Steel Processing Audit Efficient Aluminum Chip Blow-Off Air

November/December 2008

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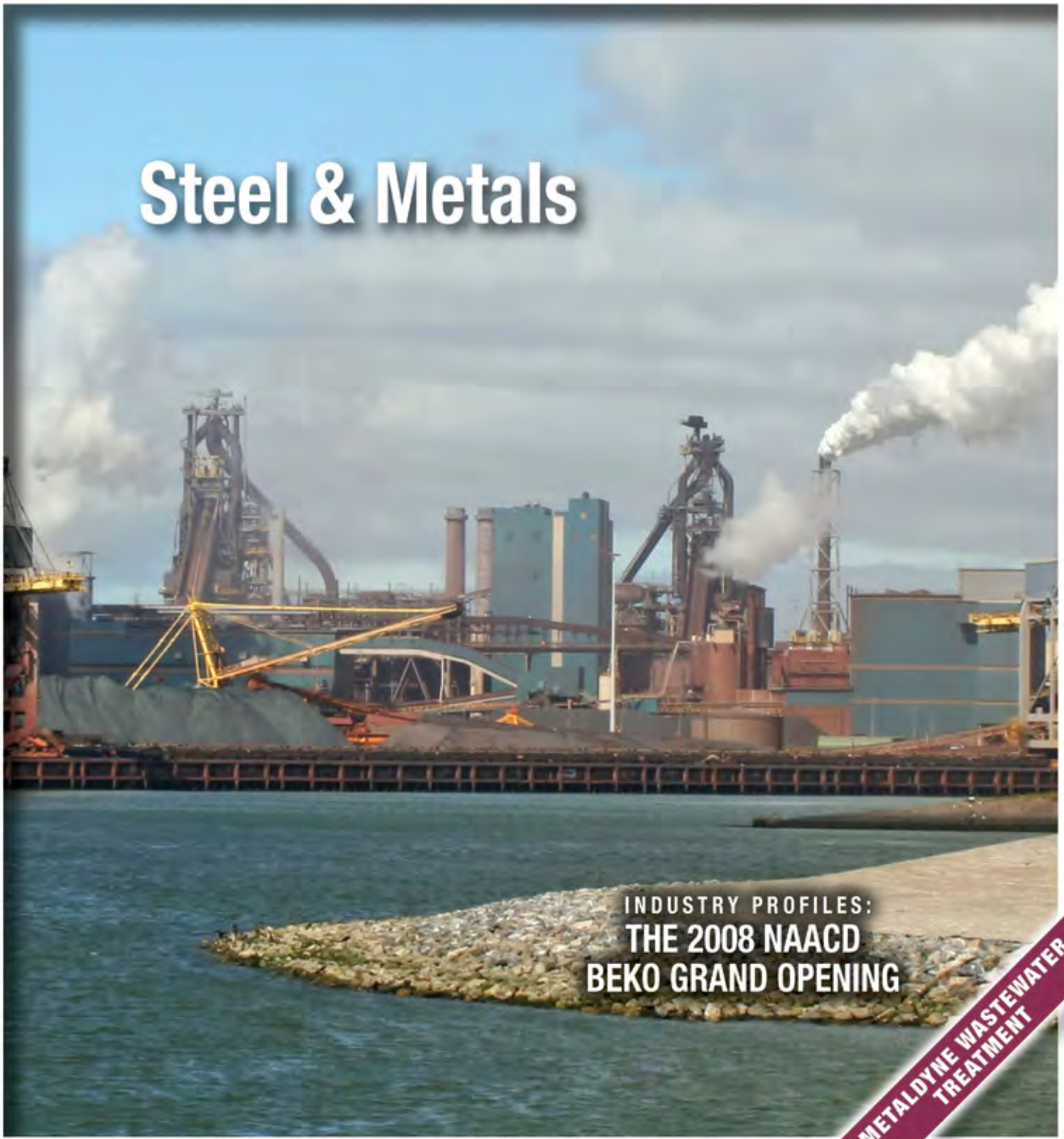

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FROM THE EDITOR

Investments in Energy Efficiency

I live in "Steeler Country" and I can't say how gratifying it is to see large steel corporations on the rebound. Be it Arcelor Mittal or AK Steel, the undeniable fact is that these industries are coming back. A key component to their recovery has been their drive to improve efficiencies. In a day and age where one doesn't dare turn on "doomsday TV," I prefer to listen to those in my world of industrial energy efficiency.

The World Energy Engineering Conference was held in October in Washington D.C. I had the opportunity to meet with MANY corporate executives who said their firms were planning significant investments in improving their industrial energy efficiencies in 2009. One gentleman had recently been specifically hired to review and optimize the compressed air systems in 97 factories around the world. My thanks go to Dean Smith, Hank Van Ormer, Ed Ball and Mike Nagy for presenting papers at our well-attended, half-day seminar at the conference.

Compressed air auditing is faring well in the steel industry. Mr. Hank Van Ormer shares with us an audit his firm implemented in a one-hundred-year-old facility. This steel processing facility is growing and was considering whether or not to buy more air compressors to support the growth. They wisely decided to have their current installation audited before making the decision. Energy costs for their compressed air system were $1.5 million and compressed air flow fluctuated between 11,000 and 20,000 scfm. After the audit's corrective actions were implemented, energy costs were reduced to $660,000 per year on compressed air flows between 7,000 and 10,500 scfm. The investment required was only $300,000, giving them a 4–5 month payback!

Audit successes like this energize our interest to publish this magazine.

Piping systems can be challenging in huge steel processing facilities. Mr. Paul Johnson, from Legris-Transair, supplies us with an interesting article on how to design an efficient piping system. His firm has developed an innovative energy-cost calculator to assist system designers. Legris is also known for having invented the convenient aluminum push-to-fit piping technology, making piping systems easier and faster to install.

Metaldyne's aluminum die-casting facility shares with us an interesting story on how they solved an ages-old problem with wastewater treatment. Their manager, Mr. Bill Cleary, walks us through the solutions provided by Koch Membrane Solutions.

Finally, my congratulations go to Mr. Tilo Fruth and BEKO for the Grand Opening of their new manufacturing facility outside of Atlanta, Georgia. My sincere congratulations are also extended to the NAACD Conference successfully held in October.

Thank you again for your support and for investing in industrial energy efficiency.

ROD SMITH
Editor
rod@airbestpractices.com

UTILITY-AIR NEWS

Parker Acquires Legris, Origa and Hargraves

Parker Hannifin Corporation announced that it has acquired three companies whose total sales for their most recently reported fiscal years are a combined $452 million. Parker is remaining focused on executing its plans for growth throughout the current economic turbulence.

"We continue to maintain our long-term focus on growth and positioning Parker for sustained financial performance," said Don Washkewicz, Chairman, Chief Executive Officer and President. "The acquisitions we have announced today bring us new technologies and market opportunities. They also signal an ongoing commitment to our growth strategy, managing our assets conservatively, and making appropriate use of strong cash flows."

Legris SA, headquartered in Rennes, France, is a leading manufacturer of fluid circuit components and systems for pneumatic, hydraulic and chemical processing applications. In 2007, Legris recorded revenues of 233 million euros (approximately $340 million). The company has approximately 1,800 employees, 10 production facilities and a global network of 25 international sales offices.

Origa Group is a manufacturer of rodless pneumatic actuators, electric actuators, FRLs (filter regulator lubricator), pneumatic cylinders and valves used in the transportation, semiconductor, packaging and conveying markets. Its most recently reported annual sales were approximately 67 million euros (approximately $98 million). The Group employs approximately 350 people and has major operations in Filderstadt, Germany, Wiener Neustadt, Austria, Glendale Heights, Illinois in the United States and smaller facilities in several other international locations.

"We're excited about the opportunities this combination offers for Parker," said Roger Sherrard, President of Parker's Automation Group. "Origa is a respected manufacturer and their world class rodless actuator line strengthens the depth and breadth of our global product portfolio. The Origa brand is well known particularly in European markets that offer growth opportunities for Parker."

Hargraves Technology Corporation of Mooresville, North Carolina, is a leader in the innovative design and manufacture of miniature liquid and pneumatic diaphragm pumps, control valves and system solutions. These products control movement and direction of precise amounts of fluid in medical devices and life science analytical instrumentation as well as diagnostic, gas detection and printing systems. Hargraves' sales for the fiscal year ending December 31, 2007 were approximately $14 million.

For more information, visit www.parker.com

UTILITY-AIR NEWS

Bosch Rexroth Participating in Chicago Climate Exchange®

Leading global supplier now part of cutting edge exchange program to help reduce gas emissions

Bosch Rexroth, a leading global supplier of products, systems and services for drive, control and motion technologies, announced it is participating in the Chicago Climate Exchange® (CCX®), the world's first and North America's only voluntary, legally binding greenhouse gas emissions reduction, registry and trading program. The company is participating with CCX through its parent organization, the Bosch Group.

As part of the Bosch Group and CCX initiative, Bosch Rexroth will be helping to reduce greenhouse gas emissions. Overall, Bosch has committed to achieve a 6% reduction in greenhouse gas emissions at its U.S. operations by 2010, from a baseline of the company's average greenhouse gas emissions in the year 2000.

"As a local company, we are pleased to participate in the Chicago Climate Exchange," said Berend Bracht, president and chief executive officer of Bosch Rexroth in North America. "We are looking forward to working with CCX in this initiative. Bosch Rexroth is aware of current environmental concerns in the industrial sector and we are excited to be part of the solution to this important issue that affects all of us."

"Bosch is a pioneer in the world of energy efficiency and sustainability — its CCX membership establishes it at the forefront of market-based climate change mitigation," said Dr. Richard Sandor, chairman and chief executive officer of CCX. "We are proud to welcome Bosch to CCX and look forward to their contribution to the evolution of this organization."

In addition to this initiative, Bosch Rexroth has long been committed to developing energy-efficient products and technologies used in the renewable and clean energy space. For example, the company's electric, hydraulic, pneumatic and linear motion products are used in areas ranging from wind energy, trash-to-energy and solar power production, to energy reduction and efficiency improvement programs on the factory floor.

For more information visit www.boschrexroth-us.com

Gardner Denver Completes Acquisition of CompAir

Gardner Denver reported today that it has completed its previously announced acquisition of CompAir Holdings Limited ("CompAir"), a leading global manufacturer of compressed air and gas solutions. Total cash consideration paid to the selling shareholders was GBP 190.2 million. Including the repayment of certain outstanding debt and the assumption of CompAir's other net debt, which totaled approximately GBP 10.4 million on September 30, 2008, the total transaction value was approximately GBP 200.6 million.

For more information, visit www.gardnerdenver.com

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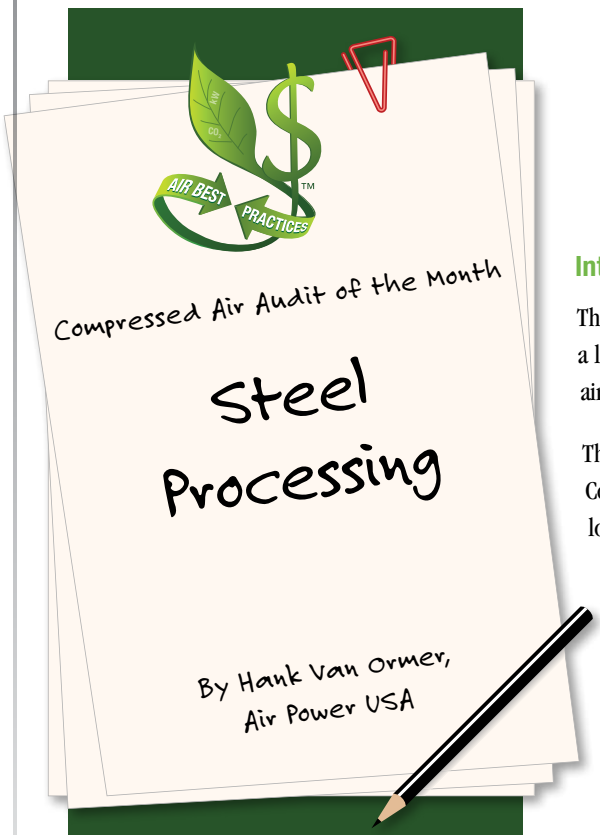


November/December Audit of the Month

Where: Midwest USA
Industry: Steel Processing
Issues: Air Leaks, Inappropriate Uses and Blow-Off Air
Audit Type: Supply and Demand Side

Financial Summary

Investment: $307,150
Energy Cost Before Investment: $1,515,000
Energy Cost After Investment: $660,000
Energy Savings/Year: $855,000
Simple Payback: 4–5 months
Power Cost/kWh: $0.045
Operating Hours/Year: 7,008

Air Flow Reduction

Before: Min/Max Air Flow: 13,000/20,000 scfm
After: Min/Max Air Flow: 7,000/10,500 scfm
Air Flow Reduction: 11,000 scfm

Air Flow Reduction Projects — Savings

Leak Management: 1,000 scfm
Blow-Off: 3,800 scfm
Air Horns: 4,700 scfm
Diaphragm Pumps: 1,500 scfm
Total: 11,000 scfm

Introduction

This steel processing facility has been operating for more than 100 years. This facility is part of a large corporation with numerous plants around the world. This audit focused on the compressed air system on one side of the Works, which we will call the "North Plant."

The North Plant operates from one central compressed air supply located in the Boiler House or Compressor Room. Air is fed from two 10" exit lines leaving the room, which both lead to a complete loop through all the various production areas.

Over the last 25 to 30 years, the air supply came from three 7,000 scfm centrifugal air compressors (one Worthington and two Joy units). Back up and emergency air have lately been supplied by rental units. The primary compressed air dryers are four blower purge dryers — one rated for 10,000 scfm and the other three rated for 6,000 scfm.

Over the last seven or eight years, the air demand in the North Plant has steadily grown by an average increase of 5,500 to 7,000 scfm with production levels generally staying constant.

Earlier this year, the Worthington centrifugal suffered a major failure and the decision was made not to invest the money to repair it and consider upgrading the supply side equipment. After the failure of the Worthington unit, additional rentals were brought in until the replacement equipment was obtained.

Plant management thought that before they upgraded the air supply to a new level, a study should be implemented to answer several questions:

- What are the underlying causes of this continuing increase in compressed air demand?
- If this is wasted compressed air with no subsequent improvement in production or quality, what is the bottom line incremental energy cost to the Company?
- What action can be implemented to eliminate this air demand? What is the cost of the action? What is the return?

> "A compressed air leak survey was conducted and 154 leaks were identified, tagged and logged."

Supply Side Audit

Setting the Baseline for Flow and Pressure

The following actions were taken to establish the baseline for flow and pressure.

1. Temperature readings were taken on all units with an infrared surface pyrometer.
2. Critical pressures including inlet and discharge were measured with a single Ashcroft digital calibrated test gauge.
3. Flow was measured and logged from the compressor room with the existing plant flow meters and logged with plant equipment.
4. Flow was measured and recorded by Air Power personnel and equipment with Eldridge or Sage thermal mass, heated wire-type meters and logged with an MDL multi-line data logger. These were installed at five pre-selected points.
5. The same basic measurement and logging was carried out for the system pressure using an Ashcroft pressure transducer and the same multi-line data logger.

COMPRESSED AIR AUDIT OF THE MONTH

Steel Processing

The five pre-selected points were:

- Location #1 — 10" line before the Roll Shop in Hot Strip Mill. Located between the Bar Mill and the Roll Mill. Measured air flow to Hot Strip Mill was 4,000 scfm
- Location #2 — 8" line near Column 31. Before air take off to Slab Yard. Measured air flow to Slab Yard was 1,200 scfm
- Location #3 — 10" line outside Lube Shop to Green Coat — 2" ball valve now in place. Measured air flow to Green Coil, Pickler and Cold Mill was 4,000 scfm
- Location #4 — 10" line from Coil Distribution building. Measured air flow to Annealing was 4,750. Note #3 flow is included in #4
- Location #5 — 10" line from Compressor Room to Electric Galvanizing and Shipping. Measured air flow to Electric Galvanizing and Shipping was 5,300 scfm
- Total measured flow was 15,250 scfm

Annual plant electric and diesel fuel costs for air production were $1,686,863 per year. This does not include engine oil changes, rental or fuel cost. If the total system was serviced by only electric compressors, along with today's equipment, the total cost would be $1,515,068 per year.

Neither cost estimate includes the cost of operating the dryers, which totals $115,070 per year. It is expected that the current air dryers (blower purge and refrigerated) will be able to efficiently purify the reduced air loads after the audit.

Table 1. Key Air System Characteristics — Current System*

MEASURE	ELECTRIC		DIESEL (1 UNIT ON)	ADDITIONAL DE-SCALE OPERATION	TOTAL
	NORMAL FLOW CONDITIONS	LOW FLOW CONDITION	NORMAL FLOW CONDITION	EXTRA FLOW	
AVERAGE SYSTEM FLOW	18,500 scfm (17,165 scfm)	15,500 scfm	18,500 scfm (17,165 scfm)	1,905 scfm	
AVERAGE COMPRESSOR DISCHARGE PRESSURE	95 psig	95 psig	95 psig	95 psig	
INPUT ELECTRIC POWER	3,541 kW	3,277 kW	18 gph	90.7 kW 18 gph	
OPERATING HOURS OF AIR SYSTEM	7,008 hrs	1,752 hrs	7,008 hrs/yr	2,808 hrs	
SPECIFIC POWER	4.85 cfm/kW	4.73 cfm/kW	126,144 gallons/yr	4.58 scfm/kW	
ENERGY COST FOR AIR — PER UNIT OF FLOW	$67.82/scfm year	$16.66/scfm year	$160.63/scfm year	$27.58/scfm year	
ANNUAL ENERGY COST FOR COMPRESSED AIR	$1,116,670/year	$258,359/year	$214,445/year	$11,461/year (electric) $85,925/yr (diesel)	$1,383,490 (electric) $300,373 (diesel) $1,686,863 total
ANNUAL ELECTRIC COST WITH DIESEL CONVERSION TO COMPARABLE ELECTRIC UNITS	$1,116,670/year	$258,359/year	$91,770/year	$48,269/year	$1,515,068

** Based on a blended electric rate of $0.045 per kWh, 8,760 hours/year. Diesel fuel cost — $1.70/gallon.*

Breakout based on:

- Average flow — 18,500 scfm: 80% of time or 7,008 hours/year
- Average flow — 15,500 scfm: 20% of time or 1,752 hours/year
- $0.045 per kWh blended power rate
- $1.70 per gallon diesel fuel cost
- Nothing calculated in for rental payments, engine oil and filter maintenance
- The PTS916 diesel is significantly more fuel efficient than the PTMS1500 and especially the LeRoi units

Demand Side Audit

Compressed Air Leak Survey

A compressed air leak survey was conducted and 154 leaks were identified, tagged and logged. Potential savings totaled 1,082 cfm for the 154 leaks that were identified.

Ultrasonic leak locators were used to identify and quantify the compressed air leaks. These tools included a VXP AccuTrak manufactured by Superior Signal, and a UE Systems Ultraprobe 2000. Estimation of leak size was achieved by noting the intensity of the signal by the operator, type of leak and observation. The estimates are made on a conservative basis and probably understate the magnitude of the volume of leaks.

COMPRESSED AIR AUDIT OF THE MONTH

Steel Processing

Shutting off the air supply to these leaks when the area is idle would save significant energy use. Reducing the overall system pressure would also reduce the impact of the leaks, when air to the system cannot be shut off. Repairing the leaks can save additional energy.

With a few minor exceptions, most of the leaks could not have been found without the use of an ultrasonic leak detector and a trained operator. Leak locating during production time with the proper equipment is very effective and often shows leaks that are not there when idle. However, a regular program of inspecting the systems in "off hours" with "air powered up" is also a good idea. In a system such as this one, some 90 to 95% of the total leaks will be in the use of the machinery, not in the distribution system.

The area surveyed in the leak study included a great deal of high background noise from steam leaks that shield many of the smaller leaks. In continuing the leak management program, plant staff should perform leak detection during non-production hours in order to eliminate some of the high ultrasonic background noise.

Estimated reduction of air flow with proposed project	**1,082 cfm**
Recoverable savings from air flow reduction [Section 2.3]	**$82/cfm year**
Annual electric cost savings with proposed project	**$88,724/year**
Cost of leak detection equipment (if required)	**$2,800**
Unit cost of leak repairs ($15 materials per leak and $35 labor per leak)	**$50**
Estimated total project cost (materials and installation) — 154 leaks	**$7,700**
Total project cost	**$10,500**

"The investment will be $160,000 to generate a savings of $360,000."

Demand Side Audit

Blow-Off Air Projects

There are 400+ locations in this steel processing facility where blow-off air is being used. Compressed air is being consumed at the rate of 3,800 scfm at a cost of $300,000 per year. We recommend modifying these applications with simple solutions, which will cost only a total of $15,000 to purchase and implement.

One example is in the Hot Mill/Furnace. Blow-air is used to clean and cool the inspection glass. There are 56 locations using an average of 25 scfm each for a total of 1,400 scfm. They are at 100% utilization and are costing the facility $114,800 per year in energy costs.

We recommend installing fixed-air amplifiers with 25:1 amplification. These nozzles will use up to 8 scfm each and flow 125 scfm of ambient or surround air at the glass. The 56 nozzles will use a total of 448 scfm at an annual energy cost of $36,736. The net energy savings will be $78,064 per year. The cost of these nozzles is $1,500. The average net compressed air usage reduction will be 952 scfm. It is possible that with this performance, you may not need to use as many blow offs in total in which case, the savings will be greater.

With a few minor exceptions, most of the leaks could not have been found without the use of an ultrasonic leak detector and a trained operator.

COMPRESSED AIR AUDIT OF THE MONTH

Steel Processing

"Annual energy savings will be $93,000 per year."

Demand Side Audit

Replacing "Air Horns"

There are 50 "air horns" or "air movers" in use. They are consuming 4,700 scfm of compressed air. These items are part of a family of products known as "Portable Ventilators." They are available in various designs to move large volumes of air (1,000 to 10,000 cfm) in plants for many applications. The most common drives are electric, but they also come in Venturi air drives, which use high-pressure compressed air to pull ambient outside air by a Venturi action. Generally, these use from 100 scfm each to 300 scfm for the most common 6" and 8" sizes.

As we reviewed the North Plant, we noted the extensive use of air movers or air horns throughout many areas. All of those observed use the compressed air Venturi drive-type; none were electric drive.

Furnace de-scale utilizes Venturi air horns to cool down the furnace. Many of these are supplied by the contractors, but all that we saw during the Furnace #1 de-scale were running on plant-supplied compressed air.

For directed air flow used in cooling, we recommend replacing the "air horns" with electric-driven air movers. We suggest electric motor-driven axial vane fans capable of large volume flow through ducting as required. They are available with totally enclosed motors (or explosion proof). They produce flow from 1,500 to 3,000 scfm and range from ½ hp to 1 hp.

For more drive and large runs of ducting, we recommend tube axial blowers with heavy-duty housings and "non-sparking" cast aluminum fan blades. We also recommend the "double-duty Heat Killer" which is an axial vane, electric-driven blower with adjustable guide vanes. They are designed for high-performance cooling and effective on "air heat quenching" applications.

We have supplied a list of 50 applications where we recommend the replacement of the air horns with electric-driven air movers. The investment will be $160,000 to generate a savings of $360,000.

Demand Side Audit

Replacing "Diaphragm Pumps"

We recommend replacing the 21 air-operated diaphragm pumps with appropriate electric-drive units. We suggest twenty 3" pumps and one each 2" pump in the Pickling, Cold Mill, Acid plant and #4 Oil Recovery area.

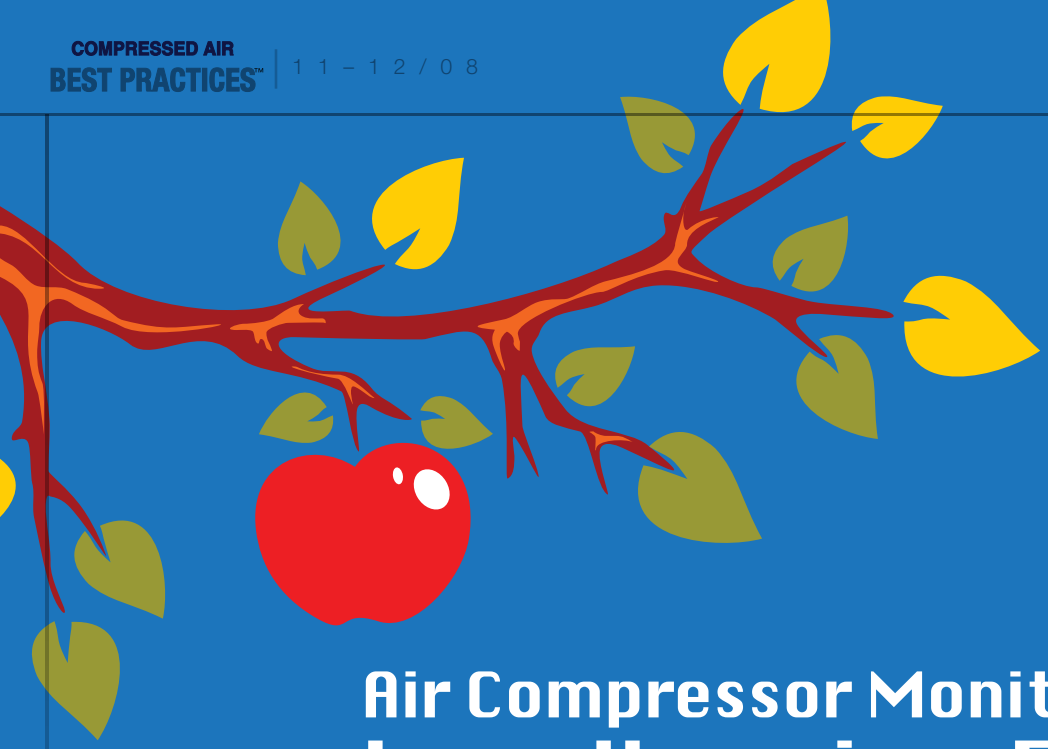
This will reduce compressed air demand by 1,500 scfm. The annual energy costs to run the diaphragm pumps is $126,000 per year. The new energy cost will be $33,000 per year. Annual energy savings will be $93,000 per year. The estimated cost of conversion to electric pumps is $120,000.

Conclusion

This project was executed and the energy savings forecast were realized. An effective air leak management process was put into place. Blow-off air was modified and diaphragm pumps were replaced by electric-driven alternatives.

The projected annual energy savings of $855,000 was delivered with a 4–5 month payback. We are now going through the same process with other facilities that this corporation operates. BP

For more information, please contact Hank Van Ormer, Air Power USA, tel: 740-862-4112, email: hankvanormer@aol.com, www.airpowerusa.com



Air Compressor Monitoring: Low Hanging Fruit

BY JON MAXWELL

With all of the different LEED credits and associated M&V requirements and tax incentive opportunities for businesses to reduce energy consumption, we have seen an increasing demand for metering. Companies are looking for more ways to estimate cost savings and prove that their energy saving investments are working.

In addition to that, we are seeing more requests to monitor the impact of sustainability initiatives. In recent years, building commissioning has become a bigger industry that requires data. Both of these trends have spurred a greater need to invest in portable data logging equipment.

Air compressor monitoring is a good example where battery-powered data loggers can be useful. When air compressors are not performing properly, they can obviously be huge energy wasters. The types of control and control settings have a major impact on the energy use of an air compressor and thus there are often many energy-saving opportunities. One of the most effective means by which to characterize and quantify these opportunities is through the use of data loggers.

However, through the years, we've seen a lot of misconceptions about how to monitor air compressors. A lot of people are not aware of the control mode that their compressor is operating under and what the monitoring intervals should be for an air compressor or process machine. Many use longer intervals (five minutes and up) to capture the energy use of the compressor over an extended time period (at least a week) and this is certainly important. However, air compressors can have a frequent rate of change in power consumption and thus the data-sampling interval should be set at a rate that you can capture change.

As an example, in a recent project, we used two Onset HOBO® U12 data loggers to log the current on a screw air compressor. One of the loggers had a fast sample rate — two seconds. The logger filled up in a day, but it enabled us to understand the exact cycling characteristics of the system.

At the same time, we installed a second logger and collected data in five-minute intervals over two weeks. This showed us the overall load over time. Together, the loggers gave us a better understanding of the compressor's performance and we could accurately estimate existing energy use and forecast savings potential. In this particular case, the savings was going to result from changing the sequencing controls to stop two compressors from both modulating at the same time.

This method also applies to many other types of equipment with high-frequency rate of change.

When monitoring relatively constant loads, a spot real power or power factor measurement combined with current logging can be a very cost-effective approach.

Even when load varies, one can use current logging in many applications. The key is properly accounting for voltage and power factor. The voltage part sounds simple, but at ERS we perform a lot of third-party reviews of metering and regularly see analysis that uses current logger readings with assumed standard nameplate 460V, instead of the actual line voltage that of around 480V.

AIR COMPRESSOR MONITORING: LOW HANGING FRUIT

INTERVAL LOGGING

In a recent real project, ERS used two Onset HOBO® U12 data loggers to log the current on a screw air compressor. One of the loggers had a fast sample rate — two seconds. The logger filled up in a day. At the same time, we installed a second logger and collected data in five-minute intervals over two weeks. This showed us the overall load over time. Together, the loggers gave us a better understanding of the compressor's performance and we could accurately estimate existing energy use and forecast savings potential. In this particular case, the high-speed logging helped us identify a sequencing problem, illustrated in Chart 1 below. Savings will result from changing the sequencing controls to stop two compressors from alternating air production. It is unlikely that we would have discovered the problem solely with 15-minute interval logging.

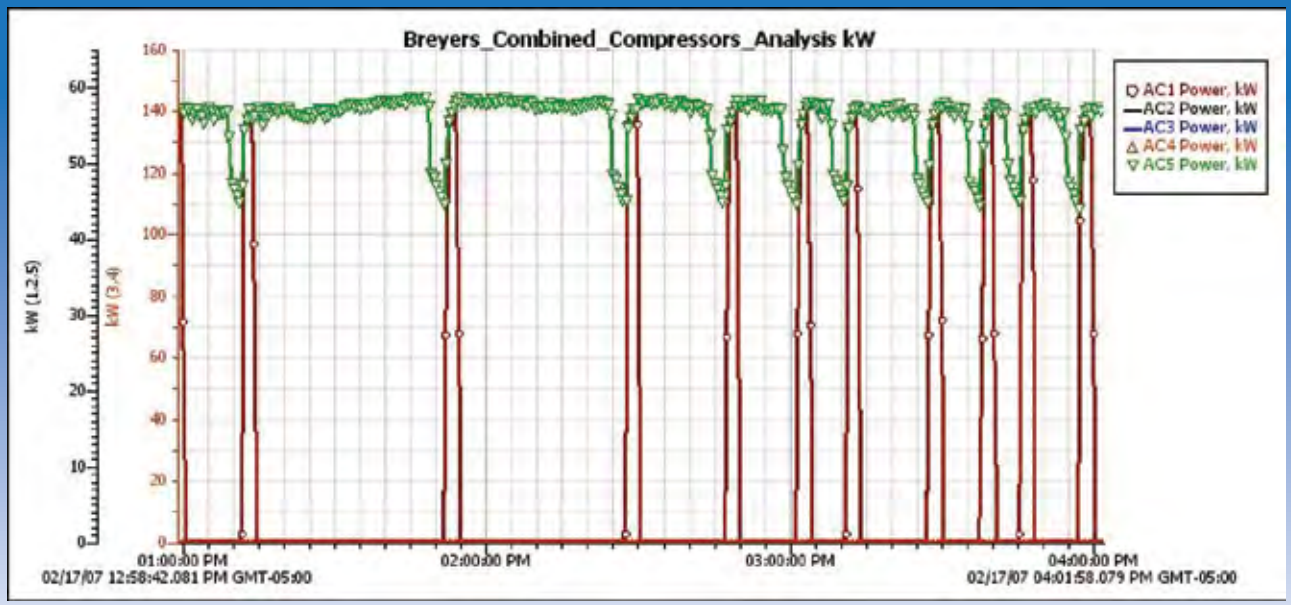


Chart 1: Compressor Sequencing Pattern Problem.

> "After almost 20 years of customers performing upgrades, market transformation, code changes and the like, when we do energy audits today, we still find between 10 and 20% savings potential."

Power factor varies as a function of both motor size and loading, which makes real power monitoring ideal for variable load conditions, but that is not always practical. There are cost constraints and sometimes physical limitations where a panel simply will not hold three CTs and a logger.

The good news is that the power factor versus current relationship is pretty predictable. At ERS we have developed custom algorithms to calculate power factor at any load. The algorithms take into account spot voltage, motor nameplate current and voltage.

When monitoring variable frequency drives, we always measure on the line and not the load side of the drive.

The cost of logging hardware has gone down and the software interfaces have improved immensely. Both of these factors have reduced the metering cost per point. This enables us to meter more equipment at each site and to meter more desirable parameters (kW, flow) than before. Also, the migration from dial-up remote data access to first cellular and now web-based mediums has improved our ability to conduct long-term metering.

When ERS staff first started performing energy audits, the average cost-effective cost savings we were able to identify averaged between 10 to 20% of total use. After almost 20 years of customers performing upgrades, market transformation, code changes and the like, when we do energy audits today, we still find between 10 and 20% savings potential. It's not because nothing has changed in these plants. It has.

Management has been investing in efficiency. But new technologies, lower equipment costs and increasing energy rates means there is plenty of low-hanging fruit. That's exciting and bodes well for the future of our industry. The missed opportunities are sometimes different from before, but they're definitely out there. BP

Jon Maxwell is the Director of Engineering at Energy & Resource Solutions, Inc., an energy consulting firm based in Haverhill, MA. Mr. Maxwell works out of Texas. He is a mechanical engineer and has been helping large commercial and industrial customers save energy for 18 years. To learn more about ERS, please visit www.ers-inc.com.

Energy-Efficient Compressed

Almost every industry in America today is experiencing higher costs — energy, raw materials, labor, health care, shipping — you name it. Energy prices have been rising and many experts forecast that these increases will continue. Energy costs sometimes are overlooked when developing productivity and cost reduction plans.

Compressed air systems are safe, reliable and versatile, but they are usually taken for granted with little regard to costs and energy consumption. There are three important reasons why it is worth investing time and effort in reducing compressed air costs:

- It will save energy and money by identifying and eliminating waste
- It will improve the reliability and performance of the compressed air system
- It will reduce environmental impact through reduced electricity consumption and consequent lower carbon emissions.

Installed Aluminum Piping.

A properly designed and maintained compressed air system that is energy efficient could save the user thousands of dollars each year. It will also minimize the risk of lost production by increasing the reliability of supply and improve the strength and safety aspect of operating a pressurized system. Every dollar saved on energy goes straight to the bottom line and is a very effective way to increase profits.

Of all utilities, compressed air represents one of the largest opportunities for immediate energy savings on any site. Furthermore, most of the energy and carbon savings are achievable with little or modest investment.

Air Piping Systems

BY PAUL JOHNSON

Compressed Air Pipe System

The role of the compressed air pipe system is to deliver the compressed air from the compressor discharge to the points of use with minimal leakage, minimal loss of pressure and minimal effect on the quality of the air.

Friction and leaks cause a pressure drop between the compressor output and the eventual point of use. This loss of energy in the pipe system is largely due to the pipe material, design and layout.

Pipe Material

Most distribution piping is made of galvanized steel, although copper, aluminum and some specialized plastics are becoming more common, with each having its own advantages and disadvantages. For instance, plastic can suffer from degradation through UV light, while high pressures and temperatures can deform the pipework. Not being as solid as metal, plastic can bow and require more brackets to install and support the ring main throughout the building. This adds cost to the installation.

ENERGY-EFFICIENT COMPRESSED AIR PIPING SYSTEMS

Metals can also degrade. Copper and black iron have been the overwhelming favorites for compressed air systems for many years due to the cost of the materials. However, threaded joints often serve as a source of leakage. This leads to higher operating costs because compressors must operate overtime to compensate for the leakage. But these aren't the only drawbacks to metal piping systems. Interior corrosion can cause scaling and pitting on inside surfaces. As the corrosion products combine with moisture and other contaminants, they accumulate on the inner surfaces of the pipe and fittings, increasing their roughness. As the internal diameter becomes rougher, pressure drop increases. Again, this ends up costing money by reducing efficiency of the compressed air system. Perhaps more importantly, particles can dislodge and clog or damage end-of-line equipment.

Lightweight aluminum is the ideal product for maximum flow. The first push-to-connect aluminum piping system was launched by Legris in 1996. Transair is a system of powder-coated aluminum pipe and engineering-grade polymer connectors. Transair's quick, instant connections eliminate the need to thread, solder or glue pipe. The lightweight aluminum pipe is also easy to handle and safe to work with on elevated platforms.

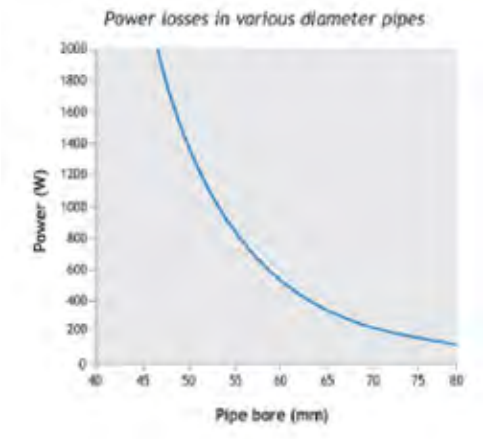
The flow characteristics of Transair's smooth bore aluminum pipework are crucial in helping to reduce the pressure loss through the system. Each stick of pipe and each take-off to a component such as an air tool will cause a reduction in pressure. For maximum system efficiency, Transair connectors do not intrude into the pipework to cause turbulence nor do they cause scratching on the outside of the pipe, which can cause a leak at each connection.

Push-to-connect aluminum piping.

Pipe Sizing

The cost of air mains frequently represents a high proportion of the initial cost of a compressed air system. Therefore, smaller diameter pipe is often specified to save on capital cost. However, this is misleading since the restriction due to the smaller piping causes greater pressure drop across the system, resulting in higher energy consumption. The increased energy costs can soon exceed the price of larger diameter piping. This graph shows what happens to the power required to deliver 29 scfm of seven 102 psig air along 328 feet of steel pipe as the diameter changes.

As a general rule, pipe diameters should be calculated based on having a maximum air velocity of 19 ft/s, in the main supply line. In branch lines with a total length less than 49 feet, velocities up to 49 ft/s are acceptable.



Pipe Layout

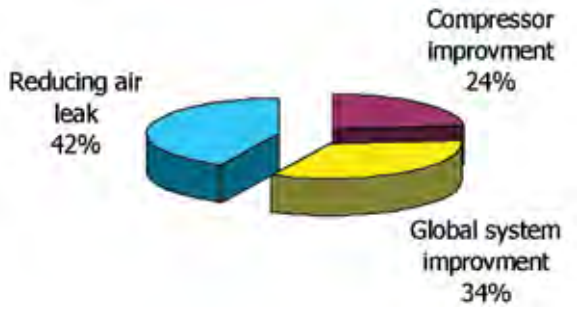
Survey the layout of the pipe system. As far as possible eliminate elbows, minimize changes in the direction of airflow, remove other constriction, reduce excessive pipe lengths and isolate unused compressed air piping because this may be a significant source of air leaks. All compressed air pipe systems should be designed with the following points in mind:

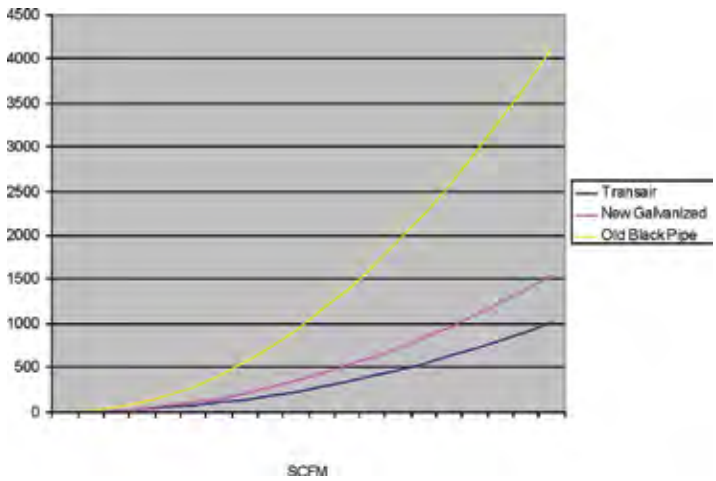
- Pipe diameters selected should minimize pressure drop and allow for possible expansion
- Fittings and valves selected should minimize restriction to airflow. Large radius bends are preferred to elbows, for example. Full-throated valves such as ball valves should be used rather than gate valves
- If replacing pipe, consider smooth bore pipe to reduce friction
- All piping must be well supported to minimize movement and sagging. This will help to minimize leaks, avoiding build up of corrosion and fluids and lengthen the life of the pipe system.

Operating Costs

Compressed air represents one of the largest opportunities for immediate energy savings, which accounts for an average of 15% of industrial facilities consumption of electricity and most of the savings are achievable with modest investments compare to total costs.

ENERGY-EFFICIENT COMPRESSED AIR PIPING SYSTEMS





Over a 10-year period, electricity costs make up 76 % of a factory's operating costs. In many cases, the electricity used by a compressed air system in a factory makes up the largest percentage of an increasingly expensive electricity bill. Monitoring compressed air usage, identifying compressed air waste and inefficiencies, and making investments in new compressed air equipment are tangible ways that businesses can cut their operating costs by lowering their electricity bill. For instance, it is estimated that a ¼-inch leak in a compressed air system equals about $8,000 per year leaking off a company's bottom line. Therefore, a proper compressed air system has a tremendous potential to save a company a significant amount of money. The impending savings (payback time of less than 36 months*) can be summarized in three main categories in term of potential contribution: compressor improvement, reducing air leaks and global system improvement.

As noted above, air leaks are the main sources for energy loss in a compressed air system. For instance, a 14.5 psi pressure drop uses 10% additional energy. Furthermore, the selection of pipe can have an impact on pressure drop. The graph below shows the difference in traditional and aluminum pipe using a length of 100 feet of pipe, 40mm (2" Steel), 60 hp compressor, and cost of electricity of $0.10 per KWh. Pressure drop can result from a number of sources, including poor system configuration, interior pipe surface corrosion and compressed air contamination.

Typical on-site savings have been estimated to be up to 30% of the energy input to the compressor. These savings are achievable through initially selecting the most efficient type of compressor, ensuring the correct air system design and ongoing efficient operation and good maintenance. It includes maximizing the use of the latest technologies available and also ensuring that attention is paid to the simple measures of keeping leakage rates to a minimum.

Energy Calculator

By choosing an efficient compressed air system the potential savings that can be achieved on a machine can reach up to 60%. Traditional piping systems, made of steel or copper and that are still in use, are known not to be energy efficient, through loss of power and considerable leakages. Difficult to trace and repair, they can have a huge impact on operating budgets.

Therefore, Legris Transair has developed an energy calculator that enables system designers to determine the precise savings to be made by using Transair in comparison to other systems. Thanks to this software, contractors/end users can immediately calculate the potential savings that can be made by opting for a Transair solution. On the basis of compressor related data such as pressure, flow rate, annual hours of operation, the type of dryer and data from the characteristics of the network and the local cost of electricity, the Transair energy efficiency calculator software defines the savings and the duration of return on investment. The return of investment is based on the pressure, power or throughput, the number of annual service hours, the type of dryer, plus data from the network, such as length of the main circuit, the type of open or closed circuit, the pipe material used and the local cost of electricity, including inflation factor. The results speak for themselves and show that Transair is the best performing system and the best long term choice, no matter whether the project is for an extension, the modification of an existing network or a new installation.

To make the calculation using the Transair Energy Calculator, you will need:

- Data about the compressor room
- Data about the compressed air network
- Economic data (quotation for the network, electricity cost)

You will be able to compare Transair pipe to traditional compressed air network (steel, copper, plastic…):

- for a new quotation: the quotation for Transair compared to the quotation for a new network in steel
- for a existing installation: the quotation for Transair compared to the annual cost for an old network in steel

The results will show estimations of:

- Total annual cost for a traditional network and for Transair
- Total of money saved for 1 to 10 years using Transair
- The payback period of the initial investment in Transair products

An additional "Financial report" will allow you to export and print a chart with a cost comparison, year after year, in order to give all the data to the decision-maker. The software is user friendly.

Financial Report.

Conclusion

In industry today, we face many challenges including the high cost of energy and foreign competition. Your electricity bill is part of your cost and it is a cost that can be controlled in part by using a high-efficiency compressed air pipe system. BP

For additional information, contact Paul Johnson, tel: 480-830-7764, email: Paul.Johnson@legris.com, or visit www.transair-usa.com

TUBULAR MEMBRANES HANDLE OILY WASTEWATER AT METALDYNE

BY BILL CLEARY, WASTEWATER TREATMENT MANAGER, METALDYNE

Challenging Mix of Oil and Glycol

Finding the most effective, reliable and economical method for separating and concentrating die lubricant is no easy task for die casting plants — and the situation at the Metaldyne aluminum die casting plant in Twinsburg, Ohio was no different. For more than a decade, Bill Cleary, the wastewater treatment manager, worked with 22 different wastewater treatment vendors, in addition to experts from academia and the United States Department of Energy to find the optimal solution for his plant.

The Twinsburg Plan is a world leader in the production of aluminum valve body castings. To facilitate this process, Metaldyne has developed a world-class die casting process that utilizes a specially-formulated die lubricant, an oil and water emulsion, which helps control the temperature of the die as well as the removal of the complex castings during the part ejection process.

Each cycle of the highly automated process begins with numerous nozzles spraying a controlled volume of lubricant onto specific locations on the die. Next, molten aluminum, at 1,250 °F, is auto-ladled into the cold chamber and injected into the die under high pressure.

The plant's drainage system collects the waste generated from the casting process, including the die lubricant, as well as detergents from washing operations and glycol from the hydraulic fluid used in the robotic machinery. In addition, some process cooling water and cooling tower bleed are piped into the wastewater treatment system. The total combined wastewater flow is 9,000 to 11,000 gpd, with chemical oxygen demand (COD) ranging from 20,000 to 40,000 mg/l.

Clogged MBR and High Disposal Costs

"The oil from the die lube and the glycol from the hydraulic fluid combine to create an extremely difficult wastewater treatment challenge," explains Bill Cleary. "We cannot use flammable hydraulic oil because of the high temperatures of the molten metal. Instead, we use glycol, which must be removed to meet our COD discharge limits."

The plant's original physical-chemical wastewater treatment system performed poorly, because it was difficult to maintain a consistent recipe. This situation was further complicated by the uncontrolled and unpredictable flow rate and the difficult composition of the wastewater stream.

In 1995, the plant installed a bioreactor system to consume the glycol. The membrane bioreactor (MBR) system was arranged with the tubular membranes external from the bioreactor, thus separating the water from the activated sludge. The effluent from the MBR was polished by a reverse osmosis (RO) system, prior to discharge into the municipal wastewater system [Figure 1].

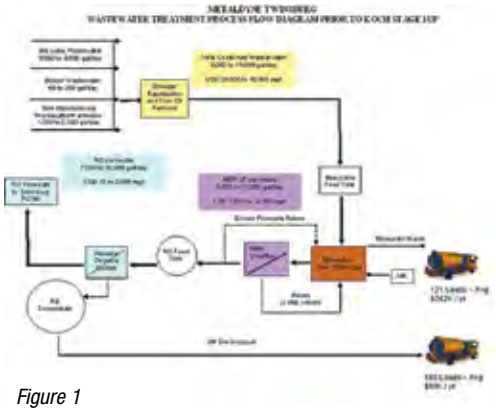


Figure 1

TUBULAR MEMBRANES HANDLE OILY WASTEWATER AT METALDYNE

Unfortunately, the tubular membranes in the MBR had difficulty handling the oils and greases, resulting in clogged pores in as little as three weeks. A scum, with a consistency of a foamy milkshake, formed on the top of the bioreactor tanks, often overflowing onto the floor. The die lube, which accounted for approximately 80% of the waste stream, seemed to be the source of the problem.

"Uncontrolled wasting from the biological tank caused a mess and it became extremely expensive to haul away all of the waste," said Cleary. "We were hauling over 120 truckloads of bioreactor waste each year, at an annual cost of nearly a quarter of a million dollars. We knew that we needed to find an effective way to prefilter the feed water to the MBR in order to remove the oil and other components that were wreaking havoc on the MBR system."

"We were hauling over 120 truckloads of bioreactor waste each year, at an annual cost of nearly a quarter of a million dollars."

FEG™ Tubular Membranes

Cleary and his team worked with almost two dozen vendors to test a wide variety of pretreatment solutions, utilizing many different types of membranes. For example, a grant from the U.S. Department of Energy funded the testing of a spinning membrane system. The system worked effectively, but it was not commercially available and high electricity costs made the system uneconomical.

"A few years ago, we heard that a new tubular membrane was developed by Koch Membrane Systems that could handle extremely difficult oily wastewater, and indeed it proved effective," says Cleary. "Finally, we had a system capable of removing the solids upstream of our bioreactor."

In 2006, the Twinsburg plant installed a KONSOLIDATOR™ 150 Industrial Wastewater System from Koch Membrane Systems Inc. (KMS) of Wilmington, Mass. The pre-engineered, pre-packaged system contains 150 FEG™ PLUS tubular UF membranes.

KMS tubular membranes have an open channel configuration capable of handling extremely high suspended solids loads. They are well suited to applications in heavy industrial wastes including oily wastewaters and can be cleaned mechanically using spongeballs. The FEG PLUS membranes are rated at 120,000 dalton molecular weight cutoff (MWCO), roughly equivalent to a membrane pore size of 0.02 microns [Figure 2].

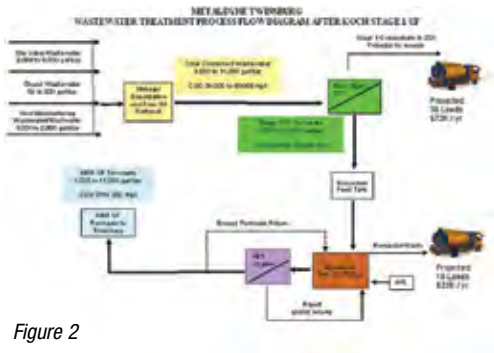


Figure 2

A Process that Works

This new "Stage 1 UF system" removes solids and concentrates the waste 25 times, equivalent to a 96% reduction in water content. Cleary is investigating options for recycling the oily concentrate.

Removal of the solids enables the bioreactor process to work smoothly. Off-site disposal of bioreactor waste has been reduced tenfold, from an average of 10 truckloads per month (at a cost of $242,000/year), to only one and a half truckloads per month (at a cost of $32,000/year) [Figure 3].

Off-Site Disposal

	PRIOR TO INSTALLATION OF STAGE 1 UF		AFTER INSTALLATION OF STAGE 1 UF	
STAGE 1 UF CONCENTRATE (25X CONCENTRATION, POTENTIAL TO RECYCLE)	NA	NA	36 loads	$72,000
BIOREACTOR WASTE	121 loads	$242,000	16 loads	$32,000
RO CONCENTRATE	180 loads	$90,000	0 load	$0
TOTAL TRUCK LOADS PER YEAR	221 loads	$332,000	52 loads	$104,000

Figure 3

Prior to the installation of the Stage 1 UF system, the MBR permeate contained a wide variation in COD levels, ranging from 1,500 to 12,000 mg/1. With the Stage 1 UF system, the MBR system now produces permeate with COD of only 30 to 300 mg/l. The MBR permeate now is well below the discharge standards set for the municipal wastewater system (COD <500 mg/l) even without polishing with RO. As a result, the RO system was shut down and permeate from the MBR is discharged directly to the sewer.

COD

	PRIOR TO INSTALLATION OF STAGE 1 UF	AFTER INSTALLATION OF STAGE 1 UF
TOTAL COMBINED WASTEWATER STREAM	20,000–40,000 mg/l	20,000–40,000 mg/l
STAGE 1 UF PERMEATE	NA	8,000–20,000 mg/l
MBR UF PERMEATE	1,500–12,000 mg/l	30–300 mg/l
RO PERMEATE	10–2,000 mg/l	NA

Figure 4

Cleary calculates that the total annual cost of off-site disposal of waste has been reduced from $332,000 to $104,000, a 69% reduction amounting to a savings of $228,000 per year.

"We have been able to reduce our costs and still maintain a reliable, manageable process," says Cleary. "We went five months without wasting in the bio system and without any ill effects. With the Stage 1 UF system, we finally have a process that works." BP

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

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

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The 2008 NAACD

• Conference and Exhibition •

The 2008 North American Association of Compressor Distributors (NAACD) Conference and Exhibition was held October 18th in Coeur D'Alene, Idaho. A strong turnout of air compressor distributors and exhibitors enjoyed the incredible mountain-lake scenery and exchanged "selling techniques" according to the theme of the event.

This Conference always distinguishes itself in how well everyone seems to get along and enjoy the company present. The President of the NAACD, Mr. Sid Van der Meer, commented, "Industry still seems strong and the distributors are very upbeat."

CompAir Compressors

The anchor exhibitor and partner with the NAACD is CompAir Compressors. The one thing in common that all NAACD members have is that they all represent CompAir products and services. CompAir sent a strong representation to the show including CompAir USA President Gavin Monn and Vice President of Sales Bill Steele.

CompAir displayed some new technologies for their customers to take a look at. Engineers from CompAir Germany and the U.K. were also on hand to discuss the development of these new air compressors first-hand with distributors. Many distributors I spoke to were particularly excited about the new 30-horsepower (hp) LSR Series air compressor, which incorporates a variable speed switch reluctance drive. The product is also extremely compact in size and can incorporate an integrated air dryer.

Compair's new 30-hp variable speed reluctance drive air compressor. Pictured are Paul Lusignan and Bill Steele (CompAir USA) and Doug Barhorst from Air Handling Equipment.

THE 2008 NAACD CONFERENCE & EXHIBITION

Belair's new AMD Series refrigerated air dryers.

Solberg is growing internationally.

CompAir Hydrovane had a new compact three-hp unit on display. This rotary vane air compressor design by CompAir has a long and rather unique history of success with OEM accounts. The durability and small footprint have been its' signature features. CompAir also displayed their high-pressure reciprocating air compressors used in natural gas and methane applications.

Air Treatment

As usual, exhibiting were multiple brands of compressed air dryer, filter, intake air filters, compressor control systems and air/oil separators. The distributors do a good job of visiting every booth and really getting to know the equipment vendor.

I can't do justice to everything on display. A technology that caught my eye is JORC's Air-Saver® programmable motorized ball valve. For those plants that consume compressed air at night when there is no production (i.e. most have major leaks), I like this simple solution, which allows one to program the ball valve to close and isolate the system downstream of the receiver tank. BELAIR was also introducing their new AMD Series refrigerated air dryers. Belair President, Bill Thomas, said that demand was very strong for this rugged yet value-oriented dryer design. SOLBERG had the booth next to mine and President Tor Solberg said that the company continues to grow internationally. Spending almost one week a month in Europe, he said that international expansion coupled with new product introductions in the U.S. is fueling their overall growth. Joe Fresch from PNEUMATECH was very upbeat about the energy-saving cycling dryers they are introducing and the continued growth of their energy saving heated desiccant air dryers.

Tom Hamway

The keynote speaker was Tom Hamway. His speech focused on sales management techniques. With material drawn from his 20+ years of consulting and of owning and operating several different types of businesses, I found his comments to be very insightful and useful. Do we allow our Top 20% of customers the majority of our time? Or do we allow our Bottom 20% of our customers too much time? Do we allow unprofitable customers to chew up our resources with rationalizations? Do we provide our sales forces (who are by nature independent characters) with the proper amounts and levels of coaching? Do we segment our service and sales forces into "A," "B" and "C" players and provide each group with the right support? Do we promote our "A" players into sales management roles where they are no longer effective? Do we coach by asking questions or do we do all the talking? I found myself thinking back and thinking of things I could have done differently as a result of this very insightful lecture.

The Location

I'd be remiss if I didn't give mention to the extraordinary location chosen for the event. The Couer D'Alene Resort boasts a world-class golf course with a floating 14th green on Lake Couer D'Alene. All the golfers raved about the golf course and the complimentary post-round massage. For the non-golfers, easy hikes right off the property along the lake were a fantastic experience. The final distributor/vendor dinner was held on a boat cruise featuring every imaginable way to eat an Idaho potato. Only the positive and productive atmosphere at the Conference matched the location. BP

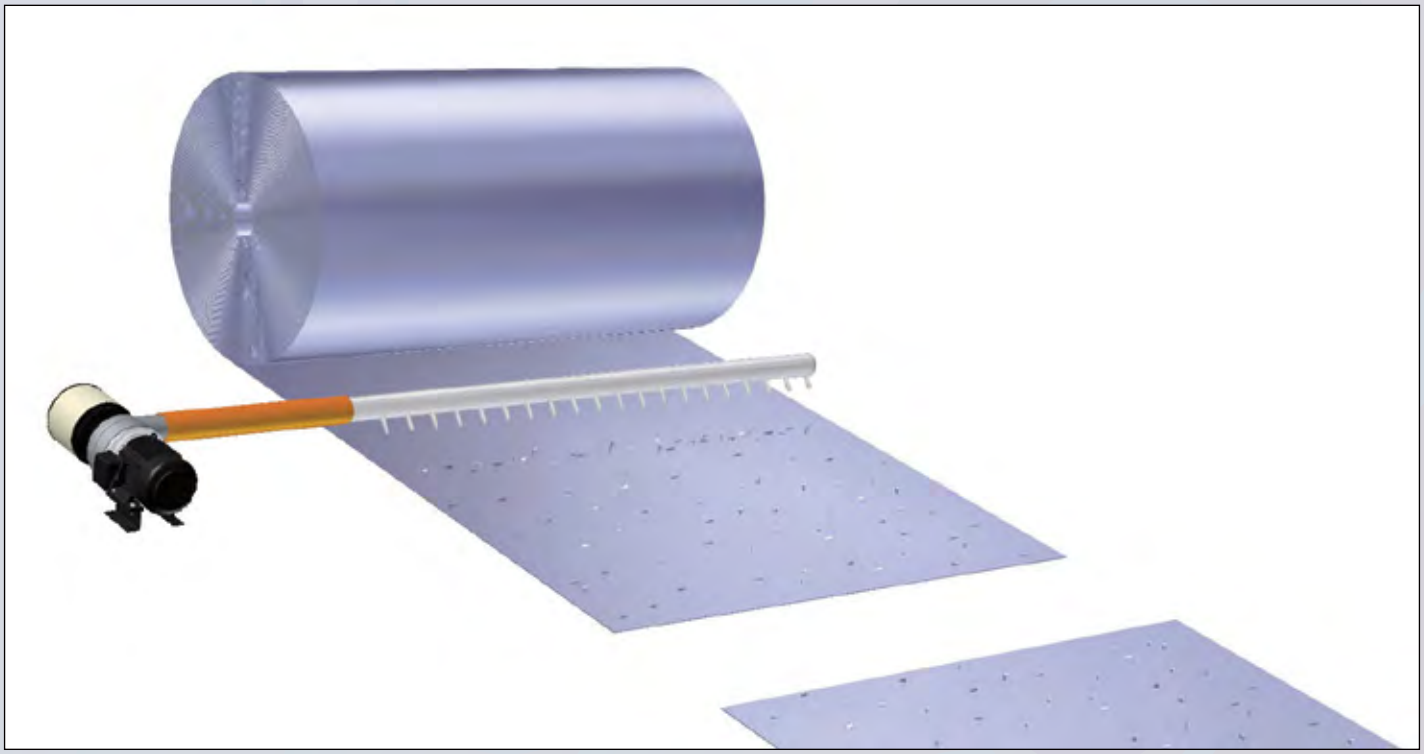
Joe Fresch, Rick Bell and Jim Donohue from Pneumatech.

Blowers Replace Compressed Air

CREATING ENERGY SAVINGS FOR ALUMINUM MILL

BY BRENDAN SMITH, JETAIR TECHNOLOGIES

Relatively few people realize that for a variety of industrial manufacturing applications, from air knife drying to simple blow-off nozzles, the use of high-pressure compressed air that bleeds into the atmosphere represents a significant waste of energy. This is confirmed by the DOE's Compressed Air Challenge®, calling it "an inappropriate use of compressed air." This costly waste of energy can be eliminated by replacing the use of compressed air with lower-pressure, high-velocity air. Beyond providing industrial process air at a fraction of the cost, high-speed blowers generally provide better results in drying and blow-off situations.



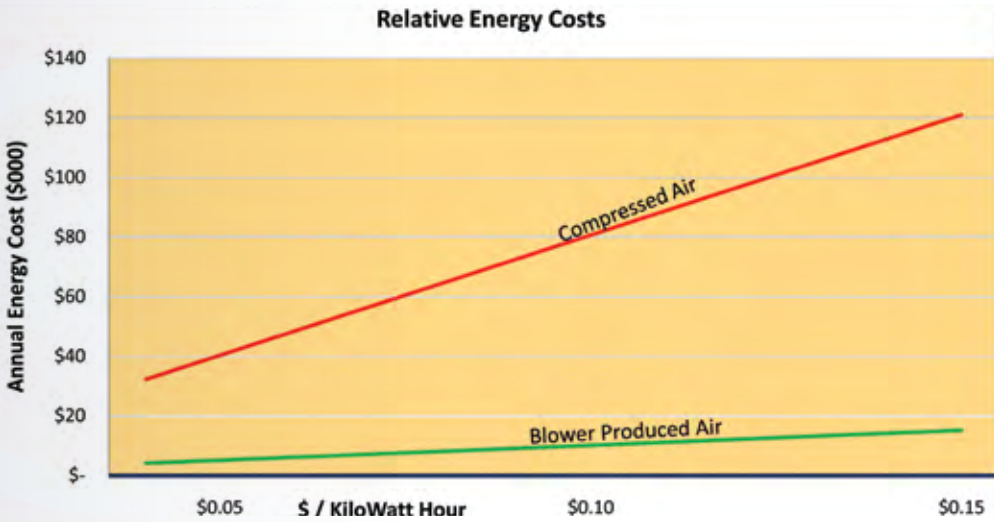
Aluminum Foil Casting Stations Require Blow-off Air to Remove Aluminum Chips.

Problem

A major United States manufacturer of light gauge aluminum decided in 2006 that it had to address the efficiency of its energy use in its manufacturing plant in western Tennessee. They found in their audit that one of the main culprits was the unrestricted and unmonitored usage of compressed air at the aluminum foil casting stations. The casters utilize a continuous casting method, in which two large rollers solidify and roll a feed of molten aluminum into a 0.200" thick sheet. As the sheet cools, a jagged, irregular edge is left on the sides. A rotary mill on each side removes the rough portions, creating a smooth, straight edge to the sheet. Most of the metal chips created by the milling fall to the floor. However a significant amount falls back onto the sheet. Later, the sheet is rolled into six-foot diameter spools. If these chips are not removed the aluminum will be damaged, causing rejects by their customers' quality control departments.

To remove the chips, the plant was using a series of multi-channel, flat fan nozzles attached to ¼" feeds from the plant's compressed air line. The pressure and flow was measured at each nozzle to be 7.7 cfm at 87 psi. Assuming 4 cfm per kW, it was determined that the plant was requiring 96 kW for each of its four casters to remove the metal chips from the surface. Operating 24 hours a day, 350 days a year, the total energy usage is 804,300 kW-hrs per year per caster. At a rate of $0.046 per kW-hr and with maintenance costs, assumed at 10% of the total energy costs, the plant was spending $40,698 a year to remove the chips from the aluminum at each of four casting stations.

BLOWERS REPLACE COMPRESSED AIR CREATING ENERGY SAVINGS FOR ALUMINUM MILL



Solution

The plant engineer contacted JetAir Technologies about the possibility of using a high-speed centrifugal blower to replace the compressed air nozzles at the aluminum casting mills. JetAir applications engineers visited the plant and determined that the metal chips could be removed with the use of a high-speed blower. "A lot of people think that you need the high pressure of compressed air for blow-off applications," says Dan Snyder, VP of Engineering at JetAir Technologies. "However, pressures around 80–90 psi are in fact overkill and far too costly to produce."

Nearly every industrial application using high-pressure compressed air that bleeds into the atmosphere can be accomplished far more efficiently and effectively by the proper combination of high flow rates and moderate pressure. The JET-3 blower uses direct-drive construction and VFD technology to operate at speeds up to 20,000 rpm, creating flow rates upwards of 1,000 cfm at pressures of 1.5 to 4 psi. Rodney Campbell, owner of Velocity Industrial LLC (Rockwall, TX), reports, "I have replaced many compressed air applications in plants across the southwest and the people there are generally amazed at how effective these high-speed blowers are. The increased performance and significant energy savings create an ideal combination that can't be denied."

JetAir engineers designed a custom solution for the aluminum plant based around the JET-3 high-speed blower. To replace the Lechler nozzles, JetAir designed a custom JetBlast nozzle manifold. The JetBlast was constructed out of rugged 304 stainless steel and featured twenty ½" ID nozzles at 2.5" spacing. JetAir engineers and test technicians determined that each nozzle needed to produce 30 cfm at 2 psi to easily remove the chips from the surface of the aluminum sheet. To do this a 15-hp model of the JET-3 was chosen to provide the air for the JetBlast.

A JetBlast Nozzle Manifold.

After testing this configuration, the JetAir engineers found that the highly efficient design and construction of the JET-3 allowed for a true energy consumption of only 13 hp, or 9.7 kW. This represented a dramatic 90% decrease in energy usage at the casting stations. Based upon the aluminum plant's production cycle and kW per hour rate, the JET-3 solution was determined to have an operating energy cost of only $3,750 per year, a total savings of almost $37,000 per year at each caster. These cost savings would pay for the entire JetAir system, including one-year maintenance and installation, in only 4.6 months and create a simple one-year ROI of 264%.

Results

The aluminum manufacturing plant was initially motivated by the dramatic reduction in energy costs the JetAir system would create. After installing the system, the plant was surprised at how well it worked. "We were impressed by what this blower-based system can do. We like the JetAir blower system so well, we bought three more for our other casting lines," says their Plant Engineer.

In this time of rising energy costs and increased concern about the environmental impact of manufacturing processes, it is more important than ever to address the wasteful use of compressed air in inappropriate industrial applications. High-speed centrifugal blowers represent not only an effective, green alternative to compressed air but also mean increased savings in energy consumption and ultimately a better bottom line for industrial manufacturers. BP

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

GRAND OPENING FOR BEKO USA

On Monday, October 20, 2008, BEKO Technologies Corporation, the American subsidiary of German company BEKO Technologies GmbH, celebrated the evolution of the business in the United States with the official Grand Opening of their new 50,000-square-foot manufacturing and warehousing center located in Atlanta, Georgia.

The event certainly did not want for attendees. The weekend prior to the actual Grand Opening, BEKO Technologies Corporation was host to the company's annual International Convention, which is a gathering of all of the company's subsidiary managers, the top executives from Germany and typically other guests or keynote speakers relevant to the particular year's agenda. The U.S. entity welcomed more than 25 BEKO executives from around the world.

More than 150 guests — comprised of customers from all over North America, suppliers and vendors from around the world — attended the Grand Opening.

As the extended "BEKO-family" came together, all were reminded of the unexpected passing of the company founder, Mr. Berthold Koch, in late October of 2007. In a way, the Grand Opening served a second purpose as a memorial to the company's founder, and should you happen to visit; you will find a permanent memorial in the lobby of this new facility paying homage to Mr. Koch.

Ribbon Cutting and Factory Tour

A long BEKO-blue ribbon stretched across the entryway and was cut by the Company owner, Mrs. Monique Abeels, and by her eldest son Mr. Yannick Koch.

The next item on the event plan was a tour for all of the guests. The entire group was broken down into five smaller groups, each named for a specific BEKO product, and four different tour stops or stages were coordinated in order to create a more personal atmosphere and to ensure everyone's participation. The four tour stages included the new manufacturing area, the BEKO showroom, a multimedia presentation and a visit to the buffet area for all where traditional German finger food and cold beverages were served.

From left to right: Markus Mueller, Werner Koslowski, Hans Gant, Monique Abeels, Yannick Koch, Senator Kasim Reed, Manfred Lehner, Matthew Patterson, Amanda Shailendra, Tilo Fruth. (photo by PWP Studios)

This particular part of the event proved to be the most significant, especially for the BEKO customer base, because it detailed so many sides of the company that the majority of people were completely unfamiliar with. "This visit was very important for us to get a much clearer perspective of who and what BEKO is. We have chosen BEKO as one of our five main vendors to improve the quality of what we provide to our customers and increase our market share," said Ed Tudor, General Manager of the Dickinson Equipment Company.

For example, when moving through the production area, no one truly realized the high level of manufacturing and sophistication used to produce the company's membrane air dryer series, DRYPOINT® M. Eyes were also opened by the BEKO showroom, which features a fully functioning compressor station where the entire BEKO product range is employed and the treated compressed air is used in the company's own manufacturing processes. Customers and suppliers alike did not realize the extent of the company's product portfolio up until that point; a point where at that moment you could no longer consider BEKO to be just a drain company anymore, but a true systems supplier from directly after the compressor to the point of use.

The multimedia presentation provided attendees with a more in-depth look at BEKO on a worldwide scale. Recent global news included groundbreaking on a four million Euro investment to expand the manufacturing center and headquarters in Germany. It also included a detailed video on one of the largest heat of compression desiccant dryers in Europe — a BEKO dryer treating more than 100,000 scfm of air.

After the planned tour stops had been seen by all and those who needed it grabbed a quick bite to eat, everyone was invited into the central part of the warehouse, where a formal dais was constructed, to hear a few words from some of the more distinguished guests. Event speakers included Georgia Senator Kasim Reed, Metro Atlanta Chamber of Commerce Senior Vice President of Economic Development Hans Gant, BEKO Technologies Corporation's President and Executive Vice President, Tilo Fruth and Markus Mueller respectively, BEKO Technologies GmbH Managing Director Manfred Lehner and Company owner Monique Abeels and her son Yannick Koch.

GRAND OPENING FOR BEKO USA

Dinner at the Georgia Aquarium. (photo by PWP Studios)

Dinner at the Georgia Aquarium

Then came the time for a little fun. The Company made arrangements for the entire aquarium to be empty — save the BEKO party. The entire group then had an hour to themselves to come and go as they wished throughout the entire Georgia Aquarium. For those who find peace and calm in fish watching or just simply enjoy things aquatic, it was quite simply fantastic.

Then right around quarter after six in the evening; the Arctic Ballroom doors were opened to the party attendees, with an entry hall faced by a large tank of fish, and in the ballroom itself a dining area flanked by the Beluga Whale tank of the aquarium. Guests were greeted with an open bar and a Wolfgang Puck catered meal directly alongside the whale tank, which created a most serene and relaxing atmosphere in which to enjoy a delicious meal.

Dinner service was purposefully delayed from the doors being opened initially to allow guests to mingle and have the opportunity to meet others they might not normally encounter. Just prior to the food being served; the guests were once again entertained with heartfelt speeches, and the presentation of commemorative gifts that were handed out to the company owner and the board. Dinner was then served and the evening ran its course.

Tim Barber, General Manager of BEKO Japan remarked, "What an excellent event the Grand Opening was — very memorable and the dinner in the aquarium was stunning. I am sure everyone who attended it will remember it for a very long time to come."

Well said by Mr. Barber and congratulations to BEKO USA. BP

RESOURCES FOR ENERGY ENGINEERS

TRAINING CALENDAR

TITLE	SPONSOR	LOCATION	DATE	INFORMATION
Fundamentals of Compressed Air	Compressed Air Challenge®	Fortuna, CA	11/19/2008	www.compressedairchallenge.org
Fundamentals of Compressed Air	Compressed Air Challenge®	Omaha, NE	3/24/2009	www.compressedairchallenge.org
Advanced Management of Compressed Air	Compressed Air Challenge®	Omaha, NE	3/25/2009	www.compressedairchallenge.org

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

New Compressed Air Management Program

Norgren Inc. and Pneu-Logic Corp. announced a joint initiative to provide industry's first intelligent compressed air management program offering plant-wide analysis, real-time process control and pneumatic system design in a single integrated solution.

Based upon Norgren's 80 years of experience in pneumatics and powered by Pneu-Logic proprietary software, the Norgren IQ program aggregates and analyzes trend data and tightens parameters over time, essentially "getting smarter as it goes," the companies said.

The program assesses both supply and demand of compressed air in factories and adjusts it dynamically to ensure continuous, optimal performance. This in turn saves energy, reduces operating expense, prevents downtime and increases productivity.

IMI Norgren
Tel: 303-797-5101
Email: kweatherson@usa.norgren.com
www.norgren.com

RESOURCES FOR ENERGY ENGINEERS

PRODUCT PICKS

New Thermal Mass Flow Meter

Fluid Components International announces the ST50 Flow Meter Series is now available with a high-precision +1 % accuracy configuration for line sizes from 2 to 24 inches (51 to 610mm) and is suitable for applications in air, compressed air, HVAC and process gases, including nitrogen.

The new high-accuracy ST50 Flow Meter features FCI's thermal dispersion mass flow sensing technology, which provides direct flow measurement for higher performance at a lower cost. With the ST50, there is no need for the temperature sensors, flow computers or other devices required with orifice plates, Venturis, Vortex shedding and other meters. The ST50's unique design also provides built-in temperature compensation for reliable measurement over a wide temperature range with almost no pressure-drop.

The versatile ST50 features a wide flow range, measuring air flow from 1 to 125 sfps (0.3 to 38 nmps), nitrogen from 1 to 150 sfps (0.3 to 46 nmps) and compressed air from 4 to 400 sfps (1.2 to 122 nmps). Accuracy is +1% of reading, +0.5% of full scale, with repeatability of +0.5% of reading. It operates at temperatures from +40 to 100° F (4 to 38° C).

Fluid Components International
Tel: 800-854-1993
Email: fcimarcom@fluidcomponents.com
www.fluidcomponents.com

New Compressor Control System

John Henry Foster Minnesota announces Flo-Trol, the industry's first flow-based centralized compressor control system. Flo-Trol eliminates many of the limitations that currently exist with compressor control systems offered by compressor manufacturers. Some of Flo-Trol's advantages include:

- Flo-Trol is non-proprietary, using off-the-shelf components
- Flo-Trol is able to control and monitor all types and manufacturers air compressors and vacuum pumps
- Flo-Trol eliminates the need to designate a lead compressor or establish a cascading pressure band system

Over the last 15 years and 200 installations, Flo-Trol has evolved into a very powerful and sophisticated control and monitoring system. Our Electro-Pneumatic Control department has applied the expertise and knowledge, gained through experience, to develop a complete family of U.L. Listed controllers under the Flo-Trol name. We are utilizing state-of-the-art hardware and software such as Allen Bradley's MicroLogix and CompactLogix controllers and Panelview touch screens to provide our customers with all the benefits this new technology has to offer. John Henry Foster is also well versed in the integration of Flo-Trol with Building Management Systems. We have extensive experience with Local Area Network technologies, such as Ethernet.

John Henry Foster Minnesota
Tel: 651-681-5724
Email: ronnordby@jhfostermn.com
www.jhfoster.com BP

Wall Street Watch

BY COMPRESSED AIR BEST PRACTICES™

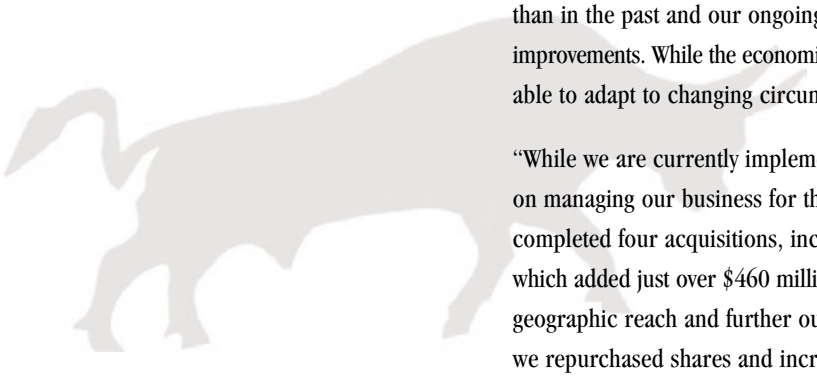
The intent of this column is to provide industry watchers with publicly held information on publicly held companies involved with the sub-industry of compressed air. It is not the intent of the column to provide any opinions or recommendations related to stock valuations. All information gathered in this column was on October 27, 2008.

Cleveland, October 16, 2008 — Parker Hannifin (NYSE: PH) reported record first-quarter sales, net income, earnings per diluted share and cash flow from operations for the quarter ending September 30, 2008.

Fiscal 2009 first-quarter sales were $3.1 billion, an increase of 10% from $2.8 billion in the same quarter a year ago. Net income increased 9% to $250.2 million from $229.6 million in the first quarter of fiscal 2008. Earnings per diluted share increased 13.1% to $1.50 compared with $1.33 in last year's first quarter. Cash flow from operations was $307.3 million, or 10% percent of sales.

"Current quarter results reflect our ability to deliver record performance in the face of a rapidly changing economic climate," said Chairman, CEO and President Don Washkewicz. "We are particularly pleased that we delivered a 4% organic growth rate this quarter.

WALL STREET WATCH



"The Win Strategy initiatives we have been implementing over the past seven years have better prepared us to weather this uncertainty in our markets. For example, today we have exposure to a greater number of end markets, many of them less cyclical than before. We also have much better geographic balance with greater than 50% of our industrial segment revenues and profits generated from international markets. Additionally, our cost structure is much more flexible than in the past and our ongoing focus on lean enterprise is delivering continuing productivity improvements. While the economic outlook for the near future remains uncertain, Parker is better able to adapt to changing circumstances in our operations than in previous downturns.

"While we are currently implementing contingency plans for the short term, we remain focused on managing our business for the long term and utilizing our strong cash position. We recently completed four acquisitions, including three on the first day of our fiscal 2009 second quarter, which added just over $460 million in annualized revenues. These investments help us extend our geographic reach and further our exposure to growth markets such as life sciences. Additionally, we repurchased shares and increased our dividend for the 52nd consecutive year, reflecting our confidence in the future."

Segment Results

In the Industrial North America segment, first-quarter sales increased 10.1% to $1.1 billion, and operating income increased 3.4% to $160.5 million, compared with the same period a year ago.

Orders

In addition to financial results, Parker also reported an increase of 1% in total orders for the quarter ending September 30, 2008 compared with the same quarter a year ago. Parker reported the following orders by operating segment: Orders increased 2% in the Industrial North America segment, compared with the same quarter a year ago.

Outlook

For fiscal 2009, the company revised guidance for earnings from continuing operations to the range of $5.35 to $5.75 per diluted share. Previous guidance for earnings from continuing operations was $5.65 to $6.05 per diluted share.

"There is enough uncertainty in many of our end markets and sentiment among our customers to warrant a downward revision in our earnings expectations for the year," added Washkewicz. "While this ultimately may prove to be conservative, at this time we believe it is prudent. Having said that, our earnings guidance still assumes that operating margins will be significantly above the levels we achieved at the bottom of the last economic cycle, evidence that we have made significant progress in transforming Parker into a premier diversified company."

Hamilton, Bermuda, October 24, 2008 — Ingersoll-Rand Company Limited (NYSE:IR), announced that total revenues increased by 93% for the third quarter of 2008 compared with the 2007 third quarter and EPS from continuing operations met revised guidance.

The company reported net earnings of $227.7 million, or diluted earnings per share (EPS) of $0.70, for the third quarter of 2008. Third-quarter net earnings included $233.7 million, or EPS of $0.72 from continuing operations, as well as $6.0 million of costs, equal to EPS of ($0.02), from discontinued operations.

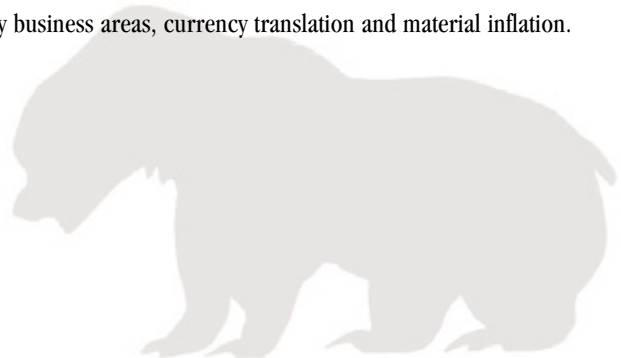
Net earnings for the 2007 third quarter of $266.6 million, or EPS of $0.92, included EPS of $0.68 from continuing operations and EPS of $0.24 from discontinued operations, which represent discontinued businesses and the retained costs of divested businesses. "Despite increasingly difficult market conditions in the third quarter, we delivered year-over-year revenue growth while reducing debt by $443 million and meeting our synergy expectations for the acquisition of Trane," said Herbert L. Henkel, chairman, president and chief executive officer. We are also accelerating productivity and cost reduction actions and have undertaken a major company-wide restructuring to adjust our cost structure to offset slowing end market activity. "While the economic conditions for the foreseeable future will remain a challenge, I am more confident than ever that we will continue to improve our processes, reduce our costs and enhance our customer offerings to emerge as a stronger and better company."

> "Air & Productivity Solutions aftermarket revenues were up 5%"

Additional Highlights for the 2008 Third Quarter

Revenues: The company's reported revenues increased by 93% to $4,313.2 million compared with revenues of $2,239.0 million for the 2007 third quarter. Third quarter 2008 includes $2,051 million of revenues from Trane, which is reported as the Air Conditioning Systems and Services (ACSS) segment. On a pro forma basis, total revenues increased by 2% and were flat compared with 2007, excluding currency. Americas revenues increased by 1%, while revenues from overseas operations increased by approximately 4%.

Operating Income and Margin: Reported operating income for the third quarter increased to $347.4 million compared with $276.3 million for the third quarter of 2007. Third quarter 2008 included approximately $122 million of one-time pre-tax costs related to the acquisition of Trane. Third-quarter reported operating margin was 8.1%. Excluding the one-time acquisition-related costs, third-quarter 2008 operating margins would have been 10.9%. Positive leverage from expense reductions, productivity actions and price increases were offset by unfavorable business and product mix in certain key business areas, currency translation and material inflation.



WALL STREET WATCH

Third-Quarter Business Review

The company classifies its businesses into four reportable segments based on industry and market focus: Air Conditioning Systems and Services (added on June 5 with the acquisition of Trane), Climate Control Technologies, Industrial Technologies and Security Technologies.

Air Conditioning Systems and Services (ACSS), which represents the results of Trane, provides systems and services that enhance the quality and comfort of the air in homes and non-residential buildings. Reported revenues for the quarter were $2,051 million with operating income of $89.5 million. Third-quarter operating income included $108 million of one-time acquisition-related costs. Excluding one-time costs, third-quarter operating margins would have been 9.6%. Total pro forma revenues for the third quarter increased by 3%. On a year-over-year pro forma basis, commercial equipment and systems revenues increased by 6%, with a 1% improvement in equipment revenue and a 13% increase in parts, services and solutions. Commercial revenue growth was balanced in the quarter with North America revenues up by 3% and international revenue growth up by 12%. Residential revenues declined by 4% in the third quarter due to continuing weakness in the U.S. housing market.

Climate Control Technologies provides solutions to transport, preserve, store and display temperature-sensitive products, and includes the market-leading brands of Hussmann® and Thermo King®. Revenues for the sector of $895 million increased by approximately 1% compared with the third quarter of 2007. Third-quarter 2008 operating margin increased slightly to 11.5%, compared with 11.3% in the 2007 third quarter. The margin increase was due to operational improvements and higher price realization, which were partially offset by increased material costs and unfavorable product mix. Total worldwide refrigerated trailer and truck revenues declined by 6%, reflecting the decline of the heavy truck market. Sea-going container sales

OCTOBER 27, 2008 PRICE PERFORMANCE	SYMBOL	LAST PRICE	1 MONTH	6 MONTHS	12 MONTHS
Parker-Hannifin	PH	$34.58	-30.7%	-53.5%	-52.7%
Ingersoll-Rand	IR	$16.01	-46.7%	-60.4%	-65.7%
Gardner Denver	GDI	$21.58	-42.8%	-56.3%	-40.6%
United Technologies	UTX	$45.18	-22.3%	-34.9%	-37.5%
Donaldson	DCI	$29.03	-31.0%	-30.1%	-28.0%
EnPro Industries	NPO	$24.42	-32.8%	-31.2%	-36.0%
SPX Corp	SPW	$38.99	-49.5%	-64.0%	-55.9%

declined and worldwide bus and aftermarket revenues were flat compared with 2007. Sales of the TriPac® auxiliary power unit more than doubled in the third quarter compared with last year. Worldwide revenues for refrigerated display cases and contracting increased by 5% compared with the third quarter of 2007 from improved sales of display cases and growing parts and service revenues.

Industrial Technologies is focused on providing solutions to enhance customers' industrial and energy efficiency and provides equipment and services for compressed air systems, tools, fluid power production and energy generation systems. Total revenues in the third quarter increased by approximately 2% to $718 million. Stable industrial and process markets outside of North America and revenues from the aftermarket business continued to benefit the Air and Productivity Solutions business where year-over-year revenues increased by 5%. Revenues in the Americas were up by 2% compared with last year as higher recurring revenues were offset by lower equipment volumes. Air and Productivity Solutions revenues in Europe, Asia and India grew by approximately 8% compared with 2007. Club Car revenues declined compared with record results in the third quarter of 2007 due to sluggish golf and consumer markets in the United States. Third-quarter operating margin for Industrial Technologies of 11.3% declined compared with 13.3% last year due to higher inflation and unfavorable mix, which were partially offset by cost productivity and higher prices. BP

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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?

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- Future advancement and growth opportunities throughout the organization
- Very visible position, where someone's hard work will not go unnoticed

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

AEE 2009 SHOW SCHEDULE

GLOBALCON 2009
APRIL 1-2, 2009
ATLANTIC CITY, NJ
www.GlobalconEvent.com

WEST COAST ENERGY MANAGEMENT CONGRESS- EMC
JUNE 10-11, 2009
LONG BEACH, CA
www.EnergyEvent.com

WORLD ENERGY ENGINEERING CONGRESS – WEEC
NOVEMBER 4-5, 2009
WASHINGTON, DC
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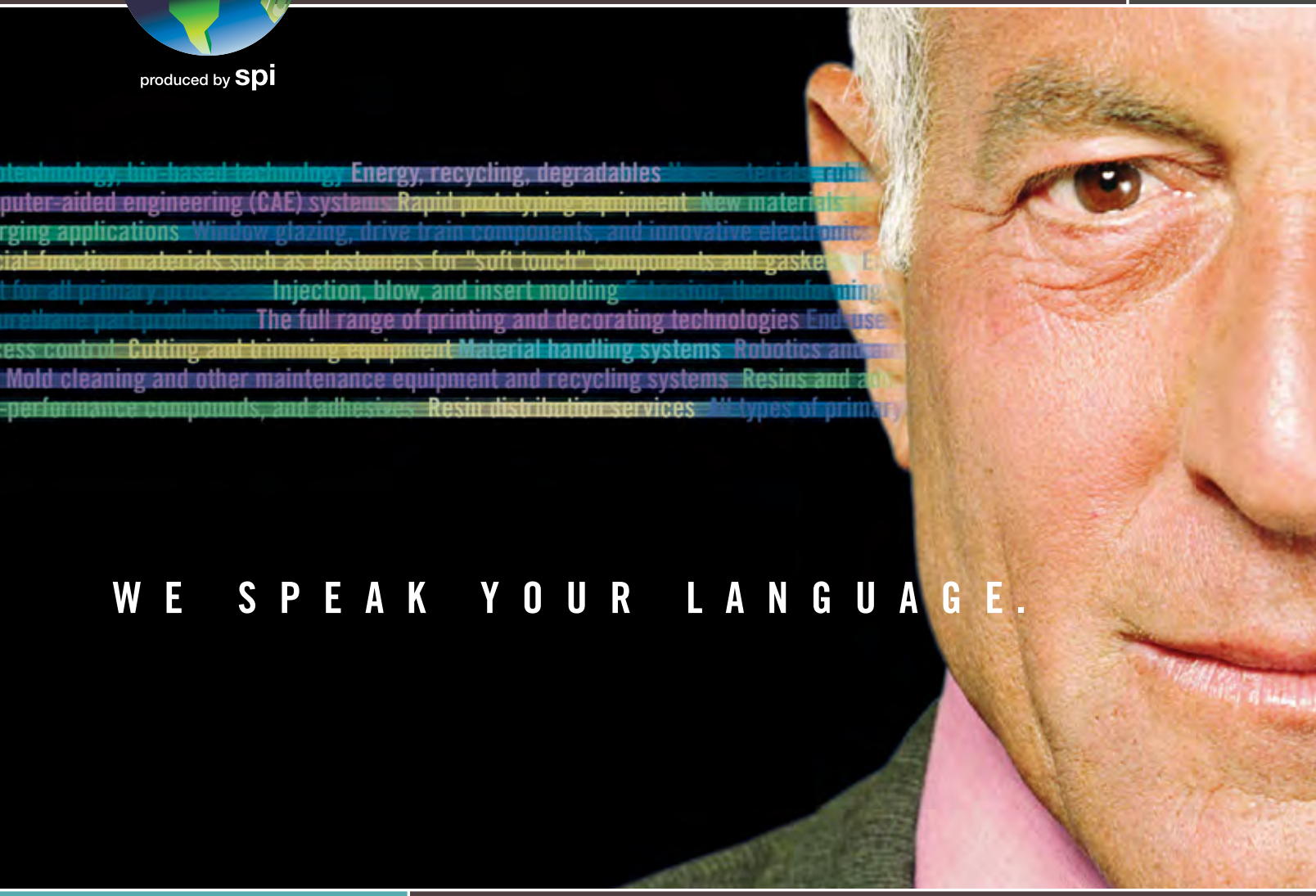

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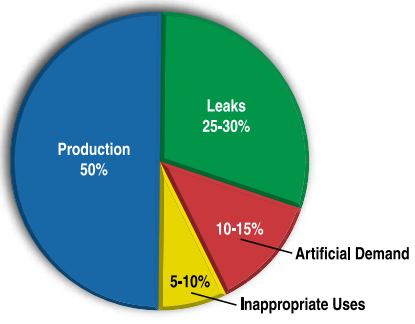

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