MasterPACKer Eco+™ Dairy Energy-Savings Air-Flow Reduction Projects

August 2011

COMPRESSED AIR BEST PRACTICES®

BEKO HYDROCARBON REMOVAL AND MEASUREMENT

Put a lid on energy waste

Hi, I'm Bob, Senior Marketing Support Specialist at Atlas Copco Compressors. For the last 38 years, I've been part of the team taking care of our valued customers in the United States. Today, let me tell you how Variable Speed Drive technology represents a great value proposition for your production.

All across the globe, customers are compressing air that just goes to waste. Energy can represent over 80% of a compressor's lifecycle cost and generating compressed air can account for more than 40% of a plant's total electricity bill. Most production environments have a fluctuating air demand depending on the time of day, week or even month. So put a lid on those energy costs with Atlas Copco's VSD technology that mirrors air usage, automatically adjusting the motor speed depending on the demand, making major energy costs savings a reality while helping to protect the environment for future generations.

Our mission is to continue to bring sustainable productivity through safer, cleaner, more energy-efficient, and cost-effective compressed air technology. Simply log onto **www.atlascopco.us/bobusa** or call **866-688-9611** to learn more about us, our products, and how we have earned and will continue to earn our reputation.

Sustainable Productivity

Atlas Copco

HITACHI COMPRESSOR CENTENNIAL ANNIVERSARY 2011

Celebrating 100 Years of Compressed Air Technology

1910 1950 1970 1980 1990 2000 2011

1911

2011

•1910: First product was a 5 HP electric motor, Hitachi was founded

•1911: 75kW Reciprocating - First Compressor in Japan

•1946: First Bebicon

•1954: Oil Free 22kW Reciprocating

•1967: Oil Free Bebicon

•1968: First Oil Free Rotary Screw DS Series

•1969: First Vortex Blower

•1976: Oil Injected Packaged Rotary Screw Series

•1977: Smallest 5.5kW Oil Injected Rotary Screw

•1980: First DSP Series Oil Free Rotary screw

•1981: Vortex Blower "E" Series

•1982: World's Smallest Single Stage Oil Free Rotary

•1986: World's Smallest Air Cooled Oil Free Rotary

•1985: World's First Oil Injected Scroll Bebicon

•1992: Vortex Blower "G" Series

•1995: Oil Free Scroll SRL Series

•2002: New Generation Oil Injected HISCREW2000 Series

2009:• New Oil Free Scroll SRL Series Multiplex

•2000: World's First Variable Speed Drive Oil Free Rotary

•1999: New Generation Oil Free Rotary Screw DSP Series

•2001: Package Scroll Bebicon

•2005: New Oil Free Scroll SRL Series

Leading Innovation over the last 100 years, Hitachi is proud to recognize the past and present milestones of air technology. It is with this foundation that we continue our growth for the next 100 years. Please join us in our centennial celebration as we strive to provide the most reliable, environment friendly and energy conscious products.

Hitachi Oil-Less Scroll SRL Series Compressors

Hitachi Oil-Free Screw DSP Series Compressors

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HITACHI
Inspire the Next

SUSTAINABLE MANUFACTURING FEATURES


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FROM THE EDITOR

Food Packaging

The packaging industry is extremely competitive and cost-sensitive. The ability to reduce operating costs can determine the future of a plant. Taking "next-steps" in managing the costs and the quality, of the compressed air system, is an area of opportunity many firms are taking advantage of.

Our system assessment article, provided to us by Hank Van Ormer of Air Power USA, details how a container facility greatly reduced their demands on the compressed air systems. The over-all energy savings totaled over $600,000 per year. Work was done on reconfiguring the piping system and on specific end uses of compressed air.

Packaging machinery represents one of the bigger end users (and energy-saving opportunities) in compressed air and nitrogen systems in the food and pharmaceutical industries. CVP Systems has come out with the MasterPACKer Eco+™ allowing customers to reduce their material (plastic film and scavengers) and energy costs significantly. This article focuses on intelligent machine designs by OEM's like CVP Systems, focusing on sustainability, that permit manufacturing facilities to reduce their environmental impact while raising profits.

BEKO Technologies has introduced an innovative technique to remove and monitor hydrocarbons in compressed air systems. We interviewed the President of BEKO Technologies, Tilo Fruth, to learn more about these systems deploying catalytic converters to remove hydrocarbons. Reflecting an overdue movement in facilities to truly measure and monitor compressed air quality in-line, the new instrumentation provided by BEKO provides real-time hydrocarbon measurement for critical processes.

Ron Marshall, for the Compressed Air Challenge, contributes again with energy-saving case studies in the dairy industry. EXAIR Corporation also contributes a nice article talking about some simple, low-cost actions on the demand-side of the compressed air system, that factories can do to save energy.

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

ROD SMITH
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"The new MasterPACKer Eco+™, from CVP Systems, allows packaging plants to reduce their environmental impact while raising profits."

— Rod Smith

SUSTAINABLE MANUFACTURING NEWS

Cargill, Campbell's, Unilever, PepsiCo

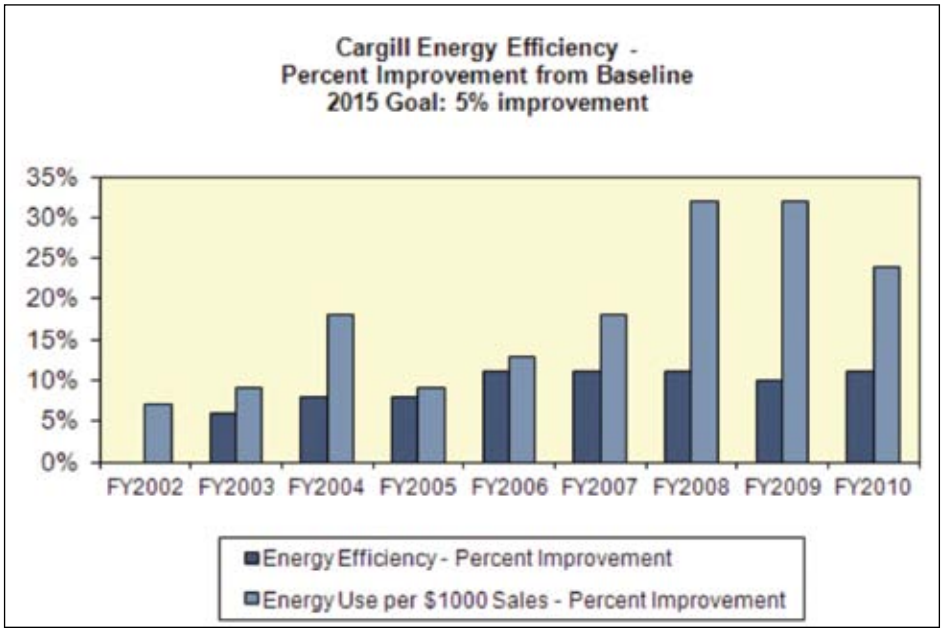
SOURCED FROM THE WEB

Cargill Energy and Water-Saving Innovations

We have been working on reducing our environmental impact for a long time. For example, since 2001 we have improved energy efficiency within our operations by more than 10% per metric ton of production (our energy efficiency per U.S. $1,000 of sales has improved by more than 20%). Cargill invests in a variety of innovative solutions to use energy and resources more wisely.

Environmental innovation examples

- **Energy performance.** Four Cargill Corn Milling North America locations — Blair, Nebraska; Cedar Rapids, Iowa; Eddyville, Iowa; and Wahpeton, North Dakota, earned the U.S. Environmental Protection Agency's (EPA's) prestigious ENERGY STAR, the national symbol for protecting the environment through energy efficiency. This places Cargill Corn Milling facilities in Blair, Cedar Rapids, Eddyville and Wahpeton, within the top 25% of wet corn milling plants in the nation, with regard to energy performance
- **GHG emission credits.** Over the past five years, we've developed — not merely invested in — projects that will generate an estimated 800,000 greenhouse gas (GHG) emissions emission credits by 2012. For instance, we build and operate anaerobic digesters, including one on a pig farm in South Africa and two on large dairy farms in the United States. These sites generate carbon credits from reduced methane emissions in the atmosphere
- **Fueled by sawdust.** Our animal nutrition business in Honduras has replaced diesel-run boilers with a boiler fueled by sawdust from the local lumber industry. Switching from diesel to sawdust has reduced carbon emissions by about 6,000 metric tons per year
- **Fueled by eucalyptus wood chips.** Our complex in Uberlândia, Brazil, is using wood chips from fast-growing eucalyptus trees as biomass to power the site's bioboiler. The process will generate 70% of the power and 100% of the steam at this location, resulting in a savings of 60,000 metric tons of fuel oil per year and reduced GHG emissions
- **Recycling water.** Our poultry facility in London, Ontario, Canada, reduced freshwater consumption by 28% in 24 months, in part because all of the water used for chilling at the facility is recycled twice for cooling and rinsing
- **Biogas.** At our beef and pork plants, Cargill reclaims methane from our waste water lagoons and turns it into biogas to fuel its plant boilers. Biogas now displaces 20–25% of natural gas demand at all eight of our U.S. meat processing plants, while reducing greenhouse gas emissions by more than 1.3 million metric tons in the last four years



Behavior-based energy management

Cargill is seeing great returns from its global behavior-based energy management (BBEM) system — a tool used to engage employees and integrate energy into daily actions to improve performance. It's led to the formation of several new efforts, including a robust leak tag initiative at our seven U.S. corn milling facilities which has resulted in the identification of water, compressed air and steam leaks and major energy cost savings.

Goals and actions

Cargill has been working on reducing our environmental footprint for a long time. We've pursued operational excellence throughout our nearly 150-year long history. We've learned that using energy and water efficiently and reducing waste is good for the environment, our communities and our business.

Cargill's vision is to be the global leader in nourishing people. In order to nourish a growing world population, we know we must produce food, feed and fuel in the most sustainable and efficient way possible. We set these goals to ensure we are a leader in continuously improving our efforts to ensure the vitality and conservation of our natural resources.

Cargill first set comprehensive environmental goals nearly a decade ago, in 2001. New goals are established every five years.

2015 environmental goals

- Improve energy efficiency by 5% from our fiscal 2010 baseline
- Improve greenhouse gas intensity by 5% from our fiscal 2010 baseline
- Increase renewable energy use to 12.5% of our energy portfolio
- Improve freshwater efficiency by 5% from our fiscal 2010 baseline

Source: www.cargill.com

Cargill®

SUSTAINABLE MANUFACTURING NEWS

Cargill, Campbell's, Unilever, PepsiCo

Campbell's Corporate Social Responsibility

We recognize and respect the fact that Corporate Social Responsibility ("CSR") and "sustainability" mean different things to different people. First, here is some context on how we view these terms.

At the most basic level, CSR and sustainability at Campbell Soup Company mean advancing global wellness and nutrition, helping to build a more sustainable environment, and honoring our role in society from the farm to the family. More broadly, we consider CSR and sustainability as approaches to the conduct of business that build employee engagement, create positive social impacts, enable operational efficiency, reduce costs, foster innovation, strengthen our relationships with our customers and consumers, and ultimately create business advantage over the long term.

We firmly believe that a company should be judged not just on its financial performance but on its commitment to CSR and sustainability.

ECONOMIC			
($ MILLIONS)	**2008**	**2009**	**2010**
Net Sales	7,998	7,586	7,676
Earnings Before Interest and Taxes	1,098	1,185	1,348
Taxes on Earnings	268	347	398
Dividends Paid	329	350	365
Capital Expenditures	298	345	315
Research and Development	115	114	123
Nutrition and Wellness** Product Portfolio (revenue)	1,720	2,029	2,466
Nutrition and Wellness revenue/total revenue	21.5	26.8	32.1

** Includes end of FY revenue from Organic, Full Vegetable Serving, Light, Low Fat, Reduced Sodium and Whole Grain products.

ENVIRONMENTAL			
	2008	**2009**	**2010**
Water Use (Gross 000 gal.)	7,829,355	7,050,749	6,891,498
Water Use Cu. Meter/Tonne of Food Produced	10.33	9.35	9.06
Energy Use (mmbtu)	10,239,864	10,276,947	10,154,522
Energy Use (mmbtu)/Tonne of Food Produced	3.57	3.60	3.53
Greenhouse Gas (GHG) Emissions ($mmtCO_2$)	899,537	879,084	850,376
GHG Emissions ($mmtCO_2$)/Tonne of Food Produced	0.313	0.308	0.295
Solid Waste Recycled (%)	64*	84.5	83.1
Waste Disposed (tonne)/Tonne of Food Produced	0.023*	0.019	0.022
Capital Investment in Environmental Compliance and Sustainability ($mill)	12.3	15.1	15.7

* Waste Disposed and Recycled % for 2008 is result for U.S. only. Subsequent numbers represent global operations.

We are confident that our consumers, customers, employees, and investors feel the same. We also believe that the importance of this commitment will increase as the 21st century progresses.

CSR Corporate Imperative 2020 Destination Goals

1. Nourishing Our Consumers — Continually advance the nutrition and wellness profile of our product portfolio
2. Nourishing Our Neighbors — Measurably improve the health of young people in our hometown communities by reducing hunger and childhood obesity by 50%
   - Supporting Goals: Make a positive impact in the lives of 100 million youth through our volunteer, community, and signature programs
3. Nourishing Our Employees — Achieve 100% employee engagement in CSR and sustainability strategies
4. Nourishing Our Planet — Cut the environmental footprint of our product portfolio in half as measured by water use and CO_2 emissions per tonne of product produced

   Supporting Goals:
   - Reduce energy use by 35% per tonne of product produced, and source 40% of the energy used by the company from renewable or alternative energy sources
   - Recycle 95% of waste generated on a global basis
   - Eliminate 100 million pounds of packaging from Campbell products
   - Deliver 100% of global packaging from sustainable materials (renewable, recyclable, or from recycled content)
   - Reduce water use by 20% and energy use by 30% per pound in our top five agricultural ingredients

Managing Performance

Campbell employs a "balanced scorecard" to define annual objectives and measure the performance of the company as a whole and by the individual business units. Goals defined in the scorecard fall within four key measurement areas relating respectively to the company's financial, strategic, operational, and marketplace objectives. Through our balanced scorecard, we assess not only whether we achieve our objectives, but also how we achieve them.

CSR and sustainability metrics are included in categories across Campbell's balanced scorecard: the primary tool used to determine

annual incentive compensation for executives, managers, and professionals. Objectives range from specific steps in strategy development to individual reporting milestones, such as establishment of agreed-upon metrics, expansion of community service programs, workplace diversity and inclusion, and supplier diversity and safety. Some examples of CSR objectives in the balanced scorecard for the current year include the following:

- Advance progress toward long-term Sustainability Destination Goals while delivering value to Campbell Businesses
- Improving environmental stewardship through reductions in energy and water use
- Increasing recycling efficiency and expanding logistics sustainability efforts
- Improving diversity representation and inclusion
- Improving Campbell's global safety performance
- Maintaining and improving our world-class levels of employee engagement
- Advancing progress to our Community Destination Goal to reduce hunger and childhood obesity in Campbell Communities
- Launching a signature community program in Camden, NJ as a blueprint for future expansion

Source: www.campbellsoupcompany.com

Campbell's®

SUSTAINABLE MANUFACTURING NEWS

Cargill, Campbell's, Unilever, PepsiCo

Unilever Manufacturing Impacts

Lifecycle assessment shows that compared to other parts of our value chain, our manufacturing is not particularly energy-intensive. However, because of the scale of our business, we continue to focus our efforts on reducing our manufacturing energy use and greenhouse gas emissions.

As part of the Unilever Sustainable Living Plan we have set ourselves the following targets:

- By 2020 CO_2 emissions from energy from our factories will be at or below 2008 levels despite significantly higher volumes. This represents a 63% reduction per tonne of production and a 43% absolute reduction (versus a 1995 baseline)
- We will more than double our use of renewable energy to 40% of our total energy requirement by 2020
- All newly built factories will aim to have less than half the impact of current ones

In 2010 we implemented Project Neutral, a site-by-site assessment to help our manufacturing operations meet our Sustainable Living Plan targets. These targets commit us to maintaining our 2008 levels of greenhouse gas, water and waste impacts against a backdrop of significant volume growth in our business.

This is a tough challenge. To achieve this, we built a detailed plan, reviewing the likely areas of volume growth from a geographic and product perspective. We also looked at the current environmental performance of all our sites. As a result we identified a number of 'levers' or areas of potential change which will deliver reductions in greenhouse gas emissions. We asked all our manufacturing sites to assess themselves against these levers, which showed us where the opportunities for reductions lie. Projects have been identified by individual sites which, when implemented, will further reduce our greenhouse gas emissions.

Performance in 2010

In 2010 we saw improvements in our two key performance measures expressed on a load per tonne basis: energy use (in gigajoules (GJ/tonne)) and CO_2 from energy (in Kg CO_2/tonne).

In 2010 we saw our energy use per tonne of production decrease by 1.0% compared to 2009. This represents a 42% reduction since 1995 (equivalent to a 45% reduction in absolute terms).

We have achieved a 44% reduction in CO_2 from energy per tonne of production since 1995 (equivalent to a 47% reduction in absolute terms). In 2010 we reduced our CO_2 from energy by 6.0% per tonne of production compared with 2009 (equivalent to a 1.6% reduction in absolute terms).

This data forms part of the eight environmental and two occupational safety performance indicators which have been independently assured by Deloitte LLP.

How are we making it happen?

Our aim is to reduce energy use and greenhouse gas emissions at our sites around the world by a combination of improved energy efficiency, technology change and the use of renewable energy. We are convinced that the application of new technologies will allow for a substantial reduction in greenhouse gas emissions. Energy from sun, wind, water, wood, pulp, straw residue and waste also offer a way of meeting the energy challenges of the future.

Here we provide a few examples of site-level activities.

Energy efficiency and new technology

At our Cali site in Colombia, Latin America, the installation of a boiler automation system resulted in an 8% reduction in our CO_2 from energy.

"In 2010 we saw our energy use per tonne of production decrease by 1.0% compared to 2009. This represents a 42% reduction since 1995 (equivalent to a 45% reduction in absolute terms)."

— Unilever

At our Wall's and Magnum ice cream factory in Gloucester, UK, we are reducing CO_2 from energy by more than 3,000 tonnes a year following the installation of a combined heat and power (CHP) plant. The 2.4 megawatt plant is primarily fuelled by natural gas, with heat in the form of hot water and steam produced as a by-product. This heat is re-used in the manufacturing process.

In Europe we have combined heat and power plants operational in Caivano, Italy, and Heppenheim and Stavenhagen, Germany. These are more environmentally efficient than importing electricity from the national supplier because they fully utilise the waste steam and hot water from electrical power generation. So far, they have produced savings of 57,000 tonnes of CO_2 emissions, equating to 9% of carbon emissions from our European operations.

Unilever's factory in Tatura, Australia, received a government grant of €700,000 to construct a 1.1 megawatt co-generation plant, which generates both electricity and heat using natural gas and thermal energy. This cuts greenhouse gas emissions by an estimated 44% while making Tatura self-sufficient in meeting its high energy demand.

We have used green plant design at our new aerosol manufacturing site in Mexico. This involved installing solar lighting and heating, water reuse and high-efficiency equipment. We are expecting a 25% reduction in CO_2 from energy and a 40% reduction in water consumption per tonne of production compared to existing aerosol production sites.

Source: www.unilever.com

Unilever

SUSTAINABLE MANUFACTURING NEWS

Cargill, Campbell's, Unilever, PepsiCo

PepsiCo Environmental Goals & Commitments

In 2009, we announced 15 global goals and commitments to guide our work to protect the Earth's natural resources through innovation and more efficient use of land, energy, water and packaging in our operations. We are focusing our work where we can make the most positive impact (water, packaging, climate change and agriculture) and on key policies and partnerships to help provide solutions to address the world's environmental challenges.

Water: Respect the human right to water through world-class efficiency in our operations, preserving water resources and enabling access to safe water.

- Improve our water use efficiency by 20% per unit of production by 2015
- Strive for positive water balance in our operations in water-distressed areas
- Provide access to safe water to 3 million people in developing countries by the end of 2015

Land and Packaging: Rethink the way we grow, source, create, package and deliver our products to minimize our impact on land.

- Continue to lead the industry by incorporating at least 10% recycled polyethylene terephthalate (rPET) in our primary soft drink containers in the U.S., and broadly expand the use of rPET across key international markets
- Create partnerships that promote the increase of U.S. beverage container recycling rates to 50% by 2018
- Reduce packaging weight by 350 million pounds — avoiding the creation of 1 billion pounds of landfill waste by 2012
- Work to eliminate all solid waste to landfills from our production facilities

Climate Change: Reduce the carbon footprint of our operations.

- Improve our electricity use efficiency by 20% per unit of production by 2015
- Reduce our fuel use intensity by 25% per unit of production by 2015
- Commit to a goal of reducing greenhouse gas (GHG) intensity for U.S. operations by 25% through our partnership with the U.S. Environmental Protection Agency Climate Leaders program
- Commit to an absolute reduction in GHG emissions across global operations

Community: Respect and responsibly use natural resources in our businesses and in the local communities we serve.

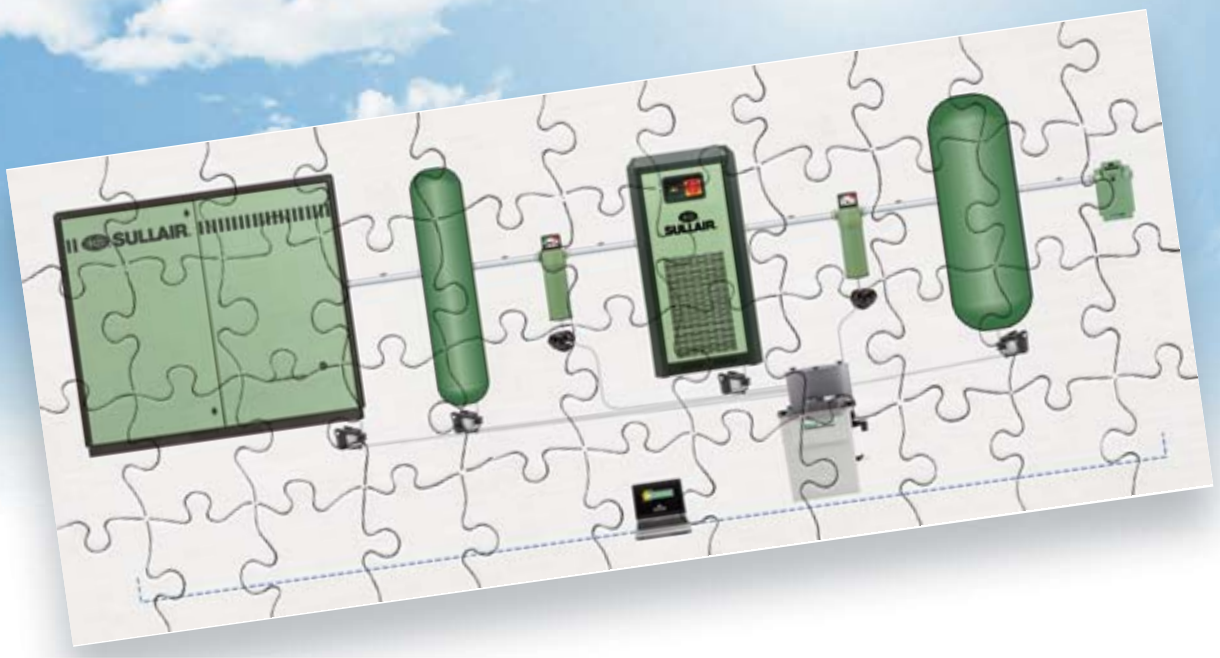
- Apply proven sustainable agricultural practices on our farmed land
- Provide funding, technical support and training to local farmers
- Promote environmental education and best practices among our associates and business partners
- Integrate our policies and actions on human health, agriculture and the environment to make sure they support each other

Source: www.pepsico.com

pepsi®

"Our goal is to improve our electricity use efficiency by 20% per unit of production by 2015."

— PepsiCo



The benefits of a Sullair Stationary Air Power System: reliability, integrity, and always a perfect fit.

Sullair offers total compressed air systems with each component of the system carefully matched for capacity and pressure to provide maximum performance and energy efficiency.

Sullair offers:

- Plant air audits
- Energy efficient products
- Compressed air system controls
- Equipment to monitor and manage systems
- Air distribution products
- After-purchase support

This integrated system helps you reduce your energy costs and improve productivity by analyzing, managing and controlling your compressed air systems.

Always air.
So dependable, the total Sullair Stationary Air Power System provides you with our exclusive air quality guarantee.

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THE SYSTEM ASSESSMENT

Reducing Compressed Air Demand

BY HANK VAN ORMER, AIR POWER USA

Introduction

This food container plant spends $1,028,672 annually on energy to operate the compressed air system at their facility. This figure will increase as electric rates are projected to be raised from their current average of 6.2 cents per kWh. The set of projects identified in the compressed air system assessment could reduce these energy costs by $616,000 per year (49%). Estimated costs for completing the supply and demand-side projects total $525,000. These costs are offset by having qualified for utility company energy incentives of $425,000. After the incentives, this project delivered a simple ROI of two (2) months.

The major savings, in this project, were found in the reconfiguration of the supply-side high-pressure system (at 100 psig) and in the distribution system. A centrifugal air compressor was upgraded to a modern, more energy-efficient centrifugal air compressor installed with a heat-of-compression desiccant air driver.

For this article, we will detail the air-flow reduction projects identified at this plant. The projects included re-piping the system, air treatment product modifications or changes, and several demand-side actions. This portion of the system assessment yielded energy savings of $137,003 with project costs of only $35,600.

Current System Background

This plant runs three bottle IS machines and lines of production with one furnace. As in most glass container facilities, there are two air systems — low pressure 55–60 psig and high pressure 90–100 psig. Most high-pressure air is used for controls, instruments and cold end material handling and packaging. The low-pressure air primarily supplies the forming and cooling air for the IS machines. This plant uses high-pressure plunger cooling air.

There are no compressed air dryers in the low pressure system. The main high pressure air supply has two refrigerated dryers — 6,000-scfm rated (100 psig @ 125 ˚F) non-cycling dryers. Current piping appears to be bypassing a great deal of air around this dryer. There is also a heatless type desiccant, regenerative dryer for the in-house air system. There is no dryer system beyond the after-coolers for the low pressure air.

PROJECT	SAVINGS PROFILE	ENERGY AND OTHER SAVINGS			TOTAL PROJECT COST ($)
		AVG KW	KWH	SAVINGS ($)	
COMPRESSED AIR SUPPLY					
Realign TA48 to base load and eliminate wasted blow off air by re-piping with removing dead head on TA48/rotary screws and XF250	746 kW vs 564 kW (921 cfm blow-off)	182	1,594,306	$98,847	$20,000
AIR TREATMENT					
Add dew point demand purge controller to the instrument air heatless desiccant dryer	30 cfm	4.7	41,443	$2,569	$5,000
Replace timer-activated with level-activated drains: High Pressure – Low Pressure –	 34.1 scfm (11 units) 40.3 scfm (13 units)	 5.4 6.3	 47,107 55,672	 $2,921 $3,452	 $2,200 $2,600
DEMAND-SIDE IMPROVEMENTS					
Replace open blows with Venturi amplifiers on 19 open blows (per list)	117 scfm	18.4	161,629	$10,021	$1,000
Remove all Venturi vacuum generators on insert machine and stackers, attach vacuum cups to overhead Sullair vacuum line and surge tanks	134 scfm (19 units)	21.1	185,114	$11,477	$2,000
Connect vacuum demand on four inserter machines to central system	12 kW	12	105,120	$6,517	$2,000
Replace air vibrators with electric units	14 cfm	2.2	19,340	$1,199	$800
Subtotal Projects	**1,290 cfm**	**252**	**2,209,731**	**$ 137,003**	**$ 35,600**

Measurement

For both the high-and low-pressure systems, 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. These were observed and recorded to relate to the unit's performance, load conditions and integrity. The findings were recorded on the table of compressor supply operating data that follows
2. Critical pressures including inlet and discharge were measured with a single Ashcroft digital calibrated test gauge with an extremely high degree of repeatability. Findings were also recorded in the table of appropriate compressor supply operating data
3. All low-voltage (480V) units had the input kW measured with a Fluke motor analyzer. The high-voltage units power draw was estimated by observing volt and amps, operation, and comparing to the OEM engineering specifications
4. Flow was also measured and logged from the compressor room with an Eldridge thermal mass heater wire-type flow meter and logged with an MDL multi-line unit. Readings were taken every 15 seconds and averaged
5. The same basic measurement and logging activity was carried out for system pressure using an Ashcroft pressure transducer and the same multi-channel MDL data logger
6. Individual critical pressures were taken with a single Ashcroft digital test gauge. This gauge was calibrated to the Ashcroft pressure transducers

Air Flow Reduction Projects

Seven projects were identified in the system assessment capable of providing reductions in required compressed air flow totaling 1,549 scfm. The projects include range from piping modifications to reduce blow-off air at the centrifugal to purge control on desiccant dryers to eliminating inappropriate uses of compressed air.

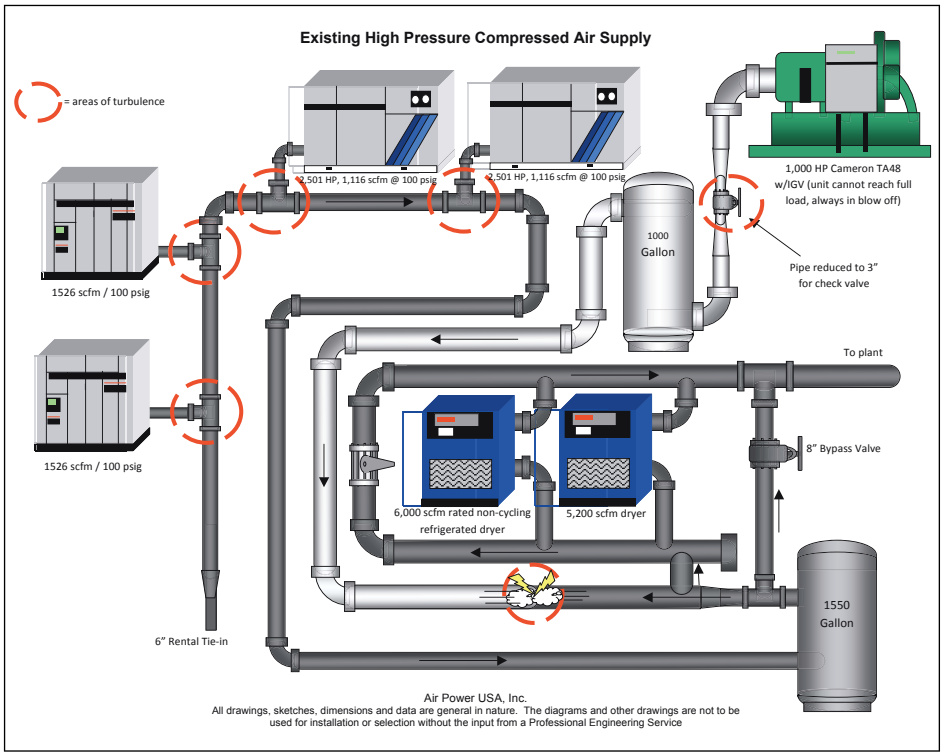
Project #1: Compressed Air Supply: Eliminate Piping "Dead-heads" and Eliminate Blow-off Air

The goal of the project is to realign the centrifugal air compressor (and other high pressure compressors) to run base load and eliminate a measured 921 scfm of blow -off (i.e., wasted) compressed air. There are a number of dead-heads and crossing tees having a significant impact on the high pressure air systems. The air turbulence, back-flows and pressure loss created by these not only force modulated controls off of full-load, when air is needed, but they also create many false signals to the capacity controls precluding proper operation. Without the elimination of these issues, no control system will run properly and respond to actual system demand. Following are the connections in question:

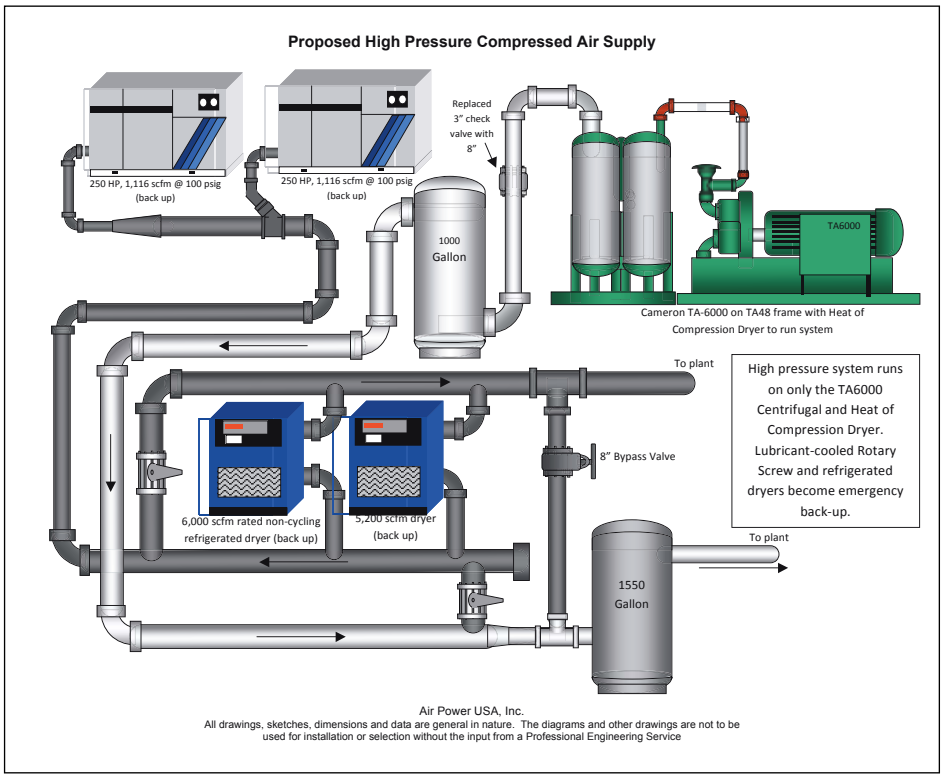
- Dead head between the centrifugal and the rotary screw air. The objective is to keep the centrifugal at base load / full load and trim with the XF250 as required. Re-pipe to a "Y" connection to a large header collector to one of two dryers. Install pressure regulators after the receiver – 95 psig maximum set to hold
- Regulator sized for 6000 scfm – 95 psig in / 93 psig out

THE SYSTEM ASSESSMENT

Reducing Compressed Air Demand



The red circles indicate the areas of high turbulence-generated back-pressure in the piping system. The compressed air flowing from the rotary screw compressors "dead-headed" to the centrifugal keeping it at constant part-load.



Proposed System

- Crossing tee connection XF250 to 8" header from XF350 to reconnect with at least half of discharge pipe 4" connected to 8" line with 30º angle entry
- Cost estimate:

Regulator installation	$8,000
Crossing tee connection	$3,500
Piping change	$8,500
Total	**$20,000**

Note: The XF350's are also tied with crossing tees to themselves and the older Centac not in use. As long as you only run one unit at a time there is no need to change these.

Project #1 Summary

Estimated reduction	921 scfm
Electrical energy cost recoverable	$107.3 cfm/yr.
Total electric energy cost recovery	$98,847/yr.
Estimated Project Cost	$20,000

Project #2: Air Treatment: Add Purge Control to Desiccant Dryer and Install No-Air Loss Drains

There is a heatless desiccant dryer, rated for 260 scfm, providing a stable -40 °F pressure dewpoint. The compressed air is being used for "Instrument Air" therefore the air quality is important. The unit is regenerating on fixed cycles even though there is a very low load profile. Our calculations show annual purge savings of 30 scfm with the installation of a standard dew point demand purge controller.

The Power House has level-activated, pneumatic-actuated no air-loss drain valves, which seem to work well and are well maintained. However, throughout the plant, there are many timer-actuated electric automatic drains that should be replaced. This project will save compressed air by replacing all timer drains throughout the supply-side and distribution system with level-activated no air-loss drains.

Dual Timer Electronic drains use an electronic timer to control the number of times per hour it opens and the duration of the opening. The theory is that the times should be adjusted to be sure that the condensate drains fully and the open time without water is minimized, because it wastes compressed air. The reality is that the cycles often don't get reset from the original factory settings. This results in condensate build-up during the summer and in getting set wide open and not closed down later during in cooler weather. When they fail "stuck open", they blow at a full flow rate of about 100 cfm.

Consider, for example, that the usual "factory setting" is 10 minutes with a 20-second duration. Some 1500 scfm of compressed air will generate about 63 gallons of condensate a day in average weather or 2.63 gallons per hour. Each 10-minute cycle will have 0.44 gallons to discharge. This will blow through a ¼-inch valve at 100 psig in approximately 1.37 seconds. Compressed air will then blow for 18.63 seconds each cycle, 6 cycles a minute, which will total 111.78 seconds per hour of flow or 1.86 minutes per hour of flow. A 1/8-inch valve will pass about 100 cfm. The total flow will be 100 x 1.86 = 186 cubic feet per hour, or 186 * 60 minutes = 3.1 cu ft/min on average. This 3.1 cfm would translate into an energy cost of $300 per year based on a typical air flow cost of $100 per cfm year.

HIGH PRESSURE AIR SYSTEM		LOW PRESSURE AIR SYSTEM	
DRAIN LOCATION	**QTY.**	**DRAIN LOCATION**	**QTY.**
Outside compressor room on each XF350	2	3 set of receivers and filters – entry – front and back	12
Basement fan room receiver & filters – both ends	6	Header below ventilation system	1
Dryer and filter	2		
Receiver outside power house in production area	1		
Total	**11**	**Total**	**13**

	HIGH PRESSURE	LOW PRESSURE
Air flow (cfm) savings per drain	3.1 cfm year each	3.1 cfm year each
Total of number of drains	11	13
Total compressed air saved	34 cfm	40 cfm
Recoverable energy savings from air flow reduction	$85.65 cfm/year	$85.65 cfm/year
Total annual energy savings	$2,921/year	$3,452/year
Cost per drain (materials and installation)	$200 each	$200 each
Cost of project (all drains)	$2,200	$2,600

THE SYSTEM ASSESSMENT

Reducing Compressed Air Demand

Project #3: Replace Open Blows with Venturis

Plants with many 1/8 and 1/4 inch lines running as blow off on units will use approximately 10 and 25 cfm each, respectively, at 60 psig. One savings approach is to use an **air amplifier,** which requires less compressed air. Air amplifiers use "Venturi" action to pull in significant amounts of ambient air and mixing it directly into the air stream, which amplifies the air available at point of use. Air amplifiers have amplification ratios up to 25:1. Ten cfm of compressed air can supply up to 250 cfm of blow-off air to the process and generate a savings of a 15 cfm of compressed air per ¼-inch blow off. Savings may be available using 1/8-inch lines, but the cost effectiveness will not be as great. In general, the open blows are very well controlled at this plant with air used for kickers (rejects) limited to a controlled pulse and blower air at many locations including the squeezers as listed below.

LOCATION	SIZE	QTY.	TEST FLOW – SCFM	USAGE RATE (8,760 HRS.)	AVERAGE NET FLOW – SCFM	SAVINGS (50%) – SCFM
(4) Pearson Packaging units	1/4" (2 per unit)	8 @ 20 cfm	160	40%	64	32
(4) Pearson Packaging units	1/4" (2 per unit)	8 @ 20 cfm	160	50%	80	40
Batch house	3/8"	3 @ 30 scfm	90	100%	90	45
					Total Air Reduction	**117 scfm**

Project #3 Summary

Estimated air reduction	117 scfm
Electrical energy cost recoverable	$85.65 /cfm
Total electric energy cost recovery	$10,021/yr.
Estimated Project Cost	$1,000

Project #4: Replace Vacuum Generators with Central Vacuum

Single-stage vacuum generators use compressed air by accelerating the air through the restrictor tube to create a Venturi effect to evacuate the required volume of air. These single-stage Venturi generators are somewhat limited in their ability to fit many applications efficiently, since their basic design is set to accommodate either the highest flow or highest volume requirement. Typically, this type of vacuum generator has a ratio of compressed air consumption (scfm) to vacuum flow (the rate at which atmospheric pressure is removed from a system) of no better than 1:1 and sometimes as high as 2:1 or 3:1.

Multi-stage vacuum generators were developed to improve this efficiency for many applications. The multi-stage units use a series of ejectors and nozzles that allow compressed air to expand in controlled stages. This usually improves the ratio of compressed air consumption to vacuum flow to a level of about 1:3. Multi-stage units are also significantly quieter.

Vacuum generators are very convenient and very responsive, but less efficient compared to positive displacement pumps (e.g., rotary screw, vane, or reciprocating pumps), which are the better choice when conditions require large flow, but offer potentially slower response time.

The plant's current production system has vacuum generators at the following locations. These can be removed by tapping into the central vacuum system. The centralized vacuum system now serves the IS units and the palletizers. They only appear to be running at 50% load. Adding an additional 40 cfm and 80 cfm demand will not affect this much and may actually help the vacuum pumps run more efficiently. Install appropriate surge tanks on the Pearson packaging units #6-8 and connect them to the overhead vacuum system.

LOCATION	DESCRIPTION	QTY.	CFM USED EACH	TOTAL CFM USED	UTILIZATION	NET CFM SAVED (HP AIR)
(4) Pearson Packaging units	Piab M50L	8	8	64	80%	51
(4) Pearson Packaging units	Vascom	26	3	78	100%	78
(2) Sheet inserter	Piab	2	5	10	50%	5
Total	**140 cfm removed**				**134 cfm**	

Project #4 Summary

Estimated air reduction	134 scfm
Electrical energy cost recoverable	$85.65 /cfm
Total electric energy cost recovery	$11,477/yr.
Estimated Project Cost	$2,000
Connect Air Inserters to Vacuum System net Savings	12 kW
Estimated Annual Savings	$6,517
Estimated Project Cost	$2,000

The projects included re-piping the system, air treatment product modifications or changes, and several demand-side actions. This portion of the system assessment yielded energy savings of $137,003 with project costs of only $35,600.

Project #5: Replace Air Vibrators with Electric

Air vibrators are used to keep product or packaging moving or separated — e.g., keeping lids separated prior to sealing. If a plant employs air vibrators that use about 10 cfm each, they will require about 2.5 hp or more to produce the same as a similar electric vibrator, which might use about 0.25-hp input energy. A list of potential air vibrator retrofits (with electric units) is provided below.

POTENTIAL PRELIMINARY LIST OF AIR VIBRATOR RETROFITS

	LOCATION	NUMBER	CURRENT AIR FLOW (CFM)	USAGE (%)	NET SAVINGS (AVG CFM)
#1	Furnace	1	7	100%	7
#2	Furnace	1	7	100%	7
				Total	**14**

Project #5 Summary

Estimated air reduction	14 scfm
Electrical energy cost recoverable	$85.65 /cfm
Estimated Project Cost	$800

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

ENERGY-EFFICIENT OEM MACHINERY

CVP Systems MasterPACKer Eco+™

BY KRISTA RAMSEY

Visit the website of CVP Systems, Inc., and the first image you'll see is Vice President and General Manager Chris van Wandelen performing a fierce karate chop on a stack of concrete bricks, breaking them clear in half. As he is also a martial arts expert, what you're seeing is the real thing—no special effects. The video reflects the company's motto, "Breaking Down Barriers," which van Wandelen uses to inspire a team building spirit among employees. The same can be said for the performance of the company's MasterPACKer Eco+™ automated case-ready packaging machine, which knocks down road blocks to real and measurable energy and materials savings. The introduction of this machine has further solidified CVP's reputation as a leader in modified atmosphere packaging.

CVP Systems, Inc.

CVP Systems, Inc. formed in 1972 when Coronet Container Corporation, based in Lombard, Ill., was required to change its technology based on industry requirements to extend shelf life for perishable products. These requirements stated that materials must be enclosed inside a vacuum-sealed package before being placed inside a corrugated box, rather than directly inside. A separate division, Coronet Vacuum Packaging, was developed and split from Coronet Containers in 1975 to become CVP Systems, Inc., based in Downers Grove, Ill., a Chicago suburb. The company employs 40 employees globally; a regional sales force covers the United States, and agents are also located in Europe and Latin

America. Industries served by CVP are red meat, poultry, fish, produce and fruit, cheese, nuts, snack foods, and spices. Its modified atmosphere packaging technology also is used in industries other than food, such as for cube reduction and anti-oxidation systems, metal parts packaging, and document storage.

Modified Atmosphere Packaging

Worldwide, Tesco, a global grocery and general merchandise retailer headquartered in Cheshunt, U.K., initiated the demand for modified atmosphere packaging technology in the early 70s. It became one of the first grocers to move away from employing an onsite butcher to using a central processing/distribution system. CVP Systems, in attempt to meet the demand by large poultry- and meat-packaging companies looking to extend their products' shelf life, offered its modified atmosphere packaging solutions. This high-efficiency system for packaging of poultry and meats removes air from a package and introduces a new more beneficial atmosphere, depending on the specific product application requirements. Specific mixtures for low-ox applications can be comprised of a mixture of 69.6% nitrogen (N2), 30% carbon dioxide (CO_2), and .4% carbon monoxide (CO) or 70% nitrogen and 30% carbon dioxide; it's based on the premise that bacteria have a difficult time surviving in a low-ox environment because they need oxygen to survive and multiply," said van Wandelen.

Some applications need only high-ox (70% oxygen, 30% carbon dioxide); however, high O_2 applications do not attain quite the same shelf life extension as low O_2. To improve its technology in modified atmosphere packaging, CVP engineers, through extensive research and development, created its MasterPACKer and just last year its "next generation" MasterPACKer Eco+™. The machine is designed for high-speed cycling and features a high-velocity "Quick Draw" snorkel. In the various process cycles, overwrapped trays containing product are robotically loaded onto a servo driven infeed conveyer. Two to eight trays are inserted into a mother bag as the machine indexes and transfers them to the next station, where a Quick Draw snorkel simultaneously draws a vacuum and inserts a pre-set amount of gas and then seals the bag.

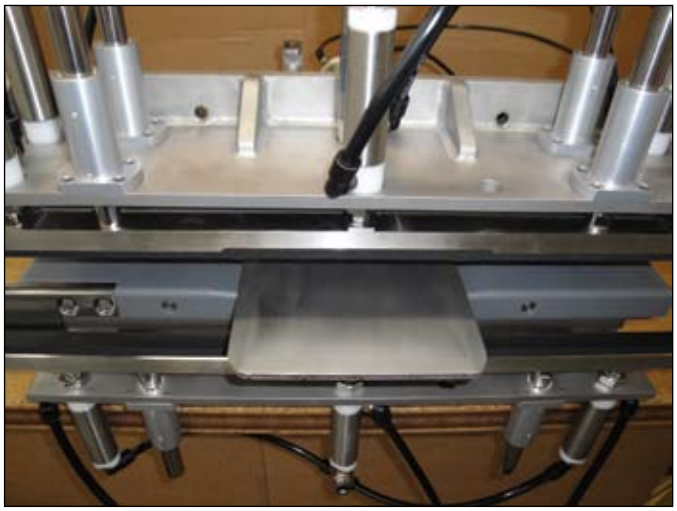
Free-Flow Gas Systems vs. MasterPACKer Eco+™

Machines using a free-flow gas system for modified atmosphere packaging cannot create a vacuum from below the package and therefore use an open tube to release a continuous flow of gas into the package to displace the oxygen. "Much of the gas in a free-flow system is released into the atmosphere, resulting in a large amount of wasted gas as well the related environmental impact," said van Wandelen. "When you compare waste between these systems and ours, taking into account the process of creating and transporting the bags, the amount of material used in the process, and the backside of the landfill effect upon disposal of the bag, the MasterPACKer Eco Plus+™ reduces each of these components by 60%, whether you're using a low- or high-ox dose. This is greatly significant from a cost and an environmental perspective and considering the overall carbon footprint.

To determine the percentage of savings between the MasterPACKer Eco+™ and a machine using a free-flow gas system, CVP compared the two using a gas flow measuring device at a large meat processing facility

ENERGY-EFFICIENT OEM MACHINERY

CVP Systems MasterPACKer Eco+™



CVP Systems, Inc. developed its High-Velocity Quick-Draw Snorkel, which as part of its MasterPACKer Eco+™, provides efficient vacuum and gas insertion during the modified atmosphere packaging process.

CVP System's new film management system has reduced bag size by 60% but retains strength of the original larger product.

for several shifts. The CVP machine used 125 cubic inches of gas per pound of meat vs. the 210 cubic inches used by the other equipment. Calculating the total annual volume for a single production line running two shifts per day, it used 2,629,441 cubic feet of gas; CVP's equipment uses 68% less than this.

"Because we actually produce a hermetically sealed bag, we can calculate the exact amount of gas needed, which results in a 68% reduction in the amount of the 70/30 mixture of nitrogen and carbon dioxide required in the process, eliminating much of the waste," said van Wandelen. "The machine's programmable PLC signals the gas accumulation tanks, allowing us to measure the flow into and out of the bag so the valves open and shut cyclically to release the premeasured amount of gas." Two timing belts control the bag, which is hermetically sealed at all times, through the entire machine cycle.

Processor requirements state that the purity of nitrogen used in the gas mixture for modified atmosphere packaging must be food grade (99.995% pure), as it comes directly in contact with the food product being packaged. Depending on the volume a company produces, it can purchase mixed gas in cylinders, store it in a refillable outside tank, or generate it on-site, which is the most cost-efficient system. "When using a low-ox mixture, our system results in a cost savings of $51,151 per year when gas is generated on-site; when bottles are used, this is substantially higher."

In addition, the new ECO+ design results in three areas of savings as compared to the original MasterPACKer: use of an impulse vs. a hot bar results in a savings of $1,557 per year, use of Servo technology for the infeed conveyor vs. an air cylinder (16-hour shifts) results in a savings of $3,500 per year, and use of an edge guide control electric eye vs. a compressed air control (.080" orifice @ 80 psi) results in a savings of $52,000 per year. "We also replaced the regular gearboxes and pneumatic systems with servo-driven motors, linear actuators, timing belts, and low-friction components on the main conveyor to reduce friction and power needed to achieve the same result," said van Wandelen. "This has reduced energy consumption and has given us better control of the mechanical process."

Additional Materials Savings

The film CVP Systems used for its modified atmosphere packaging system prior to its reconfiguration was 3 millimeters thick and 27 inches wide. The newly created film is 2 millimeters thick and 19 inches wide, which is 30% thinner and 30% more narrow, reducing the bag's size by 60%. The new film retains the strength and material characteristics of the original product. "We specifically designed our newly patented film management system in partnership with and in support of the industry's efforts to be more cost- and environmentally conscious," said van Wandelen. Resulting cost savings are $852,752 per year.

The MasterPACKer Eco+™ also provides an additional materials savings in scavengers. "Even after undergoing modified atmosphere packaging, some of the oxygen remains in the package or in the overwrapped permeable film. "Even if the initial level of oxygen is only .02%-.03%, it increases after 24 hours, so 'scavengers,' which are satchels containing iron oxide that, once activated, help to lower the residual amount of oxygen and preserve the product," said van Wandelen. "Therefore, we are able to use fewer scavengers in our process, resulting in raw

materials savings." The residual amount of oxygen left in the package must be less than .5%; CVP achieves a .02% of residual oxygen, while companies using free-flow systems can only achieve these results using additional scavengers," he added. The annual savings incurred as a result of purchasing fewer scavengers is $918,000.

In all, the MasterPACKer Eco+™ can help to achieve a reduction in costs, materials, and the environmental impact of modified atmosphere processing. "In relation to air compressors used to generate nitrogen, I reiterate that the MasterPACKer Eco+ can save 68% overall," said van Wandelen. "If you are purchasing another system, you are buying 2/3 'more' than you need. As global citizens, we must consider how we can reduce our carbon footprint from every angle." For those working in business, considering a $1,821,903 annual savings in cost also is crucial to success. BP

For more information on CVP Systems, Inc.'s MasterPACKer Eco+™ or other products, visit www.cvpsystems.com or call 800-422-4720.

The dual gas accumulator tanks on the MasterPACKer Eco+™ are able to store on-site the application specific mixture of gas needed in the modified atmosphere packaging process.

THE TECHNOLOGY PROVIDER

BEKO Hydrocarbon Removal and Measurement Systems

BY ROD SMITH, COMPRESSED AIR BEST PRACTICES® MAGAZINE

The BEKOKAT® system uses a catalytic converter to ensure hydrocarbon removal.

Compressed Air Best Practices interviewed Tilo Fruth, President, of BEKO Technologies Corporation.

Good morning. How much industrial demand is there for oil-free compressed air?

Good morning. Over the past decade, we have seen a growing market worldwide for oil-free compressed air. Applications are getting more sensitive to contaminants like hydrocarbons — which are very difficult to remove.

Production and quality engineers in industries like the food & beverage, pharmaceutical, semiconductor, and chemical sectors have established internal specifications for oil-free compressed air. The product spoilage and safety issues at risk make oil-free compressed air an absolute necessity in certain processes.

Please describe the BEKOKAT® hydrocarbon removal system.

The BEKOKAT® system transforms hydrocarbons, through total oxidation, to produce carbon dioxide and water. The heart of the system is the catalytic converter, a pressure-vessel filled with a catalytic granulate capable of "cracking" hydrocarbons. The converter is heated to an operating temperature of 302 °F. Oil-contaminated compressed air flows into the pores of the catalytic granulate surface. A chemical reaction occurs and the oil molecule chains are split up. The only remaining by-products are water and carbon dioxide.

ISO 8573-1:2001 Air Quality Classes

	SOLIDS			WATER		OIL & OIL VAPOR	
Quality Class	Max. Number of Particles per m³ 0.1 – 0.5 micron	0.5 – 1 micron	1 – 5 micron	Pressure Dewpoint °F	°C	mg/m³	Quality Class
0	As specified by the end-user or manufacturer, and more stringent than Class 1						0
1	100	1	0	-100	-70	0.01	1
2	100,000	1,000	10	-40	-40	0.1	2
3	—	10,000	500	-4	-20	1	3
4	—	—	1,000	37.4	3	5	4
5	—	—	20,000	44.6	7	—	5
6	—	—	—	50	10	—	6

ISO 8573-1:2001 Air Quality Classes

The catalytic converter ensures and guarantees the removal of all liquid oils and gaseous hydrocarbons as well as all bacterias and viruses from the compressed air stream. Compressed air quality can be classified as sterile and meeting Class ZERO air quality standards in ISO 8573.1:2001 with regards to oil and oil vapor and certified from an independent institute — the TUV.

How much maintenance is required to maintain oil-free air performance?

That is an important question. Traditionally, activated carbon filters and towers (carbon absorbers) have been used to remove hydrocarbons. BEKO also offers these technologies. While they do remove hydrocarbons, they are very dependent upon timely and frequent maintenance to maintain performance levels. Filters, using impregnated charcoal in the element, typically recommend replacement every 300 hours at 30 °C. A carbon tower is dramatically better with a maintenance interval of 5,000 hours at 30 °C.

In comparison, the BEKOKAT® system has a recommended maintenance interval of 25,000 hours. Our critical-process customers value the fact that this system virtually eliminates timely maintenance as a factor to be managed in order to ensure oil-free compressed air.

Do systems with oil-free air compressors use BEKOKAT® systems?

Treating the compressed air, regardless of the air compressor technology, is the only way to ensure oil-free compressed air. Many BEKOKAT® systems are sold into installations using oil-free air compressors. The reason is that these are the customers who place the highest value on 100% oil-free compressed air — at all times.

We all know that oil-free air compressors are vulnerable to the quality of ambient air

The BEKOKAT® system is commonly used in the food, semiconductor, and pharmaceutical industries.

COMPRESSED AIR

BEST PRACTICES

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Sustainable Energy Savings for Compressed Air Best Practices®

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

Utility and energy engineers, utility providers and compressed air auditors share techniques on how to audit the "demand side" of a system — including the **Pneumatic Circuits** on machines. This application knowledge allows the magazine to recommend "**Best Practices**" for the "supply side" of the system. For this reason, we feature **air compressor, air treatment, measurement and management, pneumatics, blower and vacuum** technologies as they relate to the requirements of the monthly **Focus Industry**.

- **Compressed Air Users — Focus Industry**
  - A. Energy and utility managers share experiences
  - B. Audit case studies and "Best Practice" recommendations
- **Utility Providers & Air Auditors**
  - A. Utility company rebate programs
  - B. Case studies by expert compressed air auditors
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  - B. Product technologies best suited for the focus industries
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THE TECHNOLOGY PROVIDER

BEKO Hydrocarbon Removal and Measurement Systems

The METPOINT® OCV Display and Measuring Cell

conditions. Airborne hydrocarbons, in the 6–10 ppm range, are normal and these can go up to 16–24 ppm in an atmosphere exposed to vehicle exhaust or in an contaminated environment like for example an airport. In many cases, up to 30% of these hydrocarbons may be condensable.

Manufacturing processes may also create hydrocarbon releases to atmosphere, which are then ingested by the oil-free air compressor.

Do systems with lubricated air compressors use the system?

Many factories install oil-free air compressors for 100% of their compressed air needs when in reality — only 40% of the compressed air needs to be truly oil-free. Engineers are recognizing this as an opportunity to reduce capital expenditures.

If 700 scfm out of 2,500 scfm needs to be oil-free, the BEKOKAT® system is installed at the point of use. This allows the facility to invest significantly less capital in air compressors than if they went with oil-free for the whole facility.

How are hydrocarbon levels measured by the system?

This is a key question and part of the big step forward that BEKO now provides to compressed air users. Up until now, end users have not had a way of knowing what the hydrocarbon content was in their

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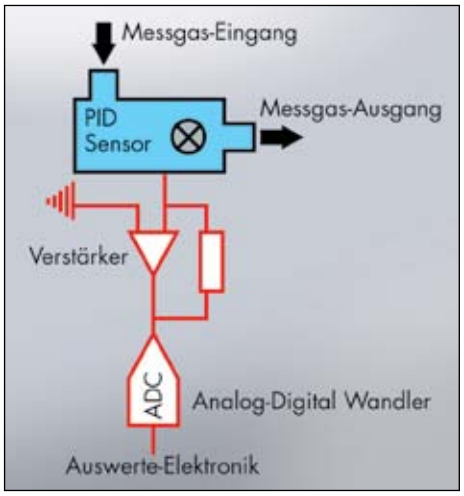
BEKO Hydrocarbon Removal and Measurement Systems



The METPOINT® Photo Ionization Detector Sensor System

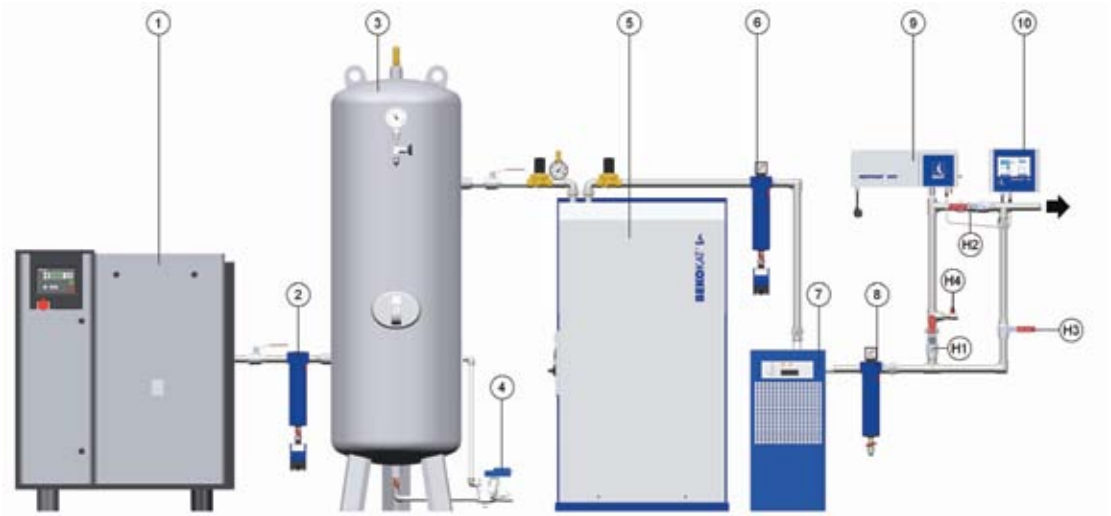
compressed air system. They had filters with alarm functions based upon time — but little more. They could send samples off to laboratories and wait to hear the results — while production continued. This was also not very satisfactory.

This situation led our company to develop the METPOINT® OCV hydrocarbon monitoring system. This innovative instrument is designed specifically for compressed air systems wanting real-time measurement and monitoring of hydrocarbons in their compressed air system.

Please describe the METPOINT® OCV hydrocarbon monitoring system.

A sample is taken from the compressed air line and supplied to the measuring cell. The measuring cell consists of the reference air generator and the actual measuring cell with PID sensor. The reference air generator is actually a "mini-BEKOKAT® producing a 100% pure and oil-free gas sample. The zero reference and the compressed air sample to be measured are supplied in turns to the measuring cell are then compared to one another. In the measuring cell, the hydrocarbon vapor portion is measured via a photo ionization detector (PID). The resulting electrical signal is amplified and evaluated.

BEKOKAT® Hydrocarbon Removal and METPOINT® OCV Hydrocarbon Monitoring System



1 Compressor
2 Water separator with BEKOMAT
3 Receiver
4 BEKOMAT for draining the vessel
5 BEKOKAT
6 Dust filter with BEKOMAT* (F)
7 Minimum requirement: refrigeration dryer*
8 Super fine filter with manual drain valve* (S)
9 METPOINT OCV measuring cell
10 METPOINT OCV display
H1/H2 Shut-off valves of the measuring section*
H3 Shut-off valve of the bypass*
H4 Outlet valve of the bypass*

IPM/ RD 06-09

*oil- and grease free

The METPOINT® OCV System installed in a pharmaceutical plant.

For those unfamiliar with PID sensors, the general operating principle works like this. Through the exposure to UV light, the gas molecules are ionized and accumulate on the electrodes. This results in a signal which is evaluated subsequent to amplification.

What are the monitoring and communication capabilities?

The METPOINT® OCV has a touch-screen multifunctional display using sophisticated software that interprets and communicates the results coming from the PID measuring cell. A unique feature is its ability to "auto-calibrate". This protects the measurement integrity of the system. Alarm functions exist at user-programmable hydrocarbon levels to protect the customer's applications. The unit has a data logger and connecting cables and Ethernet interfaces to send real-time hydrocarbon measurements to remote monitoring locations.

Many pharmaceutical firms do a high level of testing of their compressed air quality. They take samples, on a regular interval, and send it out to external laboratories. Turn-around time is usually 48 hours before they get their results back.

Our in-line and real-time measurement automates the process and provides instantaneous feedback to the customer. There is no waiting on the lab results while production continues.

What level of hydrocarbon measurement can be obtained?

The measurement level of hydrocarbon goes down to 0.0001 mg/m3 and thus is in the Class Zero range of ISO 8571.1:2001. The unit received the prestigious TUV Certificate certifying that the METPOINT® OCV meets the requirements for the measurement of oil vapor and hydrocarbons in accordance with ISO 8573.1. BP

Thank you for your insights.

For more information, please contact Mr. Tilo Fruth, Beko Technologies, email: beko@bekousa.com, www.bekousa.com

Concentrating on Attainable Efficiency Gains

BY KIRK EDWARDS, EXAIR CORPORATION

Efficiency Hierarchy

There are so many opportunities for improving your facility wide compressed air distribution system that it can boggle the mind. And if you have begun to look into improving your compressed air efficiency, either on your own or with a consultant, it can be overwhelming. There are things you can concentrate upon which will bring measurable results and quick efficiency gains without having to know all there is to know about compressed air generation and efficiency or without breaking your annual budget.

Many times, the hierarchy of making improvements in your compressed air system will begin with the larger equipment. If your compressor is outdated, inefficient or sized improperly for your plant, the cost of replacing it may scare you away from proceeding down the efficiency path. It is also typical to first concentrate on updating the controls of a compressor to best match peak demands and lulls in the need for air and, while this is a very good step to take in your overall plan of attack, it can also burden your budget. Making improvements to auxiliary equipment like dryers and cooling equipment will also improve the overall efficiency of your system but can also come at a significant cost if replacing the equipment is necessary. Furthermore, upgrading your piping system can reduce pressure drops and improve delivery of the compressed air dramatically if you have the time and capital needed to replace your delivery system. If you are serious about improving your compressed air efficiency, all of these factors should be addressed and will show great gains in achieving your efficiency goals.

It is also possible to make significant gains in efficiency by working backwards in the typical hierarchy of compressed air efficiency. You may find that there are more

A Digital Flowmeter can be used to help you monitor your compressed air usage and identify costly leaks or inefficient air products.

> "Leak detectors can help you locate and mark the specific location of each leak you deem large enough to fix. Leaks can account for as much as 30% of compressed air consumption and can quickly provide payback when addressed properly."
>
> — Kirk Edwards, EXAIR Corporation

economical ways of meeting end use needs by looking at the efficiency of end use products before conquering the distribution system and controls. Working in this way places much of the success of your program on your operators, maintenance personnel and managers. It is an opportunity for a population of people within your organization to recognize, conceive and implement a program of action which will pay quick dividends. These less discussed implementations typically come at a lower cost and time investment.

Work With Smaller Pieces of the Puzzle

Someone at your facility will know where to begin looking for savings opportunities. A particular leg of your system or a process within your production probably has a reputation of using a lot of air, and raising production costs.

When working on these smaller legs of the entire system, a baseline is still necessary in order to determine future gains in your efficiency. A simple flow meter placed on the supply line of a specific leg of your system will provide you the starting value to begin optimizing this leg of your system. You will also gain a perspective on how much air out of your entire system you are dedicating to this specific leg or process. You may immediately recognize savings opportunities if, when this leg is shut down, you are still registering some air flow on your flow meter which is a clear indication of compressed air leaks.

It will be important and useful to invest in an Ultrasonic Leak Detector for identifying these leaks, if they are not already obvious. Leak detectors can help you locate and mark the specific location of each leak you deem large enough to fix. Simply marking these leaks for maintenance will put you far ahead of most facility optimization programs, but actually fixing them is the goal. Keep your eyes open for push in fittings and quick disconnects which are notorious for leaking. Of course you will also find some valves and pipe fittings in need of repair or tightening as well. Leaks can account for as much as 30% of compressed air consumption and can quickly provide payback when addressed properly.

Over time, every little process or individual leg of a larger system develops its own set of unique fixes and solutions in order to keep the process running smoothly. Many end-use compressed air fixes come in the form of an

EXAIR's PEEK Super Air Nozzles deliver strong blowing force while providing non-marring protection. Engineered air nozzles reduce noise levels and air costs.

CONCENTRATING ON ATTAINABLE EFFICIENCY GAINS

"Installing a pressure gauge at an application will allow you to fine tune the application for success at the lowest pressure possible. Lower operating pressure also lowers air consumption."

— Kirk Edwards,
EXAIR Corporation

open pipe or tube that blows air to keep a box flap down, to clean a part surface or to reject a part from the process. These quick fixes should be addressed by implementing some engineered compressed air products which can reduce air consumption and noise levels while increasing operator safety with minimal investment.

Engineered Air Nozzles Save Air & Maintain Performance

A major North American bakery has been working on specific legs, one at a time, of their production process to reduce compressed air consumption throughout their plant. This specific example used a home-made compressed air nozzle to de-pan rolls from their baking pans.

They had fabricated their own nozzle by capping off a 3/8" pipe and drilling a 9/64" hole in the cap. Running at 80 psig this "nozzle" consumed 25.4 scfm. When retrofitting the pipe to use an engineered air nozzle, the result was 17 scfm at 80 psig, a clear savings of 8.4 scfm. There were ten nozzles used for removing rolls from the pans and it was a two shift per day operation. The following savings calculation is for one production line; in many facilities there will be more and more opportunities for savings on additional lines.

Savings = 8.4 scfm per nozzle (ten total)
8.4 x 10 = 84 scfm total
Two Shifts per day = 960 minutes
250 working days per year = 240,000 minutes
Yearly Air Savings = 20,160,000 ft³ saved

Using the average compressed air cost of $0.25/1000 ft³ we can further quantify the savings.

20,160,000 ft³/1000 = 20,160
20,160 x $0.25 = **$5,040.00 total savings per year**

The total investment for the engineered compressed air nozzles (EXAIR Model 1100 Super Air Nozzle) was $310.00, for a simple ROI of 16 days.

The force value of the home-made "nozzle" was 1.04 pounds at 80 psig. The air amplification characteristic of the engineered air nozzle allowed for a significant reduction in compressed air consumption while still being able to maintain a force value of 1 pound at 80 psig inlet pressure.

Other Attainable Areas of Improvement

Beyond local measurement of compressed air flow, locating and fixing leaks, and upgrading your end use methods, there are a few more areas available to improve upon.

Make certain to outfit any application using compressed air with some kind of control to turn the air off when not in use. A sensor to see a part which needs to have liquid removed can activate a solenoid valve or your machine controls could be programmed to open a valve only when the machine is in operation. Many production processes stop at break time or lunch time. Are you also shutting off the air supply to the machine or does air continue to blow through lunch?

For applications of high air demand which are intermittent, intermediate storage can be a solution. A receiver tank positioned to supply the application's demand will prevent a pressure loss to the whole system. Maintaining pressure will insure the rest of your applications are running properly and could prevent you from turning up system pressure or keep you from considering another compressor to satisfy one application.

And lastly, pay attention to the needs of your application. You may find that you can get the job done with much less pressure than full system pressure. Installing a pressure gauge at an application will allow you to fine tune the application for success at the lowest pressure possible. Lower operating pressure also lowers air consumption.

Keep these achievable goals in mind when the subject of compressed air reduction is addressed at your plant. The savings are measurable and valuable to any plant with a compressed air system. Beginning at the end use side of a compressed air system could allow you to realize enough savings to upgrade the more expensive elements of your system like auxiliary equipment, controls and compressor upgrades. BP

For more information contact Kirk Edwards, kirkedwards@exair.com, Application Engineer, EXAIR Corporation.

EXAIR's Electronic Flow Control minimizes compressed air use for blow off, drying, cooling, conveying and static elimination operations by turning off the air when no part is present.

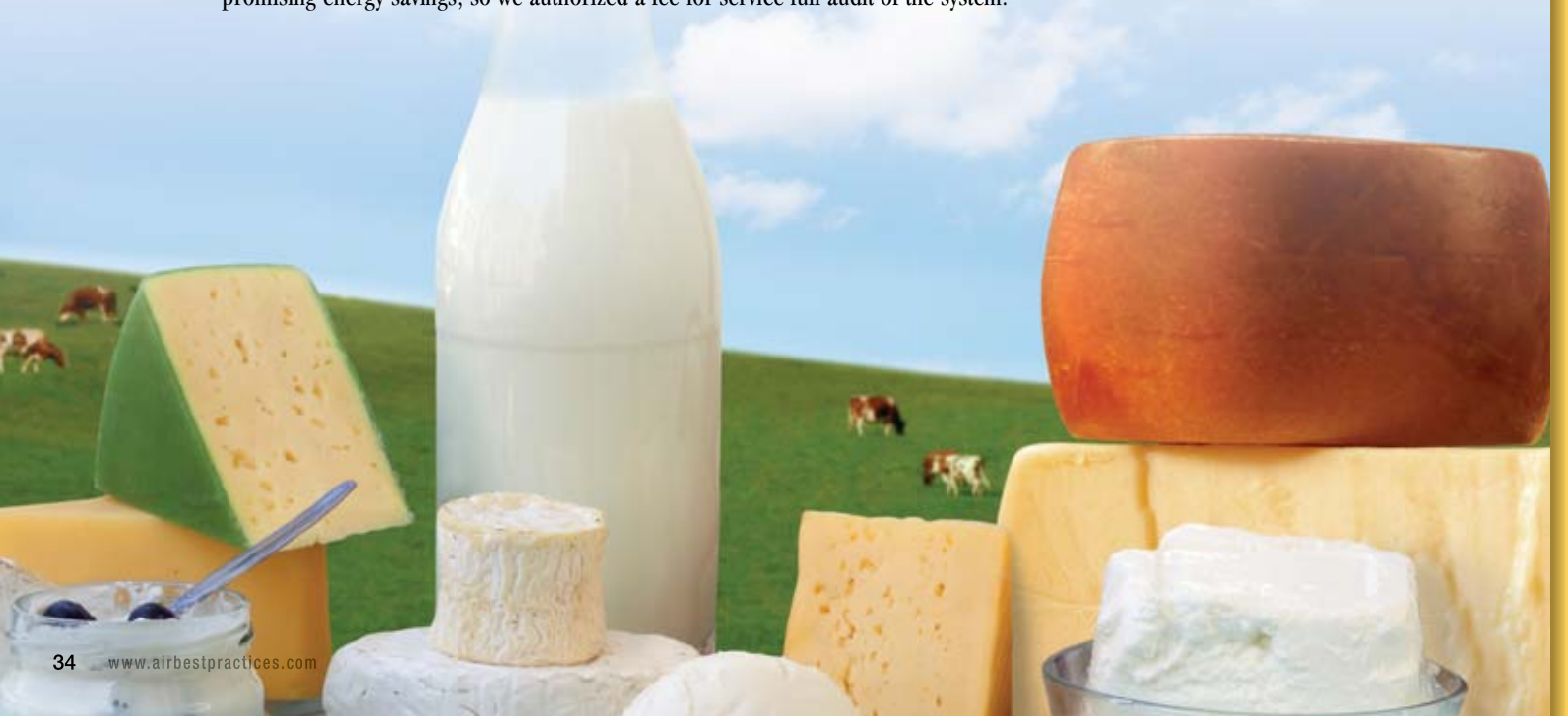
ENERGY-SAVINGS AT MILK, CHEESE, AND ICE CREAM PLANTS

BY RON MARSHALL FOR THE COMPRESSED AIR CHALLENGE®

KNOW PRESSURE
COMPRESSED AIR CHALLENGE®

Compressed air system refinements have cut operating costs at a Milk Plant located in Winnipeg Manitoba, Canada by 62%, for annual savings of nearly $30,000. The improvements were made following a compressed air audit that recommended consolidating two compressed air systems into one, installing a variable speed drive compressor, and making a handful of additional basic improvements. The improvement measures followed typical recommendations taught in the Compressed Air Challenge's Fundamentals of Compressed Air Systems seminars.

The plant's Chief Engineer credited the local power utility, Manitoba Hydro a Compressed Air Challenge sponsor, with getting the project underway. "Hydro suggested we start with one of their no-cost, compressed air scoping audits to identify opportunities for improvement. The scoping audit showed promising energy savings, so we authorized a fee-for-service full audit of the system."



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ENERGY-SAVINGS AT MILK, CHEESE, AND ICE CREAM PLANTS

"The Milk Plant upgrade saved 625,000 kWh and 87 kW peak, for annual operating savings of $29,700. With the help of a financial incentive under the Power Smart Performance Optimization Program, the project paid for itself in 1.5 years."

— Ron Marshall

The full audit presented plant management with system improvement options that are now paying for themselves in energy and operational savings. "If not for the timely advice, we'd still be struggling with our old system," said the Chief Power Engineer.

Consolidation Pays Off

It was once a common design practice to supply compressed air for instrumentation and control devices from a separate air system. Many control devices need a cleaner, drier air supply than earlier vintage main process air systems could provide. Whenever there are two separate compressed air systems using standard screw compressors, there is almost always an efficiency payoff when you combine them into a single, well-designed system. The Milk Plant was a case in point. They were operating two rotary screw compressor systems, each supplied by compressors that were running inefficiently at partial loading.

Extra Savings

The Milk Plant compressors and dryers used chilled water, a readily available cooling medium in the plant engine room to cool and dry the air produced by its two old compressors. The chilled water is produced by the main plant refrigeration system, primarily for process cooling. The audit revealed that the refrigeration system load could be reduced by installing an air compressor and air dryer that used ambient air cooling instead of chilled water. Even though the reduction in cooling load was small, the incremental change was enough to enable the plant to remove a 75-horsepower refrigeration compressor from normal service, for annual savings of $13,600 or 46% of total project savings.

Chronic Problem Solved

Routine monitoring during the full audit revealed a 30 psi pressure drop that was causing problems on a 2-liter milk carton filling machine, forcing higher than required plant pressures to compensate. Maintenance personnel found that fast-acting exhaust valves in the machine had failed in the open position, causing a large pressure differential in the machine supply lines. Repairs allowed plant pressures to drop to normal and increased the quality of milk carton seals. These are examples of the extra improvements that commonly come from air systems upgrades. Finding these savings through an air audit makes compressed air projects significantly more attractive. The Milk Plant upgrade saved

625,000 kWh and 87 kW peak, for annual operating savings of $29 700. With the help of a financial incentive under the Power Smart Performance Optimization Program, the project paid for itself in 1.5 years. "We're glad we went ahead," says the Chief Engineer. "We received a financial incentive from Hydro to speed payback, our new system is working perfectly, and we're set to save a bundle, year after year."

Cheese and Ice Cream Plant Slashes Energy Costs 56%

Manitoba Hydro also conducted an audit at the Cheese and Ice Cream Plant, across the street from the Milk Plant. A compressor at the Cheese and Ice Cream Plant was configured to run in load/unload mode, but it lacked the storage receiver capacity needed to operate efficiently. Over the years Manitoba Hydro has seen many compressors set to run in load/

Why Two Is Not Better Than One

Figure 1 shows the energy implications of running two partially loaded lubricated screw compressors to feed a total load that could be handled by only one compressor. It can be seen that consolidation can save significant energy, with the VSD choice in this case having the lowest average power.

One of the systems, driven by a 75-horsepower compressor, supplied air for process equipment, such as the machines that form and fill milk cartons and jugs. Because it was operating in modulating mode, the compressor consumed no less than 70% of its full-load energy, even when lightly loaded. The second system, driven by a 50-horsepower compressor in load/unload mode, fed instrumentation and control valves that controlled milk pasteurization. Consolidating both systems into one made it possible to supply all needs from a new 75-horsepower variable speed drive compressor, for major operational savings.

A VSD compressor is more efficient at partial loads than an equal sized load/unload or modulating mode compressor; and substantially more efficient than two partly loaded modulating systems. The new system started reducing the plant's electricity bills the moment it was turned on.

A new thermal mass air dryer complements the plant's VSD compressor for further savings. The customer also added a 660-gallon receiver to stabilize air pressure and reduce the frequency of compressor starts. An old 50-horsepower compressor was retired, and the original 75-horsepower modulating compressor was converted to load/unload and now serves as a backup.

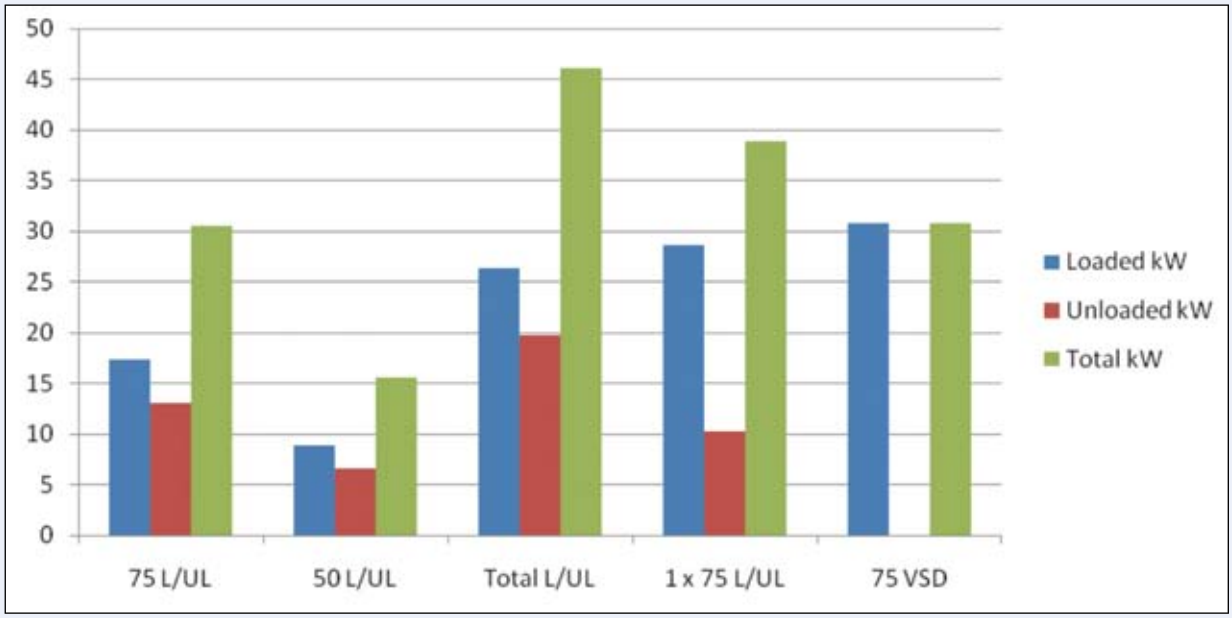

Figure 1: Comparison of average power for different compressor choices

ENERGY-SAVINGS AT MILK, CHEESE, AND ICE CREAM PLANTS

Picture of Milk Plant VSD Air Compressor

unload mode to keep costs down, however, most times the full savings never materialize because the compressors cycle excessively. Much more than the traditional 1 gallon of air storage for every cubic-foot-per minute of output is required to enable load/unload control to gain good savings. Without large storage and proper adjustment of the blow down controls, these compressors often consume a lot more energy than the theoretical calculations. In the Cheese plant's case, higher than normal unloaded power consumption, and insufficient receiver capacity, were wasting money.

The energy efficient solution could have been to adjust the compressor and install a large storage tank, sized at between 5 and 10 gallons per cfm compressor output, to reduce the frequency of compressor cycles. Instead, a VSD compressor and modest air storage was installed, for maximum long-term savings. Much smaller receiver tank capacity is required to gain optimum savings with VSD control. The smaller tank reduced installation costs and saved valuable floor space.

Other improvements included:

- A flow control valve to reduce artificial demand caused by higher than required pressure
- A thermal mass dryer to reduce dryer consumption during low loads
- Dual parallel filters to reduce pressure drop by 75%
- Airless drains to reduce waste when expelling condensate

Going A Step Further

"Our system was suffering a lot of down time," says the Plant Maintenance Engineer, at the Cheese and Ice Cream Plant. "Improvements were on the drawing board, but Hydro recommended we go a step further by installing a VSD compressor. "It was a good idea. We now have a backup compressor, better air pressure, lower costs, and no more down time." The Cheese and Ice Cream Plant saved 201,000 kWh and 16 kW peak, for annual operating savings of $8,100 or 56%. The project also qualified for a substantial Power Smart incentive. BP

Learn about more measures in our "Best Practices for Compressed air Systems manual available at www.compressedairchallenge.org

"The Cheese and Ice Cream Plant saved 201,000 kWh and 16 kW peak, for annual operating savings of $8,100 or 56%. The project also qualified for a substantial Power Smart incentive."

— Ron Marshall

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RESOURCES FOR ENERGY ENGINEERS

TRAINING CALENDAR

TITLE	DATE	LOCATION	SPONSOR(S)
Visit www.compressedairchallenge.org for more information.			
Advanced Management of Compressed Air Systems (Level 2)	August 23–24, 2011	Denver, CO	Excel Energy and the Compressed Air Challenge
Advanced Management of Compressed Air Systems (Level 2)	August 30–31, 2011	Indianapolis, IN	Compressed Air Challenge
Fundamentals of Compressed Air Systems WE (web-edition)	September 12, 2011	Online Training	Compressed Air Challenge
Fundamentals of Compressed Air Systems	September 20, 2011	Cedar Rapids, IA	Iowa Energy Center and the Compressed Air Challenge
Fundamentals of Compressed Air Systems	September 21, 2011	Ames, IA	Iowa Energy Center and the Compressed Air Challenge
Advanced Management of Compressed Air Systems	September 22–23, 2011	Ames, IA	Iowa Energy Center and the Compressed Air Challenge
Fundamentals of Compressed Air Systems	September 27, 2011	Portland, OR	Rogers Machinery and Compressed Air Challenge
Fundamentals of Compressed Air Systems	October 11, 2011	Navy Pier WEEC 2011, Chicago, IL	Association of Energy Engineers, USDOE, Compressed Air Challenge
Fundamentals of Compressed Air Systems WE (web-edition)	November 9, 2011	Online Training	Compressed Air Challenge

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

PRODUCTS

Motivair Expands Operations

Motivair Corporation relocated to a new corporate headquarters in Amherst, NY. The new building provides expanded production, warehouse, engineering, sales and service facilities for the Motivair range of products including large capacity compressed air dryers, industrial cooling systems, free cooling chillers & Chilled Door® rack cooling systems. The new building structure was designed to allow a further 50% expansion on the same site with minimal disruption to ongoing operations in anticipation of continued growth in specialty cooling, compressed air dryer & and data processing markets. The new Motivair address is: 85 Woodridge Drive, Amherst, NY 14228.

For further information contact Rich Whitmore, National Sales Manager, Phone: 716-691-9222, email: rwhitmore@motivaircorp.com. www.motivaircorp.com

PRODUCTS

New OMNILUBE® Synthetic Food Grade Compressor Lubricants

Ultrachem has developed a new line of Omnilube® food-grade rotary screw and reciprocating air compressor lubricants with greatly improved wear, oxidation and lubricity vs. currently available H-1 food grade synthetic lubricants. Field tests have shown these lubricants — Omnilube® 32/46, 68, and 455 — to outlast other synthetic H-1 lubricants by 50% to 100%.

Omnilube® food grade products meet all of the requirements of the USDA and FDA H-1 regulations, 21 CFR 178.3570, and conform to the requirements of NSF. They are also approved by the Orthodox Union for Kosher use.

Omnilube® 32/46, 68, and 455 are fully synthetic compressor oils formulated from the highest quality polyalphaolefin (PAO) base oils with a superior proprietary additive package to achieve long life. Omnilube® 32/46 and 68 are designed for rotary screw compressors and, depending on the rotary screw design, give a service life of up to 8,000 hours in good operating conditions. Omnilube® 455 is designed for reciprocating compressors.

Omnilube® products are ideal for use in meat, poultry and food processing (H-1) plants. Omnilube® 32/46, 68, and 455 also offer less varnish formation, low pour point / high flash point, and excellent compatibility with elastomers, seals, plastics, and paints.

Contact Ultrachem, Inc.
Tel: 302-325-9880
E-mail: info@ultracheminc.com
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TIGG Manufactures Custom Tanks

TIGG Tanks manufactures economical air receivers, standard and custom. The standard line includes vertical receivers ranging from 660 to 5000 gallons with an exterior shop primer. Custom engineered designs and specialty coatings are available. The company manufactures receiver tanks, used in system assessments, up to 20,000 gallons in volume.

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RESOURCES FOR ENERGY ENGINEERS

PRODUCTS

New 10-20 HP Compressors

BOGE America has extended the CL series range by introducing 10 and 20 HP models. The CL Series is noted for its very low sound levels, high performance damping and lamellar graphite casting ensure highly effective silencing producing sound levels as low as 59 dB(A). The new CL series models are available in the standard pressure of 150 PSI. Output capacities range from 11–77 cfm, motor power 4 to 20 HP.

Contact BOGE America
Tel: 770-874-1570
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WALL STREET WATCH

BY COMPRESSED AIR BEST PRACTICES®

The intent of this column is to provide industry watchers with publicly held information, on publicly held companies, involved with the sub-industry of compressed air. It is not the intent of the column to provide any opinions or recommendations related to stock valuations. All information gathered in this column was during the trading day of July 22, 2010.

JULY 22, 2011 PRICE PERFORMANCE	SYMBOL	OPEN PRICE	1 MONTH	6 MONTHS	12 MONTHS	DIVIDEND (ANNUAL YIELD) 12 MONTHS
Parker-Hannifin	PH	$86.75	$86.09	$86.47	$59.35	1.67%
Ingersoll Rand	IR	$40.48	$44.41	$46.02	$36.39	1.17%
Gardner Denver	GDI	$89.21	$80.01	$71.48	$50.53	0.23%
Atlas Copco ADR	ATLCY	$22.06	$22.19	$21.50	$15.26	2.93%
United Technologies	UTX	$88.23	$85.27	$79.90	$68.01	2.18%
Donaldson	DCI	$60.28	$57.65	$59.05	$44.94	1.00%
SPX Corp	SPW	$82.73	$82.12	$74.49	$56.40	1.21%

Atlas Copco 2nd Quarter Results

Record orders, revenues and operating profit

- Organic order intake increased 29% to MSEK 22,202
- Revenues increased 14% to MSEK 19,951 (17,430), organic growth of 27%
- Operating profit increased 19% to MSEK 4,177 (3,499)
- Operating margin was 20.9% (20.1)
- Profit before tax amounted to MSEK 4,081 (3,403)
- Profit for the period was MSEK 2,982 (2,523)
- Basic earnings per share were SEK 2.46 (2.07)
- Operating cash flow at MSEK 567 (2,467)
- New business area structure as of July 1

New Business Area Structure

Atlas Copco has decided to modify its business area structure to strengthen the focus on specific product and customer segments. As of July 1, the Group will have four business areas instead of three. The divisions for portable compressors and generators, road construction equipment and construction tools will join forces in the new Construction Technique business area. Divisions with underground and surface drilling products, crushing, loading and hauling, and exploration equipment will belong to the Mining and Rock Excavation Technique business area. Both these business areas will create dedicated service divisions. Compressor Technique will focus on stationary equipment for air and gas and related service and Industrial Technique remains unchanged.

WALL STREET WATCH

"The overall demand for Atlas Copco's products and services continued to develop positively. Order intake for mining as well as industrial equipment increased both sequentially."

— Atlas Copco

Summary Of Half-Year Results

Orders received in the first six months of 2011 increased 20%, to MSEK 43,877 (36,488). Volume for comparable units increased 29%, price increases added 2% and structural changes 2%, while the negative currency effect was 13%. Revenues were MSEK 38,174 (32,731), corresponding to 27% organic growth.

Operating profit increased 33% to MSEK 8, 164 (6,126). The operating margin was 21.4% (18.7). The negative impact of changes in exchange rates amounted to MSEK 1,460 for the first half-year.

Profit before tax increased 38% to MSEK 8,137 (5,900) and corresponding to a margin of 21.3% (18.0). Profit for the period totaled MSEK 6,015 (4,378). Basic and diluted earnings per share were SEK 4.94 (3.60) and 4.92 (3.60), respectively. Operating cash flow before acquisitions, divestments and dividends totaled MSEK 2,593 (4,690).

Review Of The Second Quarter

Market development

The overall demand for Atlas Copco's products and services continued to develop positively. Order intake for mining as well as industrial equipment increased both sequentially, i.e. compared with the previous quarter, and compared with the previous year. Sales of construction equipment increased somewhat compared with the previous year, but decreased sequentially.

Order intake in **North America** for mining equipment, industrial compressors and tools as well as for the aftermarket continued to increase. The growth was significant compared with the previous year. Sales of construction equipment were higher than the previous year but declined sequentially.

The demand in **South America** remained strong and healthy growth in order intake was recorded for the aftermarket and for most types of equipment.

In **Europe,** overall demand continued to improve. The demand for equipment and aftermarket from the mining, manufacturing and process industries increased, whereas demand from the construction industry was weaker. A positive sales development was noted in most markets in western, eastern and northern Europe, whereas southern Europe remained weak.

Compared with the previous year, the best order growth was in Russia and Germany.

Orders received in **Africa/ Middle East** was higher than the previous quarter and the previous year, primarily due to strong demand in southern Africa and in parts of the Middle East.

The overall demand in **Asia** remained robust and strong order growth compared with the previous year was recorded in all markets. However, the order intake did not reach the very high level of the first quarter, which included more large orders for gas and process compressors and mining equipment. The aftermarket continued to grow strongly.

In **Australia,** demand from the important mining industry remained strong, resulting in another record quarter for order intake.

Earnings and Profitability

Operating profit increased 19% to MSEK 4,177 (3,499), corresponding to an operating

margin of 20.9% (20.1). The margin was supported by increased volumes and prices, while currency effects and revenue mix affected negatively. The currency effect, compared with the previous year was MSEK -915 and affected the operating margin negatively by almost two percentage points.

Net financial items were MSEK -96 (-96) of which interest net MSEK -120 (-110). Interest net was affected by this year's significant capital distribution as well as higher interest rates compared with the previous year. Financial exchange rate differences were negative, while other financial items include a capital gain of MSEK 75 from the sale of shares in RSC Holdings Inc, a financial participation remaining from the sale of the Rental Service business area in 2006.

Profit before tax amounted to MSEK 4,081 (3,403), corresponding to a margin of 20.5% (19.5).

Profit for the period totaled MSEK 2,982 (2,523). Basic and diluted earnings per share were SEK 2.46 (2.07) and 2.45 (2.07), respectively. The return on capital employed during the last 12 months was 34% (22) and 37% (24) excluding the customer financing business. The return on equity was 44% (32).

Compressor Technique

The Compressor Technique business area consisted until June 30, 2011 of seven divisions in the following product areas: industrial compressors, compressed air treatment products, portable compressors and generators, gas and process compressors and expanders, service and specialty rental.

- Record order intake; 27% organic order growth
- Solid operating margin at 23.5%
- New manufacturing facility to be built in India

Industrial Compressors

The demand for stationary industrial compressors continued to improve, for all sizes of machines as well as for air treatment products. Order intake grew in all major regions, both sequentially and compared with the previous year. The best growth was noted in North America, Asia and Europe.

Gas and Process Compressors

Order intake of gas and process compressors was higher than the previous quarter and the previous year, supported by a large order in Saudi Arabia. Order intake in Asia was, however, lower than both the previous quarter and the previous year.

Portable Compressors, Generators and Rental

The demand for portable compressors and generators was healthy and order intake was above the previous quarter and the previous year. North America and most emerging markets had a positive development, while sales in Europe were below the previous quarter. The specialty rental business grew moderately compared to the previous year.

Aftermarket

Demand for service and spare parts remained strong and order intake improved in all regions.

Sustainable Product Development

A new highly energy efficient three-stage centrifugal compressor was launched. It has a high-speed motor, is without gearbox and is designed for industries that rely on high-quality, 100% oil-free air.

Structural Changes

In April, an agreement to acquire Penlon's Medical Gas Solutions business, United Kingdom, was signed. It is a leading provider of medical gas systems, medical vacuum equipment, and pipeline components for hospitals, with revenues of around MGBP 12 (MSEK 120) and about 100 employees in 2010. The acquisition is expected to be closed in the third quarter.

In May, assets related to the compressor business of the Tencarva Machinery Company, a distributor of Atlas Copco products in Southeastern USA, was acquired.

Atlas Copco has decided to build a new compressor manufacturing facility near Pune, India, to meet an anticipated strong growth in demand over the coming years. The investment of about MSEK 160 will also serve to broaden the product offering to customers in India.

As of July 1, the Portable Air division was renamed Portable Energy and is part of the Construction Technique business area.

Profit and Returns

Operating profit increased to MSEK 2,161 (2,000), corresponding to a margin of 23.5% (23.2). The positive effects from higher volumes and price increases were largely offset by negative changes in exchange rates, revenue mix and dilution from acquisitions. Return on capital employed (last 12 months) was 73% (56).

WALL STREET WATCH

"Gardner Denver had an outstanding second quarter with strong, broad based organic growth across our diverse portfolio of businesses and significant margin expansion."

— Barry L. Pennypacker, Gardner Denver's President and Chief Executive Officer

Gardner Denver, Inc. (NYSE: GDI) announced second quarter 2011 results that established quarterly records for orders, revenues, operating income and DEPS. In addition, backlog at June 30, 2011 was $681.7 million, an all-time high. Revenues and operating income were $610.7 million and $99.2 million, respectively. Operating income improved 75% compared to the three-month period of the prior year, increasing to $99.2 million from $56.6 million in 2010. Operating income as a percentage of revenues was 16.2% in the second quarter of 2011, up 360 basis points compared to 12.6% in last year's second quarter. The increase in operating income was largely driven by incremental profitability on the revenue growth, favorable product mix and the benefits of operational improvements previously implemented. For the second quarter of 2011, net income and DEPS attributable to Gardner Denver were $67.1 million and $1.27, respectively. The three-month period ended June 30, 2011 included expenses for profit improvement initiatives and other items totaling $5.2 million, or $0.08 DEPS.

CEO's Comments

"Gardner Denver had an outstanding second quarter with strong, broad based organic growth across our diverse portfolio of businesses and significant margin expansion," said Barry L. Pennypacker, Gardner Denver's President and Chief Executive Officer. "As evidenced by the record breaking orders, revenue and DEPS achieved in the second quarter, we continue to progress on our strategic priorities and improve operational execution supported by the Gardner Denver Way. Both of the Company's reportable segments delivered strong operational performance in the quarter, resulting in operating margins expanding by 360 basis points compared to the prior year. The Industrial Products Group (IPG) improved margins sequentially for the ninth consecutive quarter and continued to benefit from healthy organic growth in North America and Asia Pacific. The Engineered Products Group (EPG) benefited from broad strength across the portfolio and especially strong demand for petroleum pumps and related aftermarket parts and services."

Mr. Pennypacker continued, "Cash provided by operating activities was more than $66 million in the second quarter, a 63% improvement compared to the same period of 2010. In addition, we invested $13.0 million in capital expenditures in the second quarter of 2011, with a sustained focus on operational improvements and increased production output to meet customer demand. The Company expects capital expenditures to total approximately $50 to $55 million in 2011. Our focus on cash generation and disciplined capital allocation remains a top priority for 2011. The acquisition pipeline is strong, and we continue to selectively evaluate appropriate opportunities as they become available."

Outlook

"Our backlog for EPG remains at record levels, yielding a very positive outlook for the remainder of 2011. Demand for well servicing pumps and aftermarket fluid ends continues to grow sharply as shale activity increases and we are investing in additional capacity to meet these growing needs. Further, the demand for engineered packages and OEM compressors remains strong," commented Mr. Pennypacker.

"For the remainder of 2011, we expect continued revenue growth in IPG as a result of healthy demand in our core end markets as well as strong growth in emerging markets such as China. We anticipate that global capacity utilization will remain steady in 2011, resulting in sustained levels of

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WALL STREET WATCH

"Our backlog for EPG remains at record levels, yielding a very positive outlook for the remainder of 2011."

— Barry L. Pennypacker, Gardner Denver's President and Chief Executive Officer

manufacturing spending and investment in customer plants. We remain optimistic that this steady growth will drive demand for IPG's compressors, blowers and vacuum products as well as opportunities for replacement parts and services."

Mr. Pennypacker stated, "Based on this outlook, our existing backlog and productivity improvement plans, we are projecting third quarter 2011 DEPS to be in a range of $1.27 to $1.32 and are raising our full-year 2011 DEPS range to $5.05 to $5.15. This projection includes profit improvement costs and other items totaling $0.03 per diluted share for the third quarter of 2011 and $0.15 per diluted share for the full-year 2011. Third quarter 2011 DEPS, as adjusted for the impact of profit improvement costs and other items ("Adjusted DEPS"), are expected to be in a range of $1.30 to $1.35. The midpoint of the Adjusted DEPS range for the third quarter of 2011 ($1.33) represents a 51% increase over the same period of 2010. Full-year 2011 Adjusted DEPS are expected to be in a range of $5.20 to $5.30. The midpoint of the updated Adjusted DEPS range for the full-year 2011 ($5.25) represents a 55% increase over 2010 results and a 13% increase from the full-year 2011 guidance issued in April. The effective tax rate assumed in the DEPS guidance for 2011 is unchanged at 28%."

Engineered Products Group (EPG)

EPG orders and revenues increased 43% and 56%, respectively, for the three months ended June 30, 2011, compared to the same period of 2010, reflecting sustained, strong demand for drilling and well servicing pumps and engineered packages. In the second quarter of 2011, favorable changes in foreign currency exchange rates increased orders and revenues for EPG by 5% and 6%, respectively. The ILMVAC acquisition, completed in the third quarter of 2010, increased both orders and revenues by 2%. Organically, EPG generated order and revenue growth of 36% and 48%, respectively, in the second quarter of 2011, compared to the prior year period.

Segment operating income(1), as reported under generally accepted accounting principles in the U.S. ("GAAP"), for EPG for the three months ended June 30, 2011 was $64.8 million and segment operating margin(1) was 22.9%, compared to $36.4 million and 20.1%, respectively, in the same period of 2010. Operating Income, as adjusted to exclude the net impact of expenses incurred for profit improvement initiatives and other items ("Adjusted Operating Income"), for EPG for the second quarter of 2011 was $65.9 million and segment Adjusted Operating Income as a percentage of revenues was 23.3%. Adjusted Operating Income for EPG in the second quarter of 2010 was $35.2 million, or 19.5% of revenues. The improvement in Adjusted Operating Income for this segment was primarily attributable to incremental profitability on revenue growth, favorable product mix and cost reductions. See the "Selected Financial Data Schedule" and the "Reconciliation of Operating Income and DEPS to Adjusted Operating Income and Adjusted DEPS" at the end of this press release.

Industrial Products Group (IPG)

Orders and revenues for IPG increased 15% and 22%, respectively, in the second quarter, compared to the same period of 2010, reflecting on-going improvement in demand for OEM products, compressors and aftermarket parts and services. In the second quarter of 2011, favorable changes in foreign currency exchange rates increased orders and revenues for the Industrial Products segment by 9%. Organically, IPG generated order and revenue growth of 6% and 13%, respectively, in the second quarter of 2011, compared to the prior year period.

Segment operating income(1) and segment operating margin(1), as reported under GAAP, for the Industrial Products segment for the three months ended June 30, 2011 were $34.3 million and 10.5%, respectively, compared to $20.2 million and 7.5% of revenues for the three months ended June 30, 2010. Adjusted Operating Income for IPG in the second quarter of 2011 was $38.5 million and Adjusted Operating Income as a percentage of revenues was 11.7%. By comparison, Adjusted Operating Income for IPG was $23.2 million, or 8.6% of revenues, in the three-month period of 2010. The improvement in Adjusted Operating Income for this segment was primarily attributable to incremental profit on revenue growth and cost reductions. See the "Selected Financial Data Schedule" and the "Reconciliation of Operating Income and DEPS to Adjusted Operating Income and Adjusted DEPS" at the end of this press release.

Gardner Denver Consolidated Results

Adjusted Operating income, which excludes the net impact of expenses incurred for profit improvement initiatives and other items ($5.2 million), for the three-month period ended June 30, 2011 was $104.4 million, compared to $58.4 million in the prior year period. Adjusted Operating Income as a percentage of revenues improved to 17.1% from 13.0% in the second quarter of 2010. Adjusted DEPS for the three-month period ended June 30, 2011, were $1.35, compared to $0.73 in the three-month period of 2010. BP

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THE MARKETPLACE

TECHNOLOGY

AEE is pleased to bring the **WORLD ENERGY ENGINEERING CONGRESS (WEEC)** to Chicago's magnificent Navy Pier. Now in its 34th year, the **WEEC** is well-recognized as the most important energy event of national and international 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.

Also, in order to address the interests and needs of the large number of U.S. government professionals who traditionally attend WEEC, AEE will again offer a section of the program known as **FEMWorks 2011.** This special multi-track portion of the WEEC conference will include a comprehensive series of workshops for federal energy managers.

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 2011. Here you can examine firsthand the latest green / sustainable / environmentally friendly energy technologies now available for both new design and retrofit projects. Conference presentations will facilitate your understanding of these technologies, covering such topics as green building design and retrofit; LEED certification and building commissioning; high performance facilities; federal initiatives; state and local sustainable development programs; the latest developments in renewable energy; reducing carbon emissions; transportation solutions for the future; and green/sustainable project success stories.

FEATURED KEYNOTE SPEAKERS

OPENING SESSION

Welcome From AEE
Albert Thumann, P.E., C.E.M.,
Executive Director,
Association of Energy Engineers

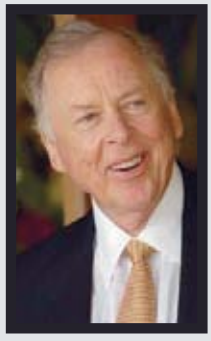
Green Solutions that Meet the Needs of Today's Property Owners
Peter Belisle
President, Energy & Sustainability Services, Jones Lang LaSalle

The Great Ocean's: Conservation & Sustainable Management
Alexandra Cousteau
Environmental Advocate & Water Policy Expert

ComEd's Environmental Achievements & Future Outlook
Val Jensen
Vice President of Marketing & Environmental Programs, ComEd

KEYNOTE LUNCHEON

Powering Our Energy Future: A Conversation with T. Boone Pickens
T. Boone Pickens
BP Capital Management



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