement with the air off with an average cycle time of 61.3 seconds.



The basic operating data was:

Production hours = 6,240 hrs/year

Blended annual power rate = $.115 kWh

Two single-stage vacuum generators at 6 cfm each full flow at 60 psig per palletizer for a total of 12 scfm each unit

Air on/off time of total = (52 seconds on + 9.3 seconds off = 61.3 seconds)

Annual operating hours air and suction on = 85% time x 6240 hrs = 5,304 hrs/year

Average cfm = 52 seconds ÷ 60 seconds = 87% of full load flow = 5.2 scfm/ea valve open

Or 10.4 scfm for two

Annual Electrical Energy Operating Cost = 10.4 ÷ 4 each/scfm = 2.6 hp for each palletizer

Or 2.6 hp x .746 ÷ 90 = 2.16 kW input energy

2.16 kW x $.115 kWh x 5,304 hrs/year = $1,318/year per unit

Total for six units = $7,908 / year

Full integrated Venturi vacuum generator with automatic start/stop.

Courtesy Parker.com

Our first suggestion to the plant was to change the software program so that the operating profile was on just the 15% of the time and off 85% of the time.

Potential annual electrical energy savings = (2.16 kW x .115 kWh x 936 hrs = $233/yr)

$1,085/yr each unit or $6,510/yr for six (6) units

It was noted that this was only figuring the electric energy cost savings which "goes immediately to the bottom line." No allowances for the other compressed air costs such as maintenance, repairs, depreciation, etc.

The reply was immediate. "There is no way anyone is going to touch that software. This machine was made overseas and no one here is trained on it." End of discussion.

Our next suggestion had a little more bite. We suggested replacing the current Venturi vacuum generators with one vacuum generator integrated system with a built-in air economizing system.

This product is a Venturi vacuum generator packaged with accessory components to automatically shut off the air supply when the target vacuum is reached and restarted as required (if required) to hold the vacuum. **Complete automatic control is accomplished within the vacuum generator assembly and there is no requirement to modify or touch the host machines control software!**

REAL WORLD BEST PRACTICES

UTILIZING VENTURI VACUUM GENERATORS

With the same operating conditions we now have the following operating electrical energy cost analysis for compressed air use.

- Production Hours — 6,240/yr
- Power Rate — $.115 kWh
- One E-Stop Venturi vacuum generator with built-in automatic control system (air economizer) and full load flow — 9.4 kW at 60 psig
- Suction time — 85% of 6,240 hrs/year = 5,304 hrs/year
- Generator on time — .7 seconds / (÷ 50 seconds) = .012 minutes
- Air on time during production = .012 minutes x 60 minutes = .72 minutes per hour
- .72 minutes per hour = (.72 ÷ 60) .012% hours
- 5,304 production hours suction or (5,304 x .012) = **64 hours/year air on**

Average scfm flow:

- Full load flow — 9.4 scfm
- Actual flow .012 minute = 9.4 scfm x .012 = .113 scfm each
- Total for six units = .678 scfm = (÷ 4-hp/cfm input power) = .170 average hp (x .746 ÷ .9 ME) = .141 average kW input
- Annual electrical energy cost of operating six units (.141 kW x $.115 kWh x 64 hours) = $1.04/yr

The applications went from an annual electrical energy operating cost of *$7,908/year for six units to $1.04/year for six units.* Or, from a significant to an almost insignificant cost by changing to a more appropriate type vacuum generator for the conditions including proper, well-sealed cups.

There are some instances where the savings might not be so dramatic such as when an extremely porous material needs to be held. However, many Venturi vacuum generator processes, particularly with robotic parts, transfer after significant opportunities. The more cups involved with the more extended time, the greater the potential savings. Obviously, when properly maintained, this type of product also should enhance productivity.

What is an integrated E-Stop Venturi vacuum generator with Air-Economizing Feature?

This product, taking advantage of modern electronics, is completely equipped as a single unit with integrated control. No other controls are needed and it can be installed and operated without the utilization of machine controlled software.

Venturi generators integrate pressure sensors, vacuum valves, blow-off valves and check valves, vacuum filters and E-Stop functions in a single assembly. The vacuum pilot valve is toggled "ON" and "OFF" for air economizing. The check valve holds the degree of vacuum in the cup when the air-economizing system is conserving air consumption. When a part is adhered to the cup, the vacuum pilot-operated valve is in the passing state.

When power is lost, the E-Stop valve shifts. This air signal passes through the vacuum pilot-operated valve, which shifts the normally closed master valve to create vacuum flow. No matter what state of air economizing, this sequence will create vacuum flow to maintain the part on the cup because the *emergency-stop unit circuit is separate from the air-economizing function.*

Use of an integrated Venturi vacuum generator with automatic control in many applications will allow the oversizing of the venture vacuum generator to cover higher cycles, unexpected leaks, etc. without interrupting production and **still only using the minimum compressed air required.**

Control circuits to accomplish the same goals can be built onsite by qualified personnel and in addition to the proper design, the optimum vacuum sensors, control valves, check valves, blow- off valves, vacuum filter and e-stop components must all be located and installed. Many operators today feel much more comfortable with the new integrated units utilizing modern, quick response reaction. BP

For more information contact Hank Van Ormer, tel: 740-862-4112, email: hankvanormer@aol.com, www.airpowerusainc.com

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Working Together for Compressed Air Best Practices

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

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

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

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

RESOURCES FOR ENERGY ENGINEERS

TRAINING CALENDAR

TITLE	SPONSOR	LOCATION	DATE	INFORMATION
Compressed Air Management	Power Supply Industries	Fenton, MO	8/19/2008	www.psiind.com
Humidity Measurement Training Seminar	Vaisala	Boston, MA	9/8–11/2008	www.vaisala.com/seminar
Energy Management Training	Masters' Academy	Milwaukee, WI	9/22–26/2008	www.mastersacademy.biz
Best Practices in Compressed Air	World Energy Engineering Conf.	Washington D.C.	10/2/2008	www.energycongress.com
Humidity Measurement Training Seminar	Vaisala	Toronto, ON	10/8/2008	www.vaisala.com/seminar
Compressed Air Management	Power Supply Industries	Fenton, MO	11/4/2008	www.psiind.com
Humidity Measurement Training Seminar	Vaisala	Chicago, IL	11/5–6/2008	www.vaisala.com/seminar

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

PRODUCT PICKS

Wireless Software for Technicians

S2000*Wireless* is now available to wirelessly connect the technician in the field to the dispatcher in the office, thus eliminating all paper work while drastically reducing communications time between the technician and the dispatcher.

This will speed up the billing process (eliminates all paper from the field), allow the tech in the field to directly extract information for the service call (equipment history, work order history, comments/notes, phone numbers, etc), update the status of the call (travel, started, complete, etc.) and then upon completing the work, he can enter hours, material (including purchased supply house material), misc. charges (travel, consumables, etc.) and notes (both typed and selected "Quick Notes"). This information along with the customers signature will then be automatically sent back to S2000WIN (service dispatch software and accounting) ready for billing review and processing.

S2000Wireless
Tel:800-643-1339 x5310
Email: rons@s2000win.com

PRODUCT PICKS

Compressed Air Hose

Parker announced its new Compressed Air Hose (CAH) designed and specially formulated to withstand the demanding requirements of air compressors. Every part of the new CAH line is specially designed — from the inner tube of Nitrile synthetic rubber, to the wire and fiber reinforcement and the outer fiber braid cover. The result is a compressed air hose with superior fluid compatibility for all air compressor applications.

Available in sizes from -4 (3/16-in.) to -40 (2 3/8-in.) CAH works equally well with the following fluids and temperatures in pressures up to 500 psi:

- Petroleum-base hydraulic fluids, lubricating oils and antifreeze solutions -10 °F to 235 °F
- Polyol Ester fluids up to 175 °F
- Water, water/oil emulsion and water glycol fluids up to 185 °F
- Air up to 158 °F

Parker Hannifin
Tel: 440-205-7799
www.parkerhose.com

Reduce Air Compressor Energy Costs

JORC announced its new Air-Saver® programmable motorized ball valve. Air-Saver® is installed on the outlet of the compressed air storage tank to isolate the tank from the downstream piping distribution system. When the plant is closed overnight and air leaks cause pressure to drop, Air-Saver® will prevent tank pressure to drop. This in turn will prevent the air compressors from starting up (thereby saving energy) to restore the tank pressure.

Ideal for installations which close down overnight, Air-Saver® can be programmed to automatically OPEN just prior to when the working shift begins and to CLOSE just after the working shift is over.

JORC INDUSTRIAL
Tel: 302-395-0310
Email: info@jorc.com
www.jorc.com

Dryers Receive CAGI Approval

ZEKS Compressed Air Solutions cycling and non-cycling refrigerated compressed air dryers have been certified to meet the requirements of the CAGI (Compressed Air & Gas Institute) Performance Verification Program. This voluntary program subjects member manufacturers' 200–1000 scfm refrigerated air dryers to controlled laboratory testing to validate pressure dew point, pressure drop and energy consumption against a manufacturer's published performance claims. ZEKS is among the first to receive this certification.

The significance of obtaining this certification is that, for the first time, buyers of compressed air treatment equipment can compare performance and energy consumption of similarly-sized dryers available from participating manufacturers using unbiased results from third-party testing. Individuals are invited to access the CAGI Dryer Data Sheets that are posted on the ZEKS website.

ZEKS
Tel: 610-692-9100
www.zeks.com.

RESOURCES FOR ENERGY ENGINEERS

PRODUCT PICKS

Direct Drive Air Compressors

Kaeser Compressors has announced their direct drive series. Designed for efficiency, reliability and minimal maintenance, these units are available from 25 to 450 horsepower (hp), in flows from 72–2003 cfm and pressures to 217 psig.

Kaeser's compressors feature the optimized Sigma Profile air end, patent-pending Sigma Control and the latest one-to-one direct drive technology. True direct drive compressors — with an oversized air end connected directly to the motor via a maintenance-free coupling for "zero-loss" transmission efficiency. Kaeser's unique cooling air flow design significantly reduces noise levels and provides superior cooling. Plus, all units are fitted with a redesigned, high-efficiency separator system for extremely low oil-carryover — perfect for instrument and bulk air needs.

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

Compressors Receive CAGI Approval

BOGE America announced their lubricated rotary screw air compressors have recently been given the seal of approval by the Compressed Air and Gas Institute (CAGI). These units have undergone and passed independent testing to verify the accuracy of stated Boge performance specifications as part of the CAGI Performance Verification Program.

Boge America, Inc. has recently joined the CAGI Performance Verification Program. Developed by the member Companies of CAGI, the program provides an industry-wide uniform verification process by which manufacturers of rotary screw compressors can verify the accuracy of technical performance data published on CAGI data sheets and within literature.

Recognizing the reliance that compressed air users have on the accuracy of data provided by each manufacturer, member Companies of CAGI developed the Performance Verification Program. Participation is voluntary and open to CAGI member and non-member manufacturers of lubricated rotary screw compressors from 50 to 200 hp.

As a participant, a test sample of Boge's equipment was recently tested by the Program Administrator — Intertek Testing Services — to verify that the certified published performance ratings are in fact accurate. The Boge equipment successfully passed the Verification Test and all related CAGI Data Sheets, product literature and the actual products will now carry the CAGI Program Verification Seal. Like other participating manufacturers, Boge America, Inc. will be subject to annual tests on two randomly chosen units.

BOGE America
Tel: 770-874-1570
Email: usa@boge.com
www.boge.com

Wall Street Watch

BY COMPRESSED AIR BEST PRACTICES

The intent of this column is to provide industry watchers with publicly-held information, on publicly-held companies, involved with the sub-industry of compressed air. It is not the intent of the column to provide any opinions or recommendations related to stock valuations. All information gathered in this column was on August 5, 2008.

Stockholm, Sweden, July 18, 2008: Atlas Copco reported second-quarter results with continued strong order growth across all business areas and regions. "The growth has been particularly strong in emerging markets and in the mining industry," says President and CEO Gunnar Brock.

"We believe that the overall demand for Atlas Copco's products and services will remain at a high level in the near term, primarily because of a continued strong demand development in emerging markets and the mining industry." Some customer segments in North America and Western Europe, related to consumer goods and residential construction, are expected to weaken.

Revenues during the quarter were up 18% to MSEK 18 884 (15 985), an organic growth of 15%. Operating profit reached a record level of MSEK 3 630, up 20%, corresponding to a margin of 19.2% (19.0). "Price increases, increases in sales volume and efficiency gains have more than offset cost increases on components and negative currency effects."

In line with the strategy, Atlas Copco continues to improve its efficiency. To strengthen the long-term cost competitiveness of Industrial Technique, the business area will close a factory in Great Britain and transfer the production to Hungary.

Through strategic acquisitions, Atlas Copco has further improved its product offering and market presence. In the quarter, the Group acquired a high-pressure compressor manufacturer in the United States focusing on the oil and gas industry, two former compressor distributors in the U.S., and two service companies active in the Indonesian mining sector.

Minimizing the use of energy is a focus area and the sales of energy-efficient products continued to increase in the quarter. "Atlas Copco's continuous shift towards more energy-efficient compressors and services has resulted in reduced energy consumption in compressed-air installations. We are now enhancing our marketing efforts to promote these leading solutions to existing and prospective customers."

WALL STREET WATCH

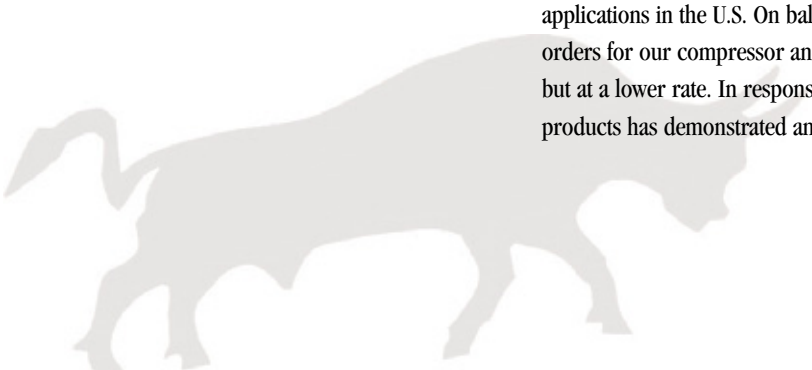
Quincy, IL, July 23, 2008 — Gardner Denver, Inc. (NYSE: GDI) announced that revenues and net income for the three months ended June 30, 2008 were $518.1 million and $49.6 million, respectively. For the six-month period of 2008, revenues and net income were $1.0 billion and $100.4 million, respectively. Diluted earnings per share ("DEPS") for the three-month period were $0.93, 12% higher than the comparable period of 2007. For the six-month period of 2008, DEPS were $1.87, 15% higher than the comparable period of the previous year. The Company's DEPS improvement for the three months ended June 30, 2008 was attributable to organic revenue growth in the Compressor and Vacuum Products segment and operational improvements. Cash provided by operating activities was $52 million in the three-month period of 2008, the highest level ever posted in the second quarter by the Company. For the six-month period of 2008, cash provided by operating activities exceeded $117 million.

"Demand for standard industrial compressors in the U.S. and U.K. has continued to slow in recent months."

Review of Results

"I am very pleased with Gardner Denver's performance in the second quarter of 2008, which reflects the Company's flexibility and drive to improve results in the face of many dynamic changes," said Barry L. Pennypacker, Gardner Denver's President and Chief Executive Officer. "During the quarter, we achieved record shipment levels, furthered our understanding and application of lean methodologies and negotiated the Company's most significant acquisition since 2005. The acquisition of CompAir is intended to strengthen Gardner Denver's position as a leading global provider of compressor and vacuum products, further diversify the Company's end market segments served and expand product technologies available to our customers. We believe the synergies between the two organizations are very compelling.

"The second quarter results reflect continued strength in most of our compressor and vacuum end market segments and a slight re-acceleration in demand for drilling pumps," said Mr. Pennypacker. "While demand for compressor and vacuum products was broad-based during the quarter, both regionally and across product lines, certain areas of our business have begun to show weakness and our outlook remains cautious for the second half of this year. In particular, demand for standard industrial compressors in the U.S. and U.K. has continued to slow in recent months. Demand for compressors tends to follow changes in industrial capacity utilization rates and when this key indicator declines below 80%, which occurred in the U.S. during the second quarter of 2008, historically orders for compressors decline six months later. Demand for compressor and vacuum products remains strong in Asia, while Europe is still growing, but at a lower rate. Demand for our engineered products continues to be robust throughout the world, including environmental and oil and gas refining applications in the U.S. On balance, the economic climate appears consistent with our expectations that orders for our compressor and vacuum products will continue to grow through the balance of the year, but at a lower rate. In response to elevated prices for oil and natural gas, demand for our petroleum products has demonstrated an improvement, although not to levels realized in 2006.



Compressor and Vacuum Products segment orders and revenues grew by 13% and 18%, respectively, in the second quarter of 2008, compared with the same period of 2007, reflecting favorable changes in foreign currency exchange rates and increased global demand for engineered packages and products used in original equipment manufacturer ("OEM") applications. Manufacturing integration projects completed in 2007 resulted in year-over-year operating margin expansion in this reportable segment and investments in lean enterprise techniques have resulted in manufacturing lead-time reductions, allowing for increased output. Compressor and Vacuum Products segment operating income (1) as a percentage of revenues (segment operating margin(1)) increased to 12.4% in the second quarter of 2008, compared to 11.5% in the same quarter of 2007. BP

AUGUST 5, 2008 PRICE PERFORMANCE	SYMBOL	LAST PRICE	1 MONTH	6 MONTHS	12 MONTHS
Parker-Hannifin	PH	$62.64	-10.6%	-4.7%	-7.4%
Ingersoll Rand	IR	$36.69	3.4%	-5.1%	-29.0%
Gardner Denver	GDI	$45.33	-15.0%	39.0%	11.8%
United Technologies	UTX	$65.54	7.2%	-8.8%	-12.4%
Donaldson	DCI	$44.89	8.3%	8.6%	20.8%
EnPro Industries	NPO	$37.34	4.9%	20.3%	-7.6%
SPX Corp	SPW	$113.43	-5.1%	10.1%	33.5%

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

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

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JOB MARKET

Job Openings in the Compressed Air Industry

TECHNICAL SALESMAN

GRS Fluid Handling is working with a client who is a top manufacturer of compressed air products and equipment to search for a top technical salesman. This position will oversee sales for a Western Regional territory and be responsible for the total sales performance of their blower line.

Background Required

- Successful track record of selling blowers; Preferably positive displacement blowers
- A four-year degree, preferably a technical degree
- Ability to work autonomously, based in a home office
- Ability to travel a west coast territory as required

Why you would want this job?

- Company offers security
- Ability to work for a growing division of a well-established global manufacturer
- Future advancement and growth opportunities throughout the organization
- Very visible position, where someone's hard work will not go unnoticed

This position offers a chance to move into a highly visible role with distinct responsibilities and challenges. It offers the chance to work autonomously and grow a business segment. Our client is well respected with a great product and talented support staff.

For more information, please contact Joe Bertolami, GRS, tel. 440-684-6150 *3007, e-mail jbertolami@grsrecruiting.com; www.grsrecruiting.com

TERRITORY SALES MANAGERS

Legris Transair, a division of Legris S.A. and the inventor of a quick connection compressed air piping solution, has two openings for Territory Sales Managers. The positions available are for the Gulf States and the Southeast region.

Responsibilities include: develop distribution channel strategy for the region; recruit and retain new distributors; manage Transair sales; train installers; troubleshoot existing Transair installations; promote Transair to A&E firms, consulting engineers, installers and facility engineers; develop sales forecasts; assist Transair Business Unit Manager on special projects.

To qualify you must have previous industrial sales experience, with experience in piping or compressed air industry a plus. Must be able to analyze and synthesize information; strong understanding of industrial distribution and related selling processes; excellent communication skills; strong organization and time management skills; travel 40% of the time.

We offer a comprehensive benefits package, including a 401K and company car/allowance.

If you are interested in the position, please submit your resume with cover letter and salary history to florent.crouy@legris.com.

legris transair

World Energy Engineering Congress returns to nation's capital in 2008!

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WORLD ENERGY ENGINEERING CONGRESS

Presented by AEE The Association of Energy Engineers
Hosted by SAIC From Science to Solutions
Featuring Green Street EXPO @ WEEC Sponsored By CHANGE FOR THE BETTER WITH ENERGY STAR

The key opportunity of the year for end users and decision-makers from business, industry, and government sectors to learn about the newest technologies, hear industry's leading experts, and network

The Association of Energy Engineers (AEE) is very pleased to bring the **WORLD ENERGY ENGINEERING CONGRESS (WEEC)** to Washington, DC for 2008—and to an extraordinary new venue—the Gaylord National Convention Center on the Potomac. Now in its 31st year, the **WEEC** is well-recognized as the most important energy event of national scope for end users and energy professionals in all areas of the energy field. It is the one truly comprehensive forum where you can fully assess the "big picture" – and see exactly how the economic and market forces, new technologies, regulatory developments and industry trends all merge to shape your critical decisions on your organization's energy and economic future.

The **WEEC** conference and expo target the complete spectrum of technologies and services of greatest importance to our delegates in attendance, including, but not limited to:

energy management • combined heat & power / cogeneration / distributed generation • lighting efficiency thermal storage and load management • integrated building automation • industrial energy strategies boilers and combustion controls • green & sustainable initiatives • geoexchange technologies renewable and alternative energy energy management • HVAC systems and controls energy services and project financing • solar and fuel cell technologies applications specific to federal energy management programs

WEEC's highly acclaimed **GreenStreet expo showcase**, introduced in 2007 and co-presented by the U.S. EPA's ENERGY STAR®, will again be a prominent part of the WEEC for 2008. Here you can examine firsthand the latest green / sustainable / environmentally friendly energy technologies now available for both new design and retrofit projects.

Government Energy Leaders

Department of Defense

GAO Accountability * Integrity * Reliability

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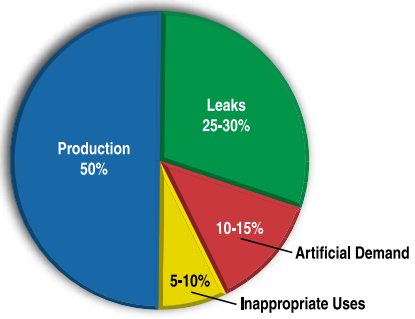

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* Source: *U.S. Department of Energy; Compresed Air Challenge®.*