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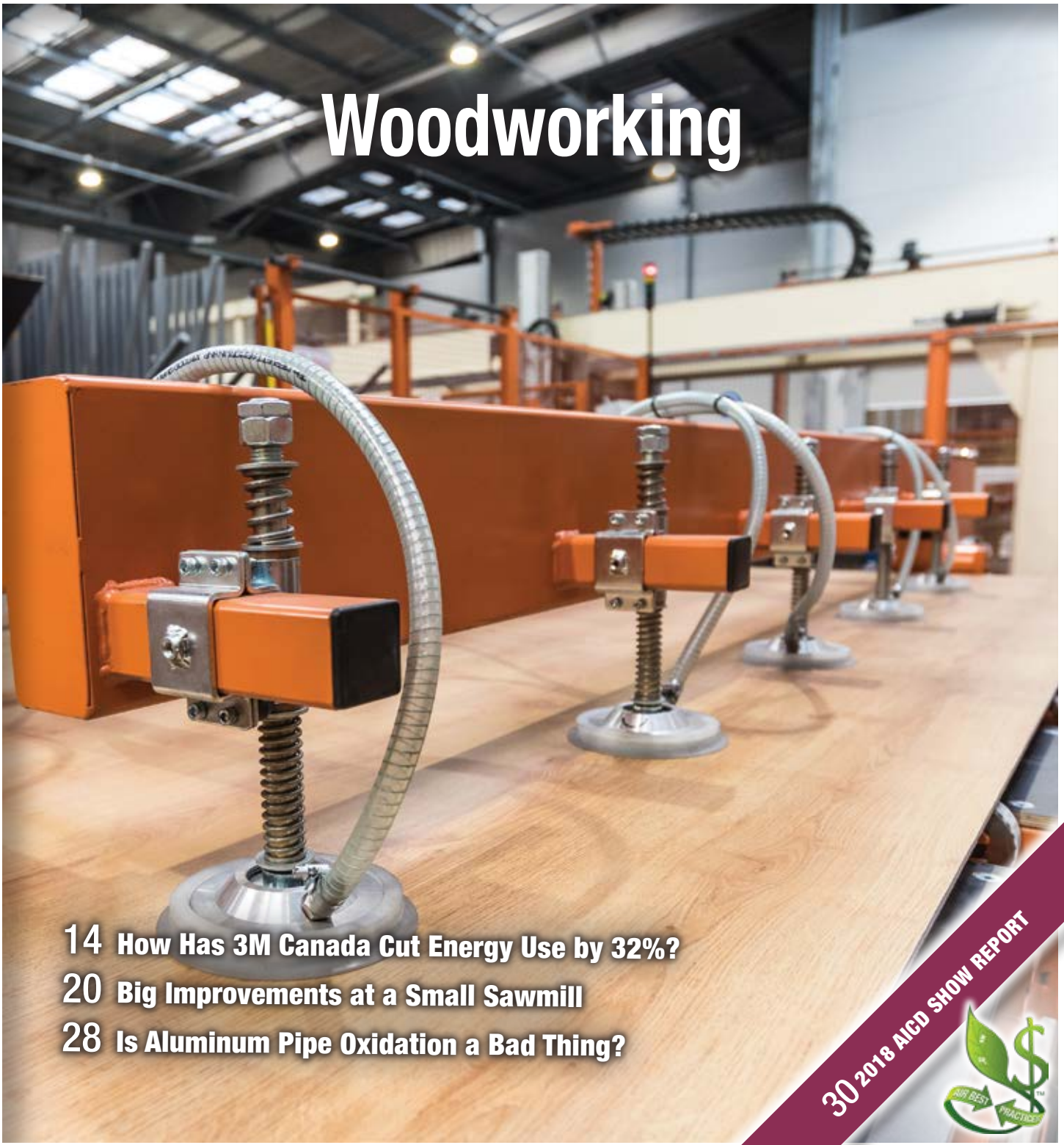

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FROM THE EDITOR | Woodworking

The 3M Company has reduced energy use by 32% since 2008. How does 3M make big decisions about energy? How does 3M find and evaluate energy projects? Anatoli Naoumov, the Managing Director at Green Partners, interviewed 3M Canada Energy Manager Andrew Hejnar to find out the answers to these and other questions. Hope you enjoy!

Spruce Products Limited (http://spl.mb.ca), a sawmill located in Swan River, Manitoba, Canada operates with five separate compressed air systems in their various buildings. Ron Marshall shares an article about a system assessment resulting in SPL optimizing two of their compressed air systems to-date, saving significant operating costs. One system is operating at 86% less energy consumption than previous levels.

Aluminum is replacing iron pipe for compressed air systems-in a huge way. This publication has documented, in many articles, the multiple customer benefits driving this change. The technology continues to advance the breadth of product offered. I was pleased to hear, from Todd Zarins of aluminum piping supplier Applied System Technologies (a Gold Sponsor of the BEST PRACTICES EXPO & Conference), they now can now offer aluminum for compressor room header piping. I hope you enjoy his article this month about aluminum pipe oxidation, is it a bad thing?!

The 2018 AICD Annual Meeting and Exhibition was held May 20-22 at the Hyatt Hill Country Resort in San Antonio, Texas. The membership of the Association of Independent Compressor Distributors came together under the theme of "Roundin' up New Business." I think it's safe to say "things are workin'" as there was both a record number of exhibitors and attendees. I hope you enjoy my Show Report.

Compressed air-driven venturi vacuum generators are used throughout industry. Hank van Ormer provides us with his fourth article, covering "Missed Demand-Side Opportunities," where he describes how they work and details their strengths and weaknesses.

Speaking of opportunities to learn, please consider attending the 2018 Best Practices Expo & Conference, September 17-19, 2018 at the Chicago O'Hare Crowne Plaza. Register at www.cabpexpo.com!

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

ROD SMITH, *Editor, tel: 412-980-9901, rod@airbestpractices.com*

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INDUSTRY NEWS

Tate & Lyle's Lafayette South plant awarded ENERGY STAR Certification

Tate & Lyle PLC (Tate & Lyle), a leading global provider of speciality food ingredients and solutions, is pleased to announce that its Lafayette South corn wetmill in Lafayette, Indiana, US, has earned ENERGY STAR certification by the U.S. Environmental Protection Agency (EPA) in recognition of its superior energy efficiency performance.

This is the third consecutive year the Lafayette South plant, which produces high quality corn-based sweeteners, has received ENERGY STAR certification. At this plant, in recent years Tate & Lyle has adapted the air emission control technology to include regenerative thermal oxidizers (RTOs), equipment that treats exhaust air before it enters the atmosphere. Although a benefit for the environment and community, operating RTOs increases energy use at the site. The team at Lafayette South took steps to offset the additional energy use from this protective environmental process, including capital investments and process improvements to reuse energy within the production cycle where possible, limiting waste.

The Tate & Lyle Lafayette South plant produces high quality corn-based sweeteners.

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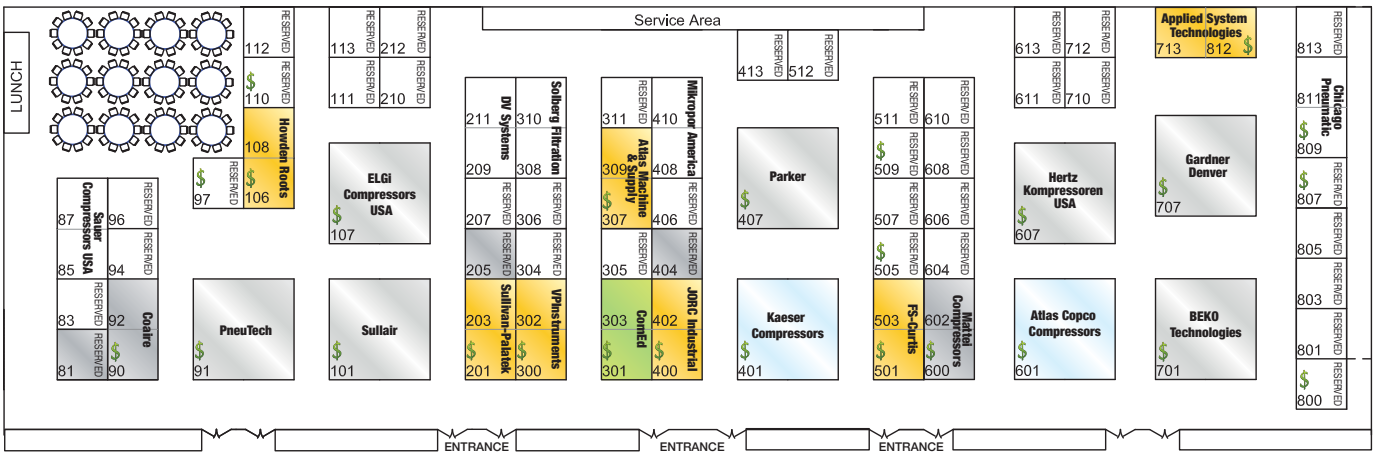

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INDUSTRY NEWS

Tate & Lyle's facility in Loudon, Tennessee, has also received the ENERGY STAR certification, helped by the completion of the site's co-generation facility early last year. The new natural gas-fired combined heat and power system not only improves energy and operational efficiency at the Loudon facility, but also reduces greenhouse gas emissions.

"We are very proud to receive this ENERGY STAR certification, which is a high honor for corn wetmills," said Travis Montoya, Plant Manager, Tate & Lyle Lafayette South. "To receive it for three consecutive years is a true testament to the efforts of all the employees at our plant. Tate & Lyle has invested significantly in Lafayette South and, in doing so, taken substantial steps to continually improve the plant's environmental performance."

"The Lafayette South and Loudon plants have been awarded the 2017 ENERGY STAR by the U.S. Environment Protection Agency (EPA) for superior energy performance," said Jean Lupinacci, Chief of the ENERGY STAR Commercial & Industrial Branch. "*The ENERGY STAR is the distinguishing mark of energy efficiency for Wet Corn Mill plants in the United States and identifies these plants' status amongst the most energy efficient based on their performance on EPA's ENERGY STAR energy performance scale. The employees at these Wet Corn Mill plants should be commended for their ability to reduce energy use and protect the environment through energy efficiency."*

* This award recognizes Tate & Lyle's energy performance over the period April 2016- April 2017

About Tate & Lyle

Tate & Lyle is a global provider of solutions and ingredients for food, beverage and industrial markets.

Tate & Lyle operates through two global divisions, Food & Beverage Solutions and Primary Products, supported by the Innovation and Commercial Development and Global Operations teams. Food & Beverage Solutions is focused on growth by building leading positions globally in the categories of beverages, dairy, and soups, sauces and

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For more information about ENERGY STAR Certification for Industrial Facilities: energystar.gov/plants

Triton to Sell Aventics to Emerson

Triton has initiated the next step to ensure a prosperous and sustainable future for Aventics by announcing its intention to sell the company

to Emerson. There has been an agreement on terms with Emerson and the regulatory approval process is now underway.

Emerson (NYSE: EMR), headquartered in St. Louis, Missouri (USA), is a global technology and engineering company providing innovative solutions for customers in industrial, commercial, and residential markets. The Emerson Automation Solutions business helps process, hybrid, and discrete manufacturers maximize production, protect personnel and the environment while optimizing their energy and operating costs.

"We would like to thank the management team, the employees and all other stakeholders for their contributions to Aventics successful development during Tritons ownership. Triton has been the owner of Aventics for more than four years and we view this as an appropriate time for a long term industrial owner to continue the development of Aventics. Emerson is an ideal partner for Aventics going forward with an ideal cultural fit. This partnership will open new opportunities for both companies" says Peder Prahl, Director of the General Partner to the Triton fund.

The transaction is expected to close in the third quarter of 2018 subject to regulatory approvals, finalization of necessary consultations and other customary closing conditions.

About Emerson Electric

Emerson (NYSE: EMR), headquartered in St. Louis, Missouri (USA), is a global technology and engineering company providing innovative solutions for customers in industrial, commercial, and residential markets. Our Emerson Automation Solutions business helps process, hybrid, and discrete manufacturers maximize production, protect personnel and the environment while optimizing their energy and operating costs. Our Emerson Commercial & Residential Solutions business helps ensure human comfort and health, protect food quality and safety, advance energy efficiency, and create sustainable infrastructure.

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INDUSTRY NEWS

About Triton

The Triton funds invest in and support the positive development of medium-sized businesses headquartered in Europe, focusing on businesses in the Industrial, Business Services and Consumer/Health sectors. Triton seeks to contribute to the building of better businesses for the longer term. Triton and its executives wish to be agents of positive change towards sustainable operational improvements and growth. The 36 companies currently in Triton's portfolio have combined sales of around €14.2 billion and around 91,000 employees.

For further information: www.triton-partners.com

About Aventics

Aventics is one of the world's leading manufacturers of pneumatic components and systems. The pneumatic engineering company provides products and services for industrial automation, as well as the food, packaging, medical, and energy technology industries. The company also develops solutions for the commercial vehicles, marine, and railway technology sectors. By integrating electronics, the use of state-of-the-art materials, and focusing on machine safety and the Internet of Things (I4.0), Aventics is a pioneer in applied and environmentally-friendly solutions. Aventics is preparing for the future by expanding its approach to digitalization. With around 150 years of expertise in pneumatics, Aventics employs over 2,000 associates worldwide. From production sites in Germany, France, Hungary, the USA, and China, Aventics markets its products in over 100 countries through direct sales and sales partners. The Aventics Group has received multiple certifications, including ISO 9001 and ISO/TS 16949 for quality, ISO 50001 for energy management, and ISO 14001 for environmental management. Further information is available at www.aventics.com.

ControlAir Announces ISO 9001:2015 Quality Certification

ControlAir, Inc., a leading manufacturer of precision pneumatic and electro-pneumatic controls, has achieved ISO 9001:2015 certification of its Quality Management

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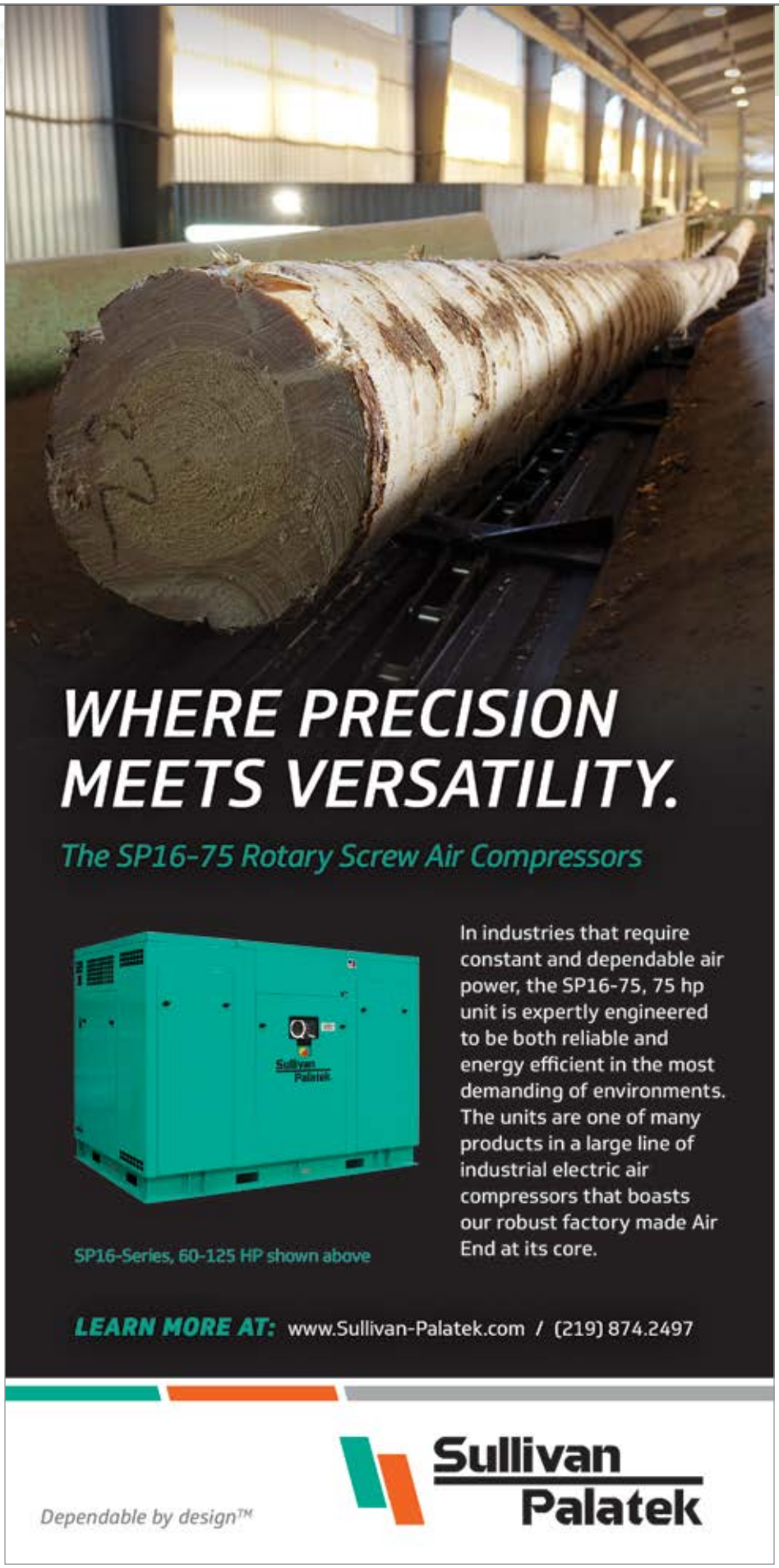
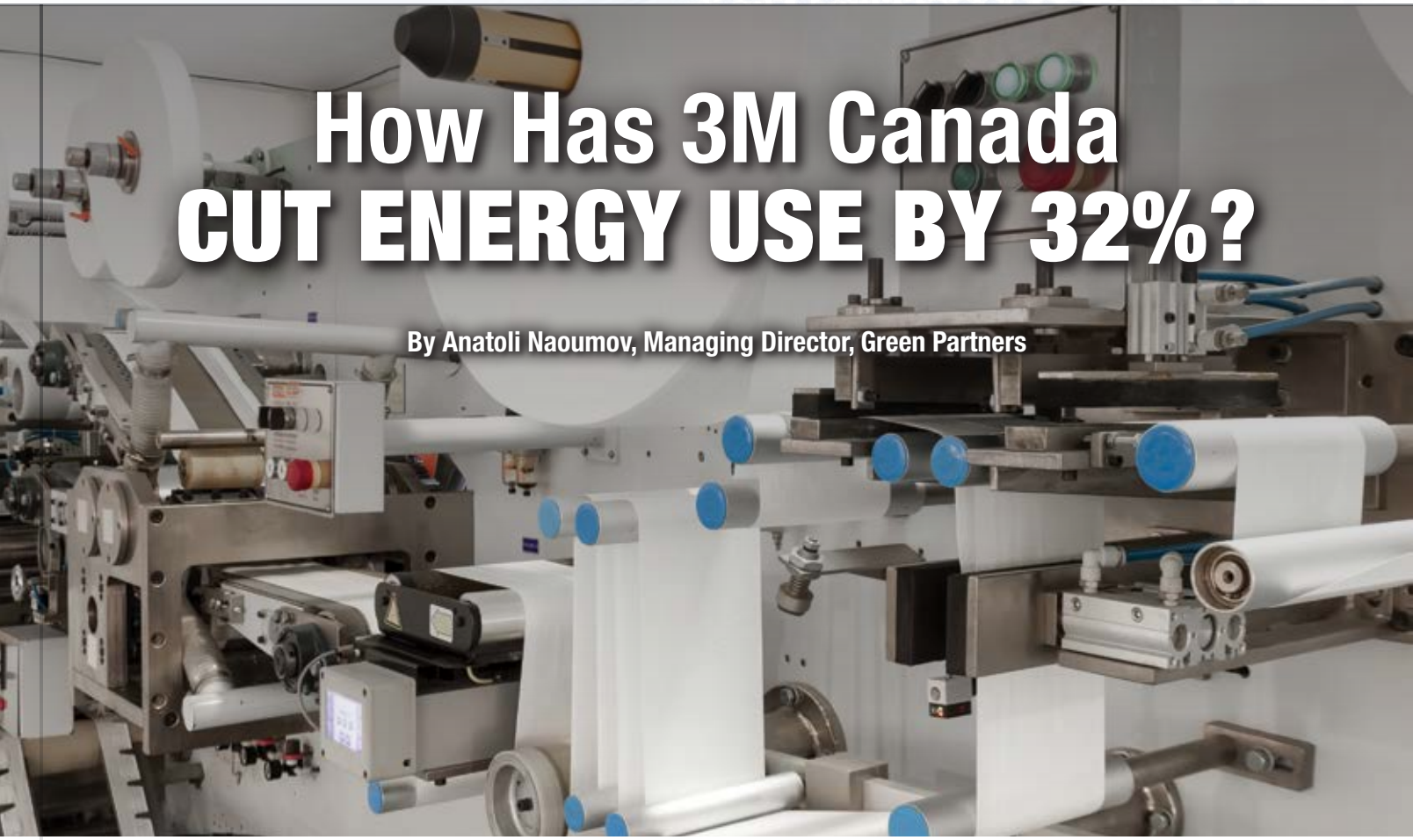
System. The Certificate of Registration was issued by International Quality Registrars on February 9, 2018. The company previously earned certification under ISO 9001:2008 in 2010 and has been audited annually since 2013.

International Organization for Standardization (ISO) 9001:2015 is the most updated standard and focuses on key principles related to quality management and business processes to improve effectiveness and efficiency. As part of the ISO certification process, ControlAir participated in a rigorous audit of its product quality requirements, as well as its business and manufacturing processes. By meeting the extensive criteria of these standards, ControlAir affirms its commitment to ensure consistent and exceptional quality throughout their manufacturing operations. Additionally, ControlAir is committed to ensure customer satisfaction and strengthening performance by driving continuous improvements to meet the evolving needs of our customers.

About ControlAir Inc.

ControlAir Inc. manufactures precision pneumatic and electro-pneumatic controls. ControlAir's markets include process control, semiconductor, printing and converting presses, diagnostic and surgical medical equipment, robotics, quality control, automotive, analyzers, compressors, pumps and paint equipment. For more information, ControlAir's website, www.controlair.com, offers full product specifications with PDF files, 3-D Interactive Catalogs, downloadable 3-D and 2-D CAD drawings, and company profile.





How Has 3M Canada CUT ENERGY USE BY 32%?

By Anatoli Naoumov, Managing Director, Green Partners

3M is recognized as a world leader in energy efficiency, hands down. Since 2008, the company has reduced energy use by 32%. This result by far exceeds the 20% reduction goal, aspired by many companies.

How does 3M work with energy? What can other companies learn from their experience?

I brought these questions to Andrew Hejnar, Energy Manager of 3M Canada, and the results of our conversation are shared in this interview article.

How does 3M make big decisions about energy?

Energy management at 3M is an integral part of the company's general business strategy. Energy is understood as a means of advancing the long-term goal of #improvinglives – lives of employees, lives of clients, and life of society.

3M Company has been at the forefront of sustainability since 1975, when 3M launched Pollution Prevention Pays as a means of empowering employees to guide the company's sustainability efforts. One of the directives in the 1975 corporate policy, which has not changed in 30 years, is that 3M "will prevent pollution at the source wherever and whenever possible."

"3M Company has been at the forefront of sustainability since 1975, when 3M launched Pollution Prevention Pays as a means of empowering employees to guide the company's sustainability efforts."

— Andrew Hejnar, Energy Manager, 3M Canada

A separate Energy group was formed at 3M Canada in 2007.

The 2025 sustainability goals include specific energy use goals:

1. Increase energy efficiency by 30%.
2. Reach 25% level of using energy from renewable sources in total electricity use.
3. Reduce GHG emissions by 50% compared to 2002.

At 3M, energy efficiency goals are set at the corporate level as part of the general business strategy. The complete list of sustainability goals and summary of progress report is published on the 3M corporate website here.

3M Adheres to Best Practices to Achieve Energy Reduction Goals

To achieve energy use reduction goals, 3M relies on established best practices compiled in ISO 50001 and further in Superior Energy Performance program (SEP), established by the US Department of Energy.

According to DOE, *"The facilities in SEP have met the ISO 50001 standard and have improved their energy performance up to 30% over three years."*

DOE have proven that "energy performance improvements at the certified facilities were significantly greater — up to 65% — compared to the non-certified facilities."

Most 3M plants have passed both ISO 50001 and SEP certifications already. The rest are working towards being fully certified. To maintain ISO 50001 certification, plants submit annual reporting, which helps keep the plant on track and maintain performance. The next milestone is to develop and implement a corporate-wide energy management standard.

HOW HAS 3M CANADA CUT ENERGY USE BY 32%?

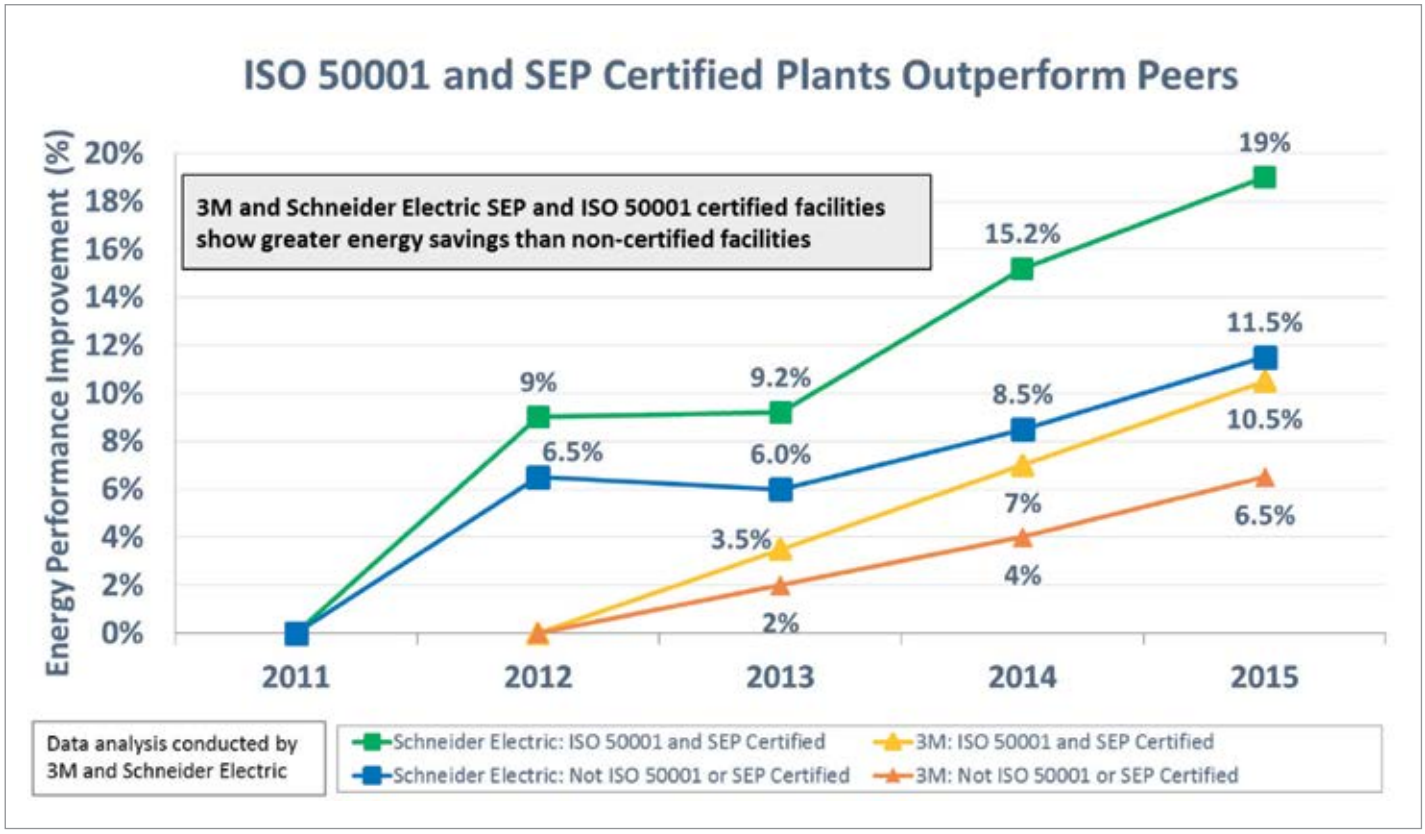
Three Pillars of Energy Management at 3M

Being a leader in innovation, 3M could not have possibly stopped at just implementing the best energy management practices, the company had to advance them.

In many companies, energy management work is understood as the implementation of new machines and processes. 3M works in a broader business context to achieve better results and do it faster. Energy management at 3M is supported by three pillars:

1. **Monitoring and Targeting (M&T)**

   'You cannot manage what you do not measure' - Lord Kelvin's idea has been popularized by management guru of the 20th century, Peter Drucker. 3M has embraced this idea. The company collects energy data, both in physical and $-terms, and then processes it using regression analysis to produce baselines in accordance with recommendations of IMPVP and requirements of SEP. This approach enables sensible monitoring of consumption in real-life conditions. *'Energy is often invisible. M&T makes it visible,'* – Andrew Hejnar. Deviations



"While many companies limit their choice of energy projects with those promising an under 2-year payback, 3M takes a longer perspective to achieve much higher results."

— Andrew Hejnar, Energy Manager, 3M Canada

from baseline predictions are closely monitored to ensure stable, efficient performance. In some instances, operators are required to monitor energy consumption continuously at machine level and report deviations in excess of 3% as they occur.

2. **People**

3M considers people to be the key to success of energy management, because no technology works without people. 3M has consistently integrated sustainability culture into daily operations since 1975. *Today, every employee, from CEO to janitor, has to take sustainability training during onboarding process and repeat this training every two years.* Sustainability culture pays off handsomely: operational and behavioral changes contribute 30% to overall consumption reduction with zero capital investment. Atop of measured energy use reduction, managers at 3M report higher productivity of employees engaged in energy efficiency work.

3. **Technology and projects**

Energy efficiency technologies and energy waste reduction projects form the most obvious pillar of energy management – implementation of efficiency projects, installation of new machines, and controls. Current energy management projects at 3M go far beyond VFDs and LEDs. Among implemented projects are heat recovery from ovens and compressors, installation of electric blowers and mixers instead of using compressed air, and installation of a behind-the-meter CHPs.

How does 3M find energy projects?

The energy management team of 3M Canada consists of four people; obviously not enough to do all the work on their own. 3M used to hire consultants to find and evaluate projects. Today, the energy management team facilitates and coordinates work of plant engineers and employees, who identify, evaluate, and implement most of the projects.

Here are a couple of tricks of the trade:

Energy Treasure Hunt

A group of engineers from different plants joins the local team to perform an Energy Treasure Hunt at a selected plant. First, the combined team walks the plant floors in an effort similar to a walk-through energy audit. Then, a brainstorming session follows. The generated results are left to a local team for deeper evaluation.

All employees contribute ideas to energy reduction

If nobody does efficiency work on a regular basis – results never come.

Since 3M wants efficiency to happen, the company rewards employees for improvement suggestions, even when these suggestions turn out to be unfeasible and not implemented. Since 1948, 3M has allowed employees to dedicate 15% of their paid time to their own projects. This is when innovation, including ways to reduce energy use, is born.

How does 3M evaluate energy projects?

While many companies limit their choice of energy projects with those promising an under 2-year payback, 3M takes a longer perspective to achieve much higher results.

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HOW HAS 3M CANADA CUT ENERGY USE BY 32%?

3M evaluates energy projects based on NPV over 10 years – the same ratio company uses for all CAPEX projects.

What differentiates energy projects, however, is that non-direct financial benefits, such as employee comfort or sustainability impact, are considered during evaluation. To account for these benefits, projects can apply for a contribution from internal Sustainability Fund final financial evaluation.

How does 3M monitor results of energy projects?

Measuring results in energy is rarely a straightforward process.

Many companies set reduction goals in absolute numbers: "Reduce consumption by 20 GWh by 2020 compared to 2010." Though absolute metric is easy to track, aiming for it may limit business growth. The same trouble happens with measuring reduction in %% of absolute numbers. Measuring energy use reduction in %% of sales is fogged by profit margin variations.

3M has set reduction goals as percentage of the value predicted by regression-based baseline specific to each plant.

In effect, each plant competes with itself in energy intensity reduction. Each plant is different. Each plant manufactures its unique set of SKUs. Competition with itself is the only way actual efficiency changes can be registered. In my opinion, this approach manifests the bold commitment to integration of energy efficiency and business.

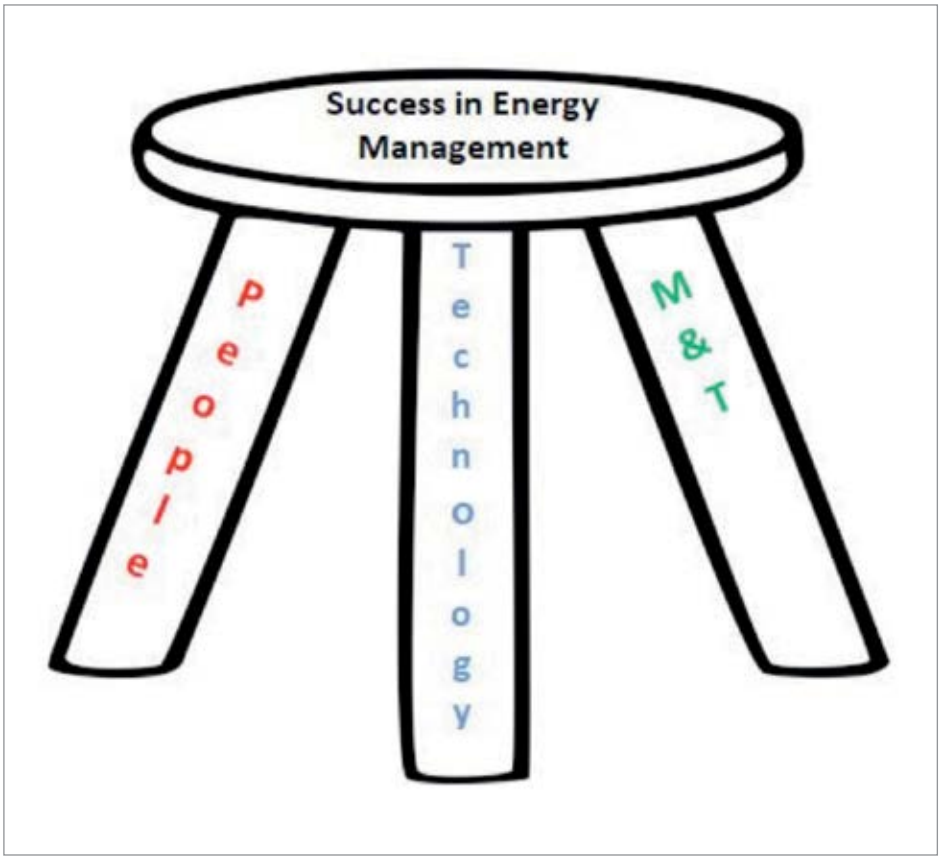
This is hardly the simplest method, but 3M is hardly a simple company. Use of baseline method supports core business: if plant increases production, it is not penalized for extra energy use. In fact, aiming for energy efficiency often leads to higher asset utilisation, lower stoppages, and higher production throughput. On the other hand, decreased production does not contribute to energy savings either.

3 tips to succeed with energy projects from 3M

Andrew Hejnar recommends:

1. **Secure high-level support of energy projects as soon as possible.** Energy touches every aspect of manufacturing process. Changes require will, coordination, and cooperation, not to mention funding and resources. All these are much easier to secure with a high-level champion.

2. **Involve utilities.** Energy efficiency specialists at utility companies are involved in dozens of projects that may benefit your plant. These people are willing and available to help find



projects, provide temporary metering equipment, and to form projects in a way to secure the most incentives. "*A plant walk-through with a utility rep often opens a different perspective,*" - Andrew Hejnar.

3. **Energy management is a team game.** Energy links all equipment and most manufacturing processes. Every process requires energy. Thus, to be successful, energy management must be a collaborative process as well. A plant may invest thousands/millions in highly efficient machines; still a sloppy operator or an outdated procedure may waste all the savings. On the positive side, joining forces with existing plant-level sustainability specialists may help HQ implement an energy project faster, because local people know local ways to get things done.

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For more information please contact Anatoli Naoumov MBA, CMVP, GreenQ Partners, tel: 416.728.7239, email: anaoumov@greenq.ca or visit www.greenq.ca

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Big Improvements at a Small Sawmill

By Ron Marshall, Marshall Compressed Air Consulting

➤ Spruce Products Limited (http://spl.mb.ca), a sawmill located in Swan River, Manitoba, Canada operates with five separate compressed air systems in their various buildings. A few years ago a sharp-eyed air compressor service representative noticed the screw compressors on site had less than optimal loading to operating hours ratios. Recognizing this was a problem, he suggested the company get in touch with their local power utility for a free compressed air scoping assessment. As a result, SPL has optimized two of their compressed air systems to-date, saving significant operating costs. One system is operating at 86% less energy consumption than previous levels.

Background

The company, operating since 1942, produces kiln dried, treated and green rough lumber primarily for the Canadian market. Important byproducts are wood chips, wood shavings and softwood lumber pellets. The air compressors in each building operate on a 5-day a week 10 hour production shift, with pressure typically

> "SPL has optimized two of their compressed air systems to-date, saving significant operating costs. One system is operating at 86% less energy consumption than previous levels."
>
> — Ron Marshall, Marshall Compressed Air Consulting

being maintained overnight for maintenance activities. A compressed air system in a boiler house in the complex runs on a 24 x 7 basis to feed boiler controls and soot blowing. Biomass is used to supplement the boilers to provide heat for lumber drying operations.

Separate compressed air systems are maintained in each of five buildings on the site. These are:

- New Mill – Three 50 hp load/unload air-cooled lubricated screw air compressors operate with cascaded pressure bands. Three 240 gallon receivers are located at various points on the system to help with compressor control.
- Old Mill – One 50 hp load/unload air-cooled lubricated screw compressor operates the old mill, the compressor has one 240 gallon main storage receiver. A weak connection between old and new mill exists, but it is too small to enable the shutdown of the old mill compressor.
- Planer – One 50 hp load/unload air-cooled lubricated screw compressor operates with a 240 gallon storage receiver, but with a narrow pressure band setting causing rapid cycling.
- Boiler Building – A 30 hp load/unload air-cooled lubricated screw compressor feeds boiler controls and a soot blowing application on a 24 x 7 basis. The system runs with three 120 gallon receivers.
- Packaging – A small 25 hp two-stage reciprocating compressor with non-cycling refrigerated dryer feeds a packaging building.

None of the main air compressors have compressed air dryers or main filters. The piping systems in the mills have been designed with well thought out drainage to enable untreated air to be used for pneumatic applications. The lack of dryers reduces the pressure drop in the compressor room.

Figure 1 shows the operating hours discovered by the service representative.

The operating hour readings suggested that two of the three of the systems were lightly loaded, site observations by the salesman confirmed the fourth in the boiler room was running unloaded most of the time. Based on this, a more thorough assessment of all systems was done using data loggers. Figure 2 and 3 show the operation of the two most important systems.

Old Mill	loaded	running	% Loaded	
C1	529	699	76%	New Control
New Mill				
C1	19986	66925	30%	Lag
C2	12256	31918	38%	Lag
C3	25919	31910	81%	Lead
Planer	16547	35241	47%	Rapid Cycling
Boiler	25313	?		No loaded timer

Figure 1: Operating Hours Survey

The compressors in the main mill were not operating in a well-coordinated manner. Most of the time during production, when only two compressors were required, there were three running. Unintended shutdowns were occurring, causing low pressure due to the poor condition of one of the compressors. High load was detected during non-production hours, suggesting unacceptable leakage losses and rapid cycling of the main compressor.

BIG IMPROVEMENTS AT A SMALL SAWMILL

In the boiler building, the data loggers showed the main compressor was running very lightly loaded, but never turning off. This accumulated significant wasteful unloaded run time, where the compressor consumes power, but produces no air. Transient dips in pressure caused by soot blowing blasts drew down discharge pressure to lower levels, but this did not affect boiler operations.

Figure 2 shows the baseline readings of the main systems.

Bldg	HP	kVa	kWh	$ Cost	Pk cfm	Ave cfm	kW/100
New Mill	3 x 50	159	392,230	$34,365	700	300	22.0
Old Mill	50	32	104,815	$9,390	120	111	29.2
Planer	50	39	98,000	$8,460	115	60	43.3
Boiler	30	13	73,584	$4,560	24	9	89.3
Total	280	243	668,629	$56,775	959	480	

Figure 2: Baseline Energy and Cost with specific power

The total compressor energy consumption of all the compressed air system combined was estimated at about 12 percent of the total electrical consumption of the facility. It can be seen that the specific power (kW/100 cfm) of the various systems varies widely from a low of 22 kW/100 cfm to an extremely high value of 89 in the Boiler Building. These numbers suggested there was a significant potential for system efficiency improvement if the compressor control was changed to VSD mode. Further reductions in energy

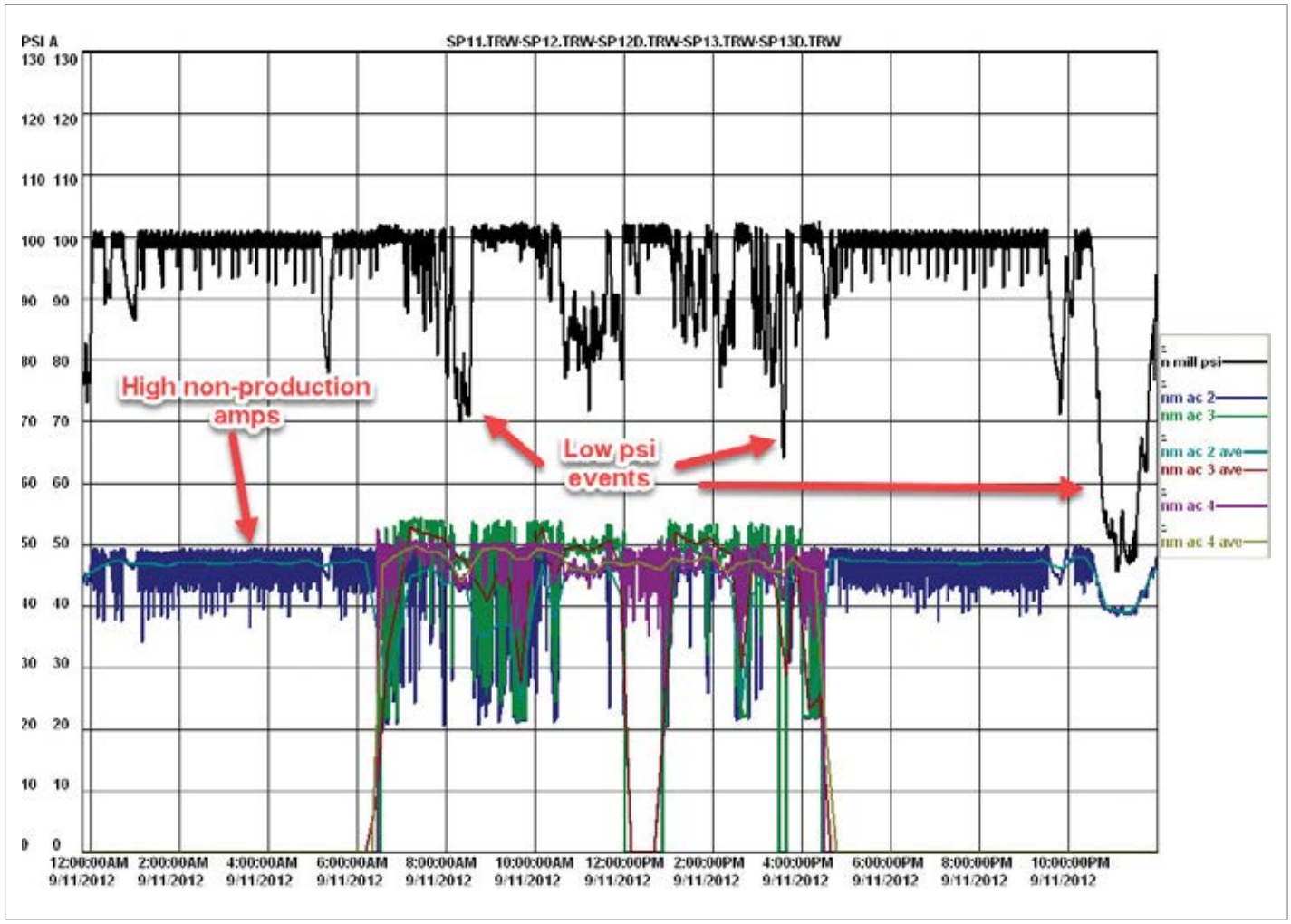

Figure 3: Original pressure/amp profile – New Mill

consumption could be gained by reducing compressed air leaks or optimizing end uses.

The power utility, Manitoba Hydro estimated total possible savings of 36 percent could be gained by adding VSD compressors to the various systems.

Project Results

SPL decided to start the improvement process by first upgrading the systems in the New Mill and the Boiler Building. A 75 hp VSD compressor was selected for the New Mill to work with the existing 50 hp fixed speed units. Selection of a VSD unit larger than the base compressors makes control of the compressors much better, as it avoids a control gap problem, allowing the VSD to run continuously within its regulation band. The VSD target pressure in these cases is typically nested within the cascaded load/unload pressure bands of the fixed speed units for a very well-coordinated control strategy, with more stable pressure.

When the system was verified, there were some unexpected problems. The data logging of the original setup showed the coordination was less than optimum as there were periods of unacceptable unloaded run time for the base compressors, and some unexpected compressor operations during non-production hours. The problem was traced to a pressure transducer out of calibration, the actual reading was about 4 psi different than the control value. This caused the pressure band coordination to be less than optimal, causing some undesired interaction between the base and VSD compressors where the units would fight for control. Correction of the calibration brought the system under control and minimized the unloaded run time of the base units to less than 3 percent. Together the base units combined run duty is about 40 percent of the time, with the VSD supplying the main plant flows as the lead unit.

During non-production periods some high flow short duration pulses were detected that were affecting the operation of the compressors.

BIG IMPROVEMENTS AT A SMALL SAWMILL

Occasionally when this high flow triggered, during times when the system was lightly loaded, a second unneeded compressor would see the pressure change and start and run unloaded in anticipation it would be needed. This problem was traced to a timed blowing operation shown in Figure 5 where the coils of an air conditioning unit were cleared of sawdust contamination to improve ventilation. This air conditioning unit was used to cool an electrical room containing critical electronic controls, and as such the plant personnel were hesitant to completely remove it. The operation was modified so the high flow blast was fed by air stored in two receivers, with the flow of air feeding the receivers metered in slowly between blasts, eliminating the large flow step change. This eliminated the unwanted compressor starts.

Final verification of this system found the optimized system was consuming about 29 percent less energy than previous, and the plant pressure was running at a more constant level.

In the Boiler Building, a small 25 hp VSD compressor was installed and the old 30 hp load/unload unit retired to standby duty. The small unit runs in start/stop mode during light loads, but runs at full speed whenever it needs to supply soot blowing operations. This reduces compressor run time to about 24 percent compared to running 100 percent of the time, mostly unloaded, with the old compressor. This eliminated the wasteful unloaded run time making the previous operation so inefficient. Final verification found the new system was consuming slightly more than 10,000 kWh per year, for a reduction of 86 percent compared to the original baseline. The completion of both projects resulted in both a reduction in operating costs and a substantial utility incentive to help pay for the new compressors.

Other Changes

SPL staff are considering further changes to their system, as budget allows:

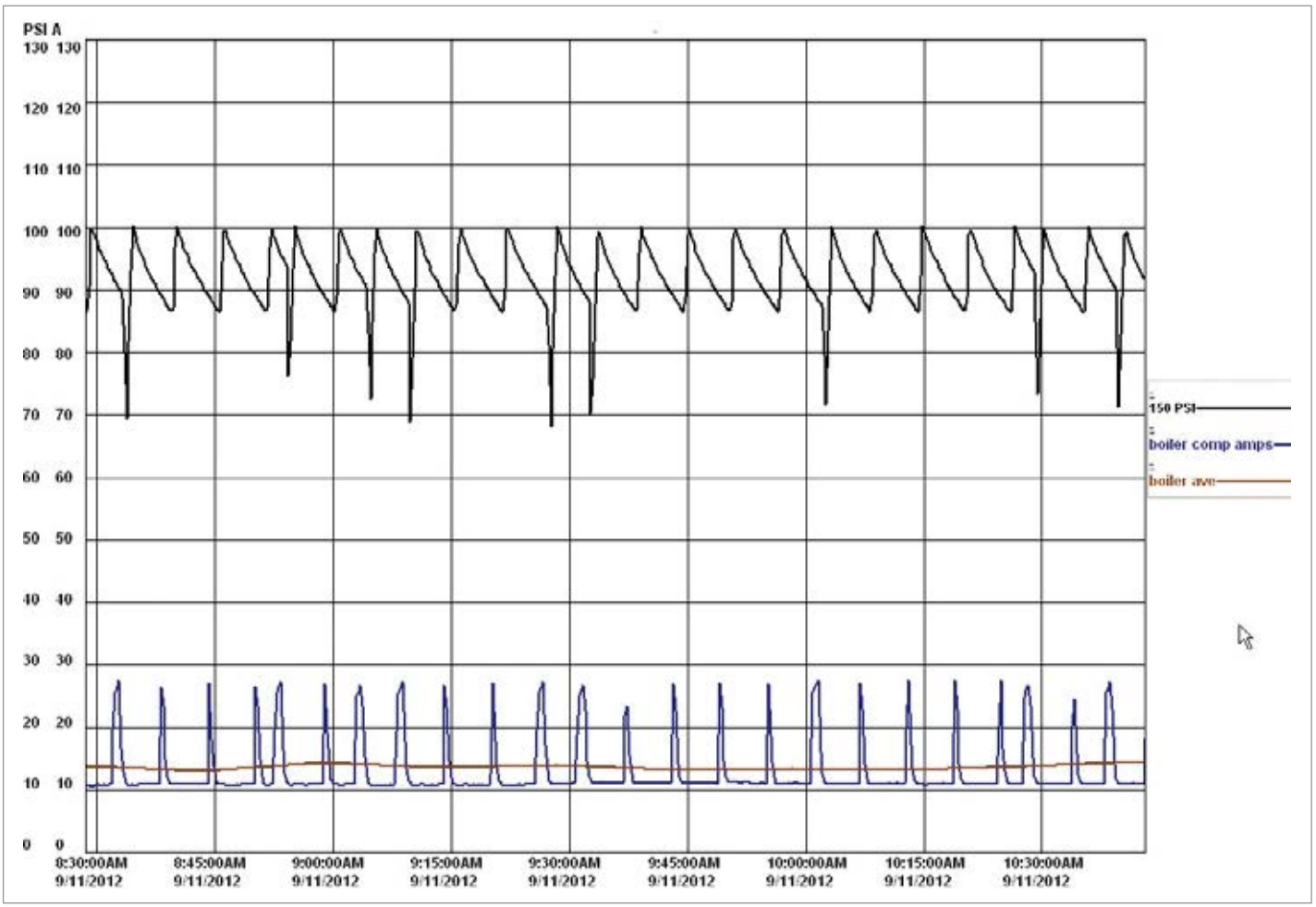

Figure 4 – Original Boiler Building profile

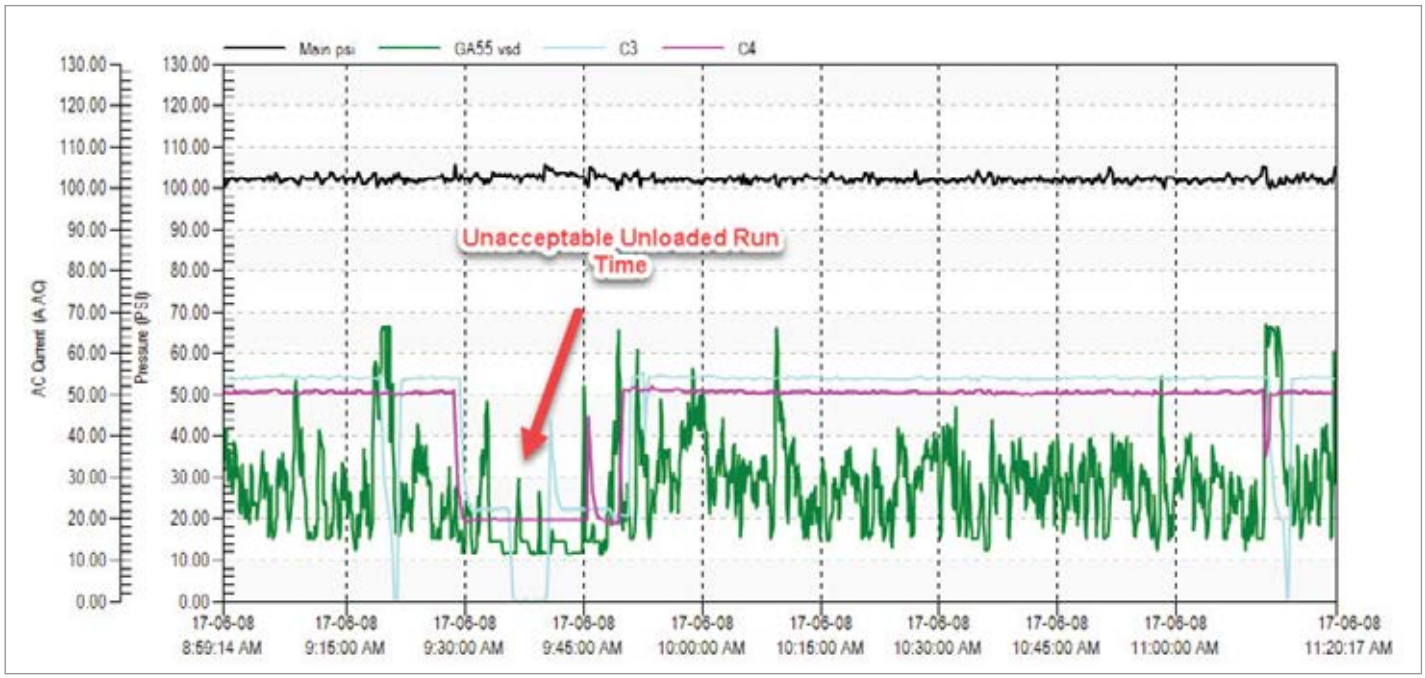

Figure 5: Verification of New Mill VSD installation showed problems

- A connection between the old and new mills may be upgraded so the two systems can be combined into one efficiently operating system.
- A new VSD compressor is being considered for the Planer area.
- The reciprocating compressor in the Packaging area will be converted to a similar style VSD compressor as used in the Boiler Building. This will result in a slight reduction in energy, as a lubricated screw is more efficient at full load than a small air cooled reciprocating compressor. Compared to a load/unload screw, an option that could have been taken, the VSD compressor is much more efficient, for the reasons shown in the Boiler Building project. The new compressor will also be outfitted with a cycling dryer, reducing the energy consumption of the non-cycling existing unit.
- Staff are considering changes to condensate drainage to eliminate the waste from constantly operating timer drains.
- Some open blowing in the planer area is being looked at for optimization.
- Leakage reduction strategies are ongoing.

Figure 6: An air conditioning unit was cleaned by a timer controlled blast affecting air compressor control

BIG IMPROVEMENTS AT A SMALL SAWMILL

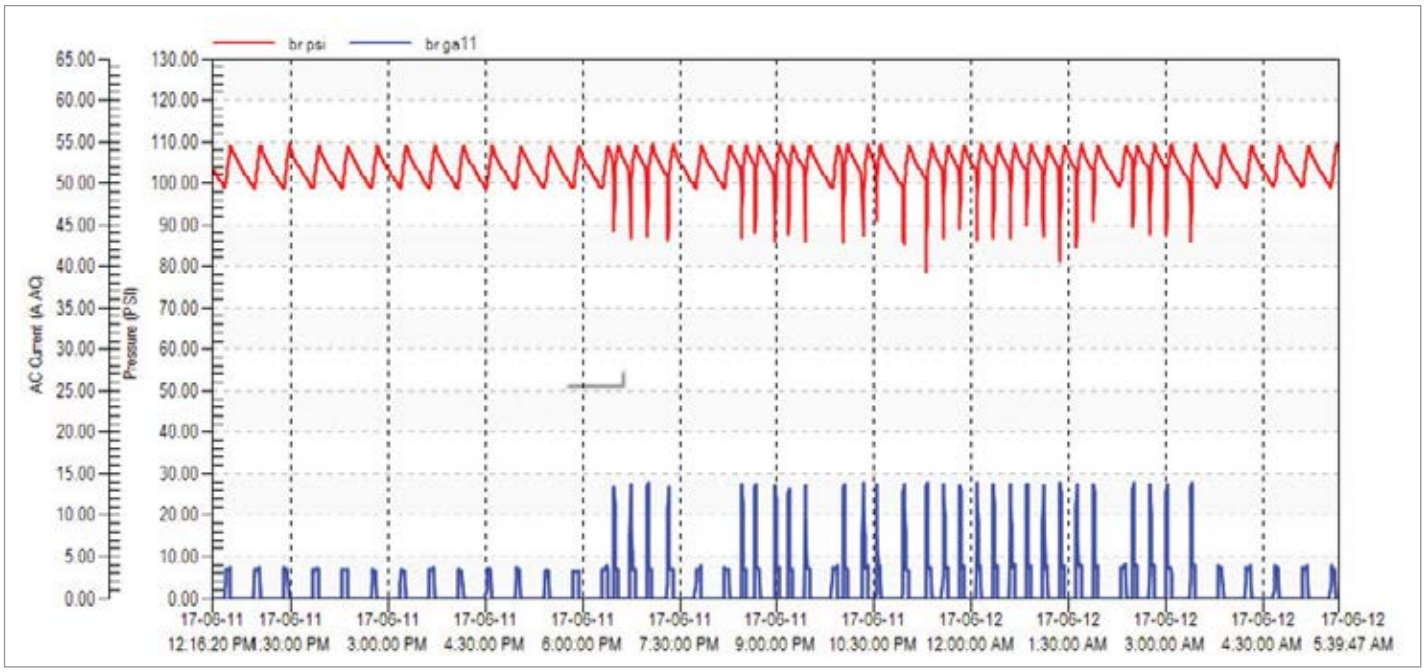

Figure 7: The boiler compressor now only runs 24 percent of the time with no unloaded run time.

Figure 8: Both compressed air blowing (pipe with holes drilled) and mechanical broom power are used to clear wood chips from lumber pieces. Guess which uses less energy.

Conclusion

The results of this assessment, and the projects generated, show the value of having well trained sales representatives look at your system. Often there will be potential opportunities for savings that are not obvious to plant compressor operators. More precise measurement with data loggers can bring these savings to light and set up the projects so they can be supported by local energy incentives. This plant is just another example of how this can work in an excellent manner. BP

For more information contact Ron Marshall, Marshall Compressed Air Consulting, tel: 204-806-2085, email: ronm@mts.net

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NETWORKING EVENTS

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Monday, September 17, 2:45-4:45:

Track 1, Session #2

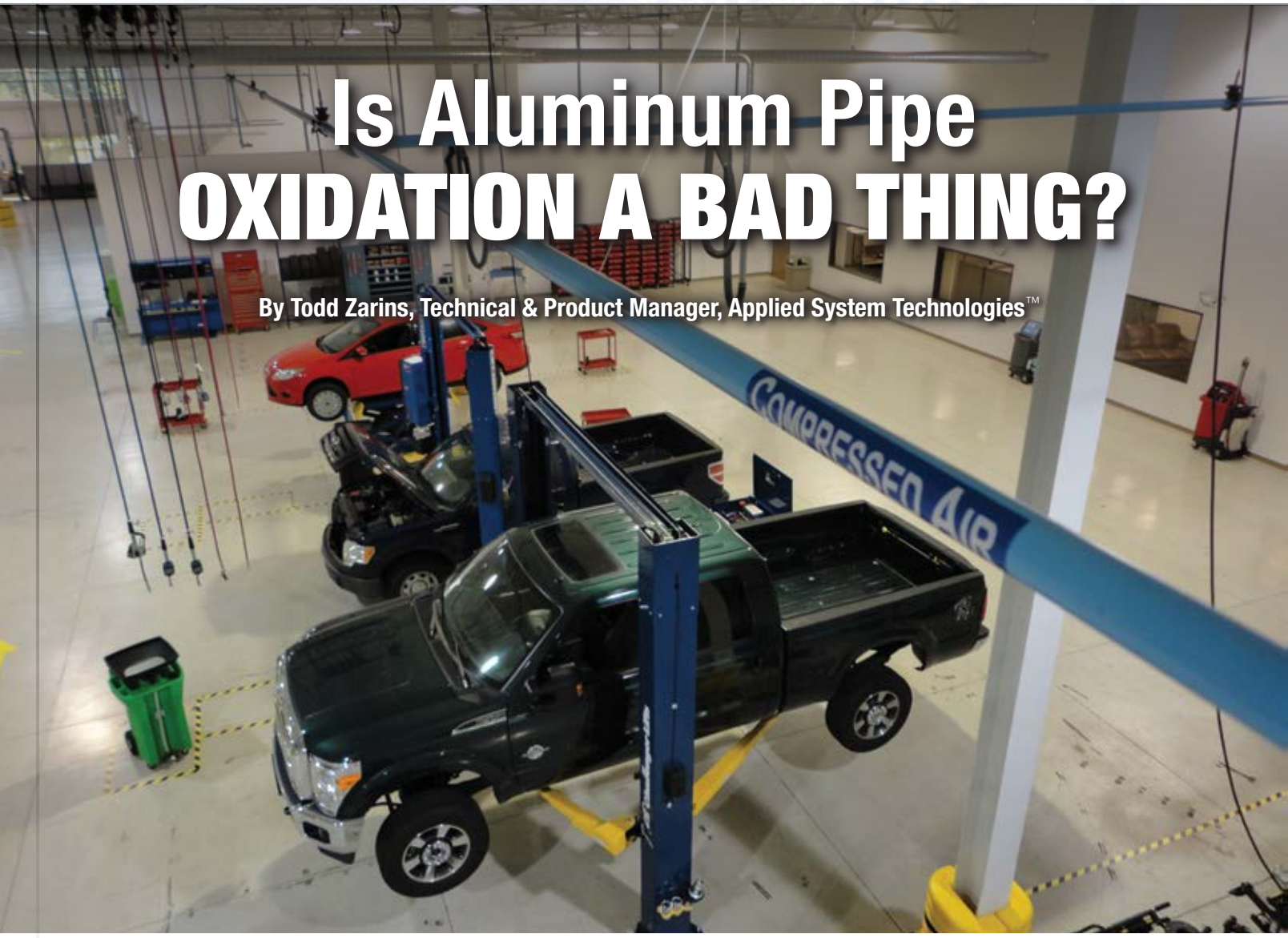
Working Together as the United Voice of the Compressed Air Industry
Chair: Chad Larrabee, Education Committee Chair, Compressed Air & Gas Institute

Industry Trends in Compressed Air Efficiency
Brian Freeman, Second Vice President, CAGI

How to Compare Performance Claims to Ensure the Highest Efficiency
Dave Prator, Immediate Past President, CAGI

Quick Hits to System Optimization
David Booth, System Assessment Section Member, CAGI

Are You Hiring the Right Professional to Assess Your Compressed Air System?
Wayne Perry, System Assessment Section Chair, CAGI



Is Aluminum Pipe OXIDATION A BAD THING?

By Todd Zarins, Technical & Product Manager, Applied System Technologies™

➤ Background

It's been a common practice in the U.S., for more than 75 years, to use iron pipe for building a compressed air distribution system. Its popularity skyrocketed during the U.S. industrial revolution. This was mostly due to iron pipe's availability and initial strength.

Consumers are more educated today than ever before. Learning that clean and dry compressed air quality means more consistent, higher quality product out the door, there has been a shift away from the use of black iron. Aluminum's light weight properties combined with push to connect metal fittings also have made assembly of the system easier and faster.

> "Coupled with the ever-rising cost of copper and the dangers of using plastics, consumers are starting to request aluminum as a preferred piping system material."
>
> — Todd Zarins, Technical & Product Manager, Applied System Technologies™

Coupled with the ever-rising cost of copper and the dangers of using plastics, consumers are starting to request aluminum as a preferred piping system material. Aluminum piping isn't new, it's been in the compressed air market for over 25 years. Recent years, however, have seen the growing consumer education translate into significant growth of this technology and is now considered a high quality alternative material to the old Black-iron systems typically installed by plumbing firms.

Exterior Pipe Coatings

As consumer awareness of the attributes of aluminum tubing have driven its popularity, so have a swell of additional well thought-out questions. One question is asked with regularity, "What is done to protect the inside of the tubing"? Even though most all aluminum compressed air piping systems feature a painted or powder coated exterior, the interior of the tubing has no coating.

The pipe exterior is coated for two reasons. The first reason is to add a distinct color to the tubing so as not to confuse it with electrical conduit or other utility. Our piping system, for example, is offered to customers in multiple standard color options for pipe identification, safety and esthetics including compressed air blue, vacuum grey, inert gas black and nitrogen green as our standard colors.

A second reason to coat the pipe exterior is to provide a consistent, esthetically appealing exterior. As its becoming more common place for manufacturing and automotive facilities to have their customers take a tour, they want their facility to be dressed to impress. With iron and copper, cleaning and painting headaches and cost are required.

The Significant Difference Between Iron Oxide and Aluminum Oxide

When iron oxidizes it forms iron oxide - a reddish, powdery substance more commonly known as rust. This rapid process has likely started even before the piping is installed. Ambient conditions including oxygen and humidity start to oxidize the pipe creating what's most commonly called rust. Flakes of rust form on the interior of the pipe. As the rust becomes more severe the flakes dislodge from the pipe exposing fresh metal, which immediately begins to rust. This cycle continues until there is no iron left. This flaking leads to a shrinking internal diameter of the pipe, increased turbulence and failure of mechanical devices due to rust particles clogging crucial equipment. Eventually corrosion of the Iron will lead to leaks causing pressure drop as well as loss of system efficiency and increased energy bills.

Inlet and outlet aluminum piping delivering compressed air to a refrigerated compressed air dryer and then to storage tanks.

The air compressor system will have to work harder to meet this artificial demand increasing energy costs.

When aluminum oxidizes, it forms aluminum oxide, an entirely different animal. In crystal form, aluminum oxide is classified as a corundum. Gem quality forms of this mineral are sapphires and rubies and it is among the hardest naturally occurring substances found on earth. Aluminum Oxide is used in many products such as sandpaper and even hard wood flooring coatings. If you're looking for a strong, scratchproof coating, there's none better than aluminum oxide.

Oxidization of aluminum forms a protective coating chemically identical to a sapphire. It has a transparent to milky white color, is impervious to air and protects the surface from further corrosion. Once a microscopically thin layer has formed, the corrosion stops. This nearly invisible barrier forms so quickly that aluminum will only oxidize on the surface, providing immediate protection from continued corrosion.

Anodized aluminum is a process which speeds up and controls the oxidized coating. Anodized aluminum has been treated with an electrically charged acid to force the growth of an extra-thick layer of Aluminum Oxide. BP

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SHOW REPORT
Compressed Air Technology at the
AICD CONFERENCE & EXHIBITION 2018

By Rod Smith, Compressed Air Best Practices® Magazine

AICD Board Members at the BEKO Technologies booth. Brent Pifer, Michael McCulley, Sal Calvo, Lisa Lewis, Kasey Gould, AICD President Phil Kruger (Harris Equipment), Bart Frush, Renee Garza and Jeff Brennan (left to right).

Todd Zarins, Incoming AICD Vice President Sal Calvo (MidState Air Compressor), Incoming AICD President Lisa Lewis (Michigan Air Solutions), Mike Cranford and Bryan Becker at the Applied System Technologies booth (left to right).

The 2018 AICD Annual Meeting and Exhibition was held May 20-22 at the Hyatt Hill Country Resort in San Antonio, Texas. The membership of the Association of Independent Compressor Distributors came together under the theme of "Roundin' up New Business." "AICD membership has doubled over the past three years," said AICD President Phil Kruger (Harris Equipment). "After selling out exhibit space in 2018, we believe our direction focused on serving the needs equally, of both vendors and members at our conference, is working."

The members of the AICD (Association of Independent Compressor Distributors) send owners and senior management to the event. AICD member companies are independent companies selling and servicing air compressors in North America. There are member companies from Canada, Mexico and the U.S.. These members have always told me how invaluable the personal networks they develop here are. I wish I could find a similar association of small industrial magazine publishers! "We are now up to 77 member companies and are targeting hitting 100 in the near future," said Incoming AICD President Lisa Lewis (Michigan Air Solutions). "We were pleased to see an all-time record attendance, here at the 2018 Annual Meeting, of 60 member companies."

Incoming AICD Vice President Sal Calvo (MidState Air Compressor) was enthused by the increased exhibitor turnout. "We try hard to recognize our vendors. This year, for example, we will have our first vendor wrap-

up meeting to receive feedback." Calvo added the AICD is planning on introducing an on-line service training course in 2018. To say there is demand for this type of training would be an understatement.

The Conference

The AICD has always had a strong conference format aimed at helping senior management better manage their business. Speakers normally include economists with market forecasts, leadership and sales management gurus, and compressed air industry professionals with very tailored information for our market. This year was no exception and the 2018 line-up is below.

- J.R. Gillette, The State of the Economy
- Holly Green, Using Your Brain to Win
- Mike Batchelor, TASK Sales Training to Sell Capital Equipment to Industry
- Fares Kabbani, How to Value a Business and Prepare for a Sale to a Private Equity Firm
- Sam Richter, Every YES begins with a KNOW

The event excels in providing organized social events and downtime where members and exhibitors have time to socialize and get to know each other better. Whether it's at the annual golf tournament or the second night AICD dinner/reception (with some awesome Golf awards from the exhibitors!), or the Grand Finale Party – there's always something to do. AICD Administrator Kasey Gould makes it all look so easy as she strolls around with an ever-present smile on her face!

The Exhibition – Air Compressors

The exhibition portion had at least 70+ companies exhibiting and during the hours allocated, I only had a chance to visit (rapidly at that) a sampling of the booths. My apologies go out to all the booths/exhibitors not mentioned or photographed here.

ELGI Compressors has had an amazing year and continues to forecast significant growth. Director of Sales Keith Sportsman said, "Customers continue to turn to ELGI due to the slow-rpm, fast-delivery, reliable and extremely robust design of our rotary screw air compressors." Offered in fixed speed or with VFD, the EG Series offers models from 15 to 300 hp. They claim to be the "coolest running compressors on the market at 115 °F (45 °C).

Robert Groendyke, Rick Lamb and Bryan Smithers from Brehob Corporation, and Mert Alpagut at the Hertz Kompressoren booth.

Ken Tubbe (Winter Compressor Service), Darren de Bie, Kasey Gould (AICD), and Jan de Bie at the JORC booth (left to right).

Brian Stober, David Raffin, Greg Verheyen, Steve Van Loan, Mike Gondor and Tim Berkheimer (DownForce Air Solutions) at the Sullivan-Palatek booth (left to right).

SHOW REPORT: THE 2018 AICD CONFERENCE & EXHIBITION

Hannu Heinonen, Brian Antony (John Henry Foster Minnesota), Olli Kuismanen, Jonna Kannosto and Timo Pulkki at the Tamturbo booth (left to right).

Jenny Palkowitsh, Erin Hamelback, Marka Peterson, Phil Kruger, Ruby Ochoa and Alfredo Dominguez at the Trace Analytics booth (left to right).

Craig Thoresen and Howard Kielar at the MTA booth (left to right).

Sullivan Palatek was talking about new rotary screw air compressor product introductions and line extensions. President Steve Van Loan said the C Series introduction has gone extremely well and is now up to 30 horsepower, the Aqua Air oil-free water-injected rotary screw now goes up to 150 hp and the SP Series has added a 60 hp unit. The SP Series now has standard enclosed or non-enclosed models from 60 to 125 hp.

Sauer Compressors was talking about their rental fleet of high pressure air compressors. Five different WP Series models offered pressure ranges from 150 to 640 psig with capacities from 41 to 207 scfm. The packages come with an electric motor, controller, base frame and demister. They also offer custom containerized rental solutions as well as a CNG package.

Rogers Machinery presented the Kobelco oil-free rotary screw KNW Series and announced the new K Series line of lubricated rotary screw air compressors and vacuum pumps. The K Series is designed, assembled and manufactured in the Centralia, Washington plant, which has broken ground on a significant expansion to support this product line. All K Series compressors come in both variable and fixed speed options. They offer a line of 40 to 350 hp single-stage rotary screws in highly customizable open frame (K/KV Series) and enclosed units (KR/KRV). They also offer a standard single-stage 10 to 100 hp product line (KI/KIV). Lastly, Rogers now offers a line of two-stage rotary screw air compressors from 100 to 500 hp without enclosures (K2/K2V) and with enclosures (KR2/KR2V). Rounding out the line is their new 20 to 250 hp KRVP Series single-stage rotary screw vacuum pump line.

Kaishan Compressors, China's largest rotary screw air compressor manufacturer, has officially landed in the U.S.. They claim to be the third largest manufacturer of rotary screw air compressors, by unit volume, in the world. They have established their U.S. headquarters just outside Mobile, Alabama. Sales Manager Dave George told me their Phase 1 product introduction is of 7.5 to 500 horsepower rotary screw air compressors. The units are single-stage or two-stage with VSD as an option along with a lifetime airend warranty.

Hertz Kompressoren, under the leadership of Bob Groendyke in their Charlotte-based U.S. subsidiary, displayed their HDD Series, direct drive, lubricated screws. The full HDD range is from 7.5 to 400 hp. Bob told me their deliveries are "In-stock or up to 4 weeks maximum." Their philosophy is about going back to basics. Groendyke said, "Our units are very simple to service, very price competitive and we always have a human being answering every phone call for after-sales support."

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Compressed Air Best Practices® is a technical magazine dedicated to discovering **Energy Savings** in compressed air systems — estimated by the U.S. Department of Energy to represent 30% of industrial energy use. Each edition outlines **Best Practice System Assessments** for industrial compressed air users — particularly those **managing energy costs in multi-factory companies.**

"We had three 900 hp air compressors. A big part of the reduction was getting the right air compressors in place."

– Bob Nelson, Engineering Manager, Ball Corporation, Saratoga Springs (NY) Facility (feature article in March 2017 Issue).

"We performed a compressed air leak survey at a refinery identifying 1,726 leaks resulting in 13,324 cfm of lost air to leakage."

– James Nipper, Vice President, Petro Chemical Energy (feature article in May 2017 Issue).

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

Industrial energy managers, utility incentive program managers, and technology/system assessment providers are the three stakeholders in creating energy efficiency projects. Representatives of these readership groups guide our editorial content.

"The membrane dryers are able to drop the pressure dew point to -121 ºF (-85 ºC) for the laboratory."

– From April 2017 feature article; "NMR Spectroscopy Lab Requires a -112 ºF Dew Point and Pure Nitrogen."

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SHOW REPORT: THE 2018 AICD CONFERENCE & EXHIBITION

Christina Bailey, Ken Schiefer, Jeff Crutchfield, Dan Smayda (Advanced Air Compressor), and Nitin Shanbhag at the Mikropor America booth (left to right).

Sergio Castillejos, Jane Sexton, Nick Herrig, Don Joyce and Tommy Williams (AKG) at the nano-purification solutions booth (left to right).

Cameron McKillop, Stephen Taylor, Andrew Ragen and Rodolfo Hernandez (Impulsora Zeus) at the Rogers Machinery booth (left to right).

BOGE was talking about their new CL Series of 5 to 20 horsepower, direct drive, tank mounted, full enclosed rotary screw air compressors. The units can also be purchased with integrated refrigerated dryer and coalescing filter. Sales Manager Jerry Elsen said this product line is making an impact on their business.

Making their AICD debut was Ozen Compressed Air Technology with a familiar face in their booth, Director of Sales & Operations Larry Cooke. Larry introduced me to their President, Fehmi Esen, who told me the firm has set up U.S. operations in the Charlotte area. Their Phase 1 launch is with a line of 5-50 hp belt-drive rotary screw air compressors with a VFD option. Interestingly, they told me an important product line for Ozen is their rotary screw booster line, able to deliver up to 518 psi from a 100 psi inlet.

The Exhibition – Compressed Air Purification, Cooling, Aluminum Piping and Measurement

Applied System Technologies brings the INFINITY line of aluminum piping to the market. President Mike Cranford showed me their new aluminum piping headers going up to 10" in diameter. "We are the only brand offering up to 10" aluminum piping," said Cranford. "We are doing a lot of work with mechanical contractors who are replacing welded and black iron pipe with our lighter, lower pressure drop aluminum piping." This piping brand uses Victaulic fittings, popular with contractors, and also offers a lifetime warranty on the piping system.

Lately it seems I've been having a lot of conversations about the ANSI Instrument Air Specification (basically asks for pressure dewpoints 18 ˚F below the lowest ambient temperature) to protect instruments from damaging particulates - often resulting from pipe corrosion. Aluminum piping resists corrosion naturally as it turns into aluminum oxide – see the article in this issue! I'm glad to see aluminum arriving as an option for headers.

Parker Transair was displaying their new "Y" and "T" aluminum cast piping reducers – going from 6" down to 2 ½". Product Sales Manager Guillermo Hiyane told me their "Y" unit was the most popular. I found this very interesting as we often publish articles detailing how this is where many systems create pressure drop and artificial demand. Parker Transair also introduced their new Condition Monitoring System featuring in-line sensors (in their aluminum pipe) to measure flow, pressure, relative humidity, dewpoint and temperature. The flow

meter uses differential pressure to provide a reading. Dan Long is doing a "road show" and said the 6-pack is pretty popular consisting of 5 pressure sensors plus a relative humidity sensor.

BEKO Technologies reported significant growth from their refrigerated and desiccant dryer product offerings. This company is on a roll. Eastern Regional Manager Russ Jones said their heatless desiccant dryer, which they stock up to 1500 cfm, is their fastest growing desiccant dryer line. They also had their new FDR Series Membrane Dryer line on display which is part of their Drypoint M Series. Manufactured by BEKO in Atlanta, this point of use air purification comes with a filter and a regulator. The company also announced new pleated filter media technology for their Clearpoint filter line. The new filters provide longer element life and lower pressure drops than the prior design.

JORC introduced several new Industry 4.0 concepts into their compressed air condensate management technologies. JORC introduced their vision of being able to wirelessly monitor and control all drain and oil-water separator operations to ensure reliable condensate management. I really like this concept as we all know what happens when a drain gets stuck open or closed – nothing good!

MIKROPOR provides a full range of compressed air purification products and has recently added folks to their staff of regional sales managers. Mikropor America's President Nitin Shanbhag showed me an innovative nitrogen generation system, with a built-in buffer tank, to allow for more advantageous sizing. I've been impressed with many thoughtful standard design features, on this and their refrigerated dryer product lines, aimed at solving common issues in the field.

Hydrothrift continues to provide a very important service to the customers of those in the compressed air industry – customized cooling solutions. Bruce Williams told me about a very interesting heat recovery project recently done at a New York City area bus station. Their heat exchangers were connected into the lubrication circuit of the Atlas Copco rotary screw air compressors installed. The resulting warm water is now used for the showers and other applications-greatly reducing the heating oil bill from the boiler system. New York City has recently passed Local Laws 84-88 requiring buildings, in a certain zone, with over 25,000 square feet to reduce their kW consumption by 18% before 2025 or face fines.

MTA finally got through my thick head how their new DEi TECH refrigerated dryers work. It's an interesting design, which they say

Bruce Williams at the Hydrothrift booth.

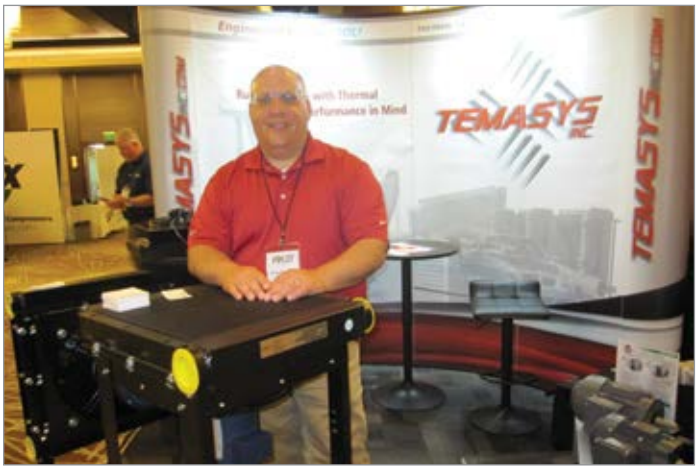
Rob Grizzle, Steve Lawson and Jim Suarez (Advanced Compressed Air Solutions) and Jerry Elsen at the BOGE Compressors booth.

Randy Olson (Dakota Fluid Power), Keith Sportsman and Brandon Dial at the ELGi Compressors booth (left to right).

SHOW REPORT: THE 2018 AICD CONFERENCE & EXHIBITION

David Swartz and Chris Burns (Mobile Mechanical) at the Sauer Compressor booth (left to right).

Dave George, Curt Greifer, Erika Blackburn, Keith Schumacher and Chris Downs at the Kaishan booth (left to right).



Greg Molineri at the Temasys booth.

recently qualified for a Variable Speed Drive utility incentive (which had a higher incentive rate than a cycling dryer)! The core of the innovation is in the refrigeration system. Their suction pressure valve will close and has a bypass around it "pulsing" refrigerant back to the refrigeration compressor during low load operation. This causes the refrigerant compressor to use less energy. Their modular ETM DM line of Enhanced Thermal Mass dryers also continues to be a focus.

Nano-purification solutions displayed their Gen2 nitrogen generator, Sepura oil water separators and were talking about their new agreement, with AKG, to provide cooling solutions. Nick Herrig said the operations continue to grow in Charlotte as well as in Europe. Don Joyce commented the chiller business was seeing "significant" growth. Stay tuned for more news on an innovative new free-cooling chiller design in the works at Nano. This company embodies the execution of a "customer-centric" philosophy – and not just a powerpoint on it.

Temasys is an up and coming fluid cooling company based in Buffalo. Entrepreneur Greg Molineri showed me their "Universal Cooler" package for OEM's designed for glycol, air, oil and hydraulic fluids. Their units have 8" x 8" face areas going up to 20" x 20". Featuring low pressure drops, the heat exchangers are designed for vertical or horizontal flexibility with few components. He's my kind of guy as he started the business from scratch a few years ago, paid his dues, and things are starting to roll.

Control Devices is a market leader in safety valves for air compressors. Manufactured in St. Louis, they were also exhibiting a new line of 2", 2 ½" and 3" blower relief valves. They also had a new pneumatic "zero air-loss" condensate drain they were displaying.

Conclusion

Once again, the AICD exceeded expectations – plus every one had a great time. I hope this report provides a taste of what happened – there's no way to cover the whole event and do all the exhibitors justice in these short pages. I'll note the event is run perfectly – with no hitches. The 2019 AICD will be held in May in Orlando, Florida. For more information, please contact Kasey Gould, AICD Administrator, tel: 409-860-9961, email: admin@aicd.org, or visit www.aicd.org BP

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

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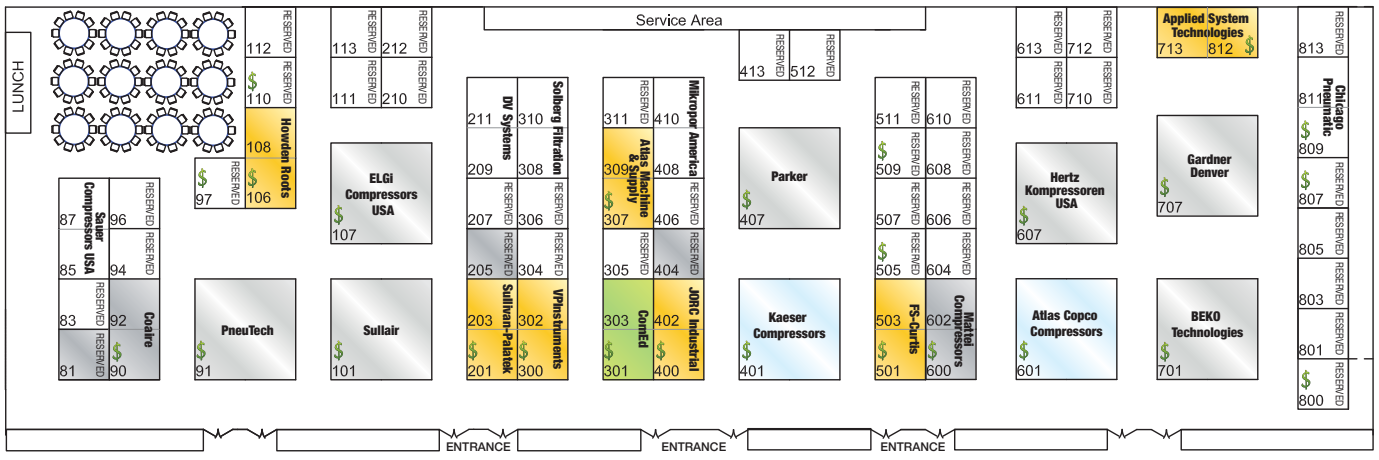

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Missed Demand-Side Opportunities Part 4

UTILIZING AIR-DRIVEN VENTURI VACUUM GENERATORS EFFICIENTLY

By Hank van Ormer, Contributing Editor

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

- Many end users, through lack of information, do not fully understand the benefits of this product and most importantly it's limitations. To further confuse the issue, various manufacturers call them different names, i.e. pump, ejectors, vacuum transducer pump, etc. The most accepted general category name is Venturi Vacuum Generator, which describes exactly what it does.
- To some it is the greatest thing since sliced bread. To others it is a constant waste of air. Continuous product development by industry leaders has made these products, when properly applied, not only convenient and responsive but often a very energy efficient selection.

How it Works

In its simplest form, the single- stage Venturi generator flows air through the conical Venturi orifice. As the conical orifice opens in size, the pressure falls and the velocity increases. The intensity is such that a vacuum (lower pressure

"The Venturi vacuum generator uses compressed air whenever it is on; therefore minimizing the ON time is PARAMOUNT."

— Hank van Ormer, Contributing Editor

than ambient air pressure) is formed and air to be evacuated from the process is pulled into the flowing airstream and blown out.

Venturi Vacuum Generator Advantages

- No moving parts
- Vacuum is on and off immediately with the air supply
- Low Cost
- Quick to repair or replace
- Can be located very close to process reducing the amount of evacuation air and offering faster cycle times

Venturi Vacuum Generator Disadvantages / Opportunities

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

Basic Operating & Design Considerations to Take Advantage of the Positive Features and Minimize the Negative

The Venturi vacuum generator uses compressed air whenever it is on; therefore minimizing the ON time is PARAMOUNT. Deliver only the vacuum you need and then shut off the "Compressed Air Supply Line" to the generator. Do not shut off the Vacuum Line to the process because the compressed air will usually continue to flow.

Venturi Vacuum Generators should generally be located as close as possible or of the actual process:

- An effective Venturi Generator offers great flexibility in a decentralized system when well controlled.
- With a decentralized system and Venturi generators are mounted close to the suction cups or on the cup itself. The air use is minimized by reducing the volume to be evacuated, eliminating excess hoses, bends, fittings, valves, filters, etc.
- When a proper system design strategy is implemented, it will take advantage of the ability of the Venturi vacuum generator located near the process to react quickly and pull the required vacuum quickly, then shut off the air supply whenever possible.
- Utilizing the current state-of-the-art Venturi vacuum generators – low pressure inlet compressed air, auto shut off of the air supply (and vacuum), reduced size and better cup choices to use the lowest possible vacuum level – will almost always deliver efficient vacuum with regard to compressed air use.

Developmental Changes Introduce Multi-Stage Generators

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

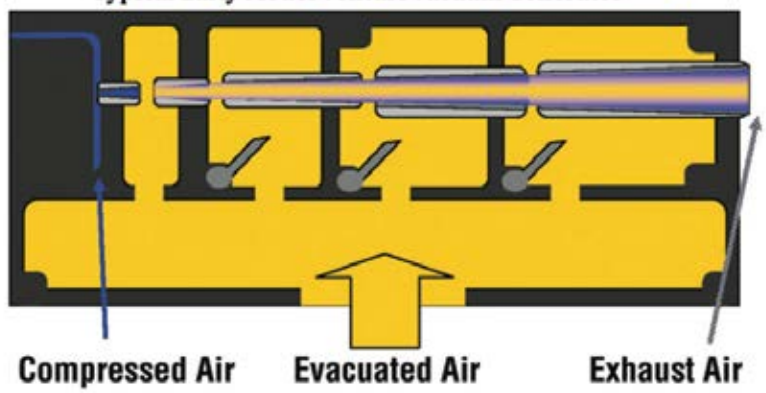
MISSED DEMAND-SIDE OPPORTUNITIES PART 4

air consumption to vacuum flow to a level of about 1:3 or better. Multi-stage units are also significantly quieter and can develop vacuum at lower pressure. This performance will reduce compressed air flow required under the same conditions and/or decrease reaction time and increase productivity. It is important to not operate multi- stage units at other than their rated inlet pressure or the valve timing will be negatively affected. Early models were large and somewhat cumbersome and often could not be mounted near the cups.

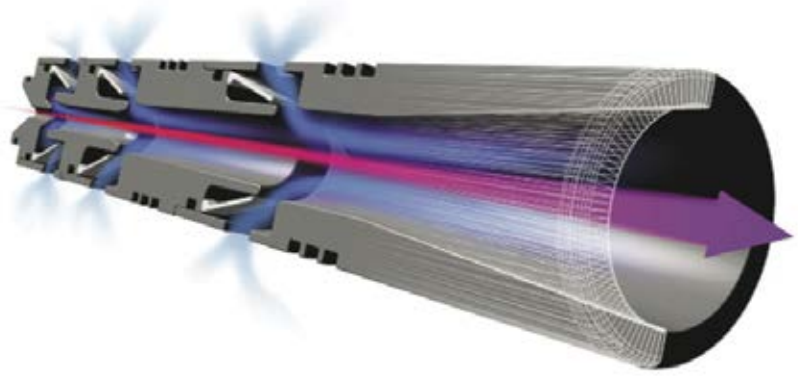
Coaxial Multi-Stage Venturi Vacuum Generator

Coaxial units are multi-stage vacuum generator with the multi-stage valves installed around a coaxially covered tube, this significantly streamlines the flow profile through the generator. Basic design allows the coaxial cartridge to meet and deliver many different flow and pressure requirements. In many cases the coaxial cartridge inside the generator body can be exchanged with another to allow the same hardware to meet varying conditions with optimum energy efficiency at relatively low cost. Development and production of the coaxial multi-stage Venturi vacuum generator brought more to the game than just a more efficient air- driven vacuum pump. The very characteristics of its design miniaturized the product while greatly improving performance and lowering maintenance and repair, which also led to dramatic changes in Venturi vacuum system design and configuration to further reduce compressed air usage limited only by imagination.

Typical Early Model Venturi Vacuum Generator



Typical Coaxial Multi- Stage Venturi Vacuum Generator



New Energy Efficient Venturi Vacuum Generator System Accessories and System Design Opportunities for Reduced Energy Impact

- **Use of Low Pressure Inlet Compressed Air**
  Recently developed coaxial multi-stage Venturi Vacuum Generators can be properly applied to lower inlet compressed air pressure resulting in less compressed air use to generate the same basic air removal to reach a similar vacuum level. Coaxial pumps high and low pressure cartridges are often interchangeable within a body.

- **The Use of Lower Vacuum Levels Means Faster Evacuation Time and Lower Energy (Compressed Air Use)**
  The majority of evacuation time is from 12" Hg and deeper vacuum. Therefore, use a lower vacuum level with larger or more appropriate cups whenever possible is to be considered. Proper cup selection is very critical to optimize the operating costs and productivity, and new vacuum cup technology continues to expand the opportunities.

For example a 40mm diameter vacuum cup with 27" of Hg vacuum level will lift a nominal 5.5lbs. A 75mm diameter vacuum cup at 18" of Hg vacuum level will lift a nominal 22lbs. The increase in the level of vacuum from 18" Hg to 27" Hg will be up to 10 times less energy efficient.

Establishing "End of Tool Technology"

The miniaturization of these very effective even lighter and smaller generators some now with

3D printer manufacturing, this has allowed further and faster use of the "End of Tool Technology." This allows a process to go from a centralized to decentralized application with the Venturi Generator mounted directly on the vacuum cup itself. Instead of evacuating all the air in the feed lines from the centrally mounted vacuum generator, the only evacuation air volume is the amount below the cup. Combine this with built- in auto air shut off and the required compressed air flow is often reduced to almost a negligible "puff."

This allows machinery system designers to take more advantage of end-of-tool evacuation when space and cycle times allow. Compressed air flow is still there to offset any leakage and not drop the piece.

Case Study

On a recent auto plant audit we were able to measure the compressed air usage on a centralized system with the following equipment- (2) Larger Central Vacuum Generators operating at 87psig with 3 cups per generator. The air consumption was 112scfm with 40 cycles per minute which would be about $11,200/ year at $0.06 kwh/ 8,000 hours/ year.

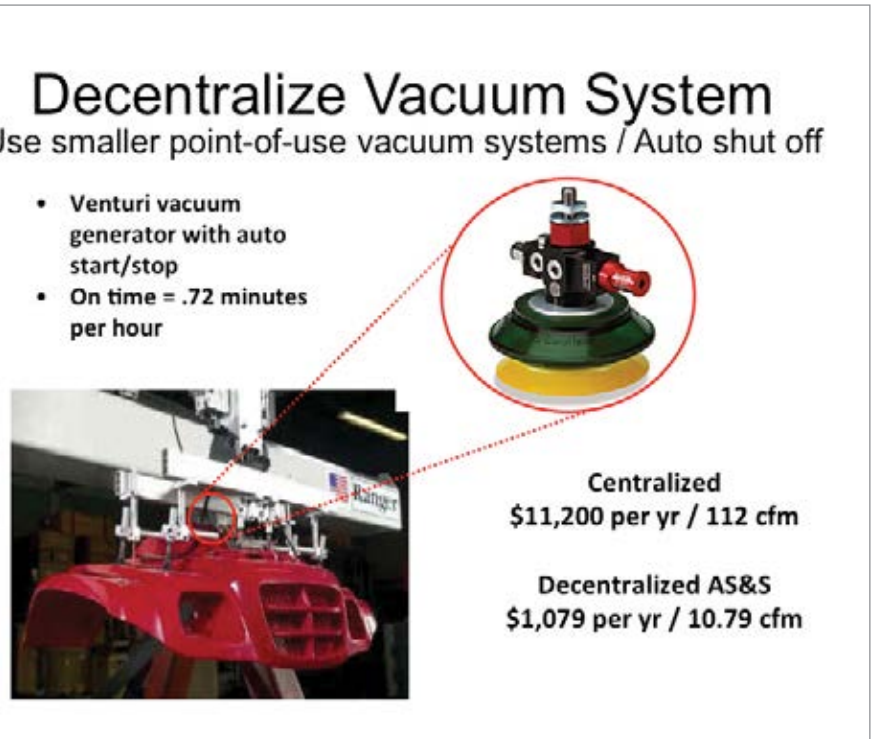
Converting the six cups to "End of Tool Technology" with vacuum a generator mounted on each cup with auto shut off lowered this to 10.79scfm for 40 cycles per minute; at a cost of $1,079/ year at the same conditions. Therefore, a projected annual savings of $10,121/ year for this one process.

Other New Accessories to Improve the System When Applicable

Suction Cups with Built-In Evacuation Air Shut Off is a product available with very high potential energy impact is the newly developed

Typical Performance of Single- Stage and Coaxial Multi- Stage Venturi Vacuum Generators at Various Inlet Pressures

Single-Stage			Coaxial Multi-Stage		
Inlet Pressure	Compressed Air	Vacuum	Inlet Pressure	Compressed Air	Vacuum
45	8.6	12"	45	4.2	26"
50	9.4	14"	50	4.6	26"
55	10.2	16"	55	4.9	26"
60	10.9	18"	60	5.3	26"
65	11.6	22"	65	5.7	26"
70	12.4	25"	70	6	24"
80	13.8	27"	80	6.7	24"
100	16.8	26"	100	8.2	22"



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cup connectors with a built-in valve that only opens when the cup sets on the piece and vacuum is needed. These valves close when there is no piece to pick up.

In the case where multiple cups are on the machine and various sizes and shapes of pieces are to be picked up, any unused cups will not pull open ambient air into the evacuation airstream. Thus optimizing the compressed air use in the process.

Constant open flow into the evacuation airstream will increase the compressed air on- time required for the working cups to reach the target vacuum level. In some cases it may require reduction in cycle time to avoid product drops.

Vacuum Regulators in Place of Compressed Air Regulators

These vacuum regulators directly control the actual vacuum level instead of the inlet pressure to indirectly control the vacuum level. Tests have shown this will minimize the "on time" much more effectively.

Summary

Throughout the past fifty years, the air- driven Venturi vacuum became more and more popular as manufacturers of production machinery found their size, feasibility, and inherent fast response time allowed design flexibility and most importantly, line speed increase. This is especially true during the 1980's and 1990's as automation surged in search of productivity improvements.

Unfortunately, little attention was paid to the operating energy cost of these products, which utilize compressed air – a plant's most expensive utility.

Other than the multi-stage Venturi vacuum generator, which was and still is a most significant development, very little true innovation has implemented with the basic technology. Most development centered on and around industry issues such as control. The biggest missing piece has been product knowledge and training from the production machine manufacturers to plant engineering and maintenance personnel. BP

We hope you've found this interesting and look forward to your comments! Contact Hank van Ormer, email: hankvanormer@aol.com, tel: 614.580.2711

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TECHNOLOGY PICKS

Sullivan-Palatek C-Series 5-30 hp Rotary Screw Air Compressors

Versatile and energy efficient, the C-Series industrial electric rotary screw air compressors are part of a growing number of products provided by Sullivan-Palatek. Standard C-Series compressors are offered from 5-30 hp, while 10-30 hp models are offered with optional integral dryer package. Compact in size and only 68 dBA, the minimal footprint and noise of these machines is ideal for auto body shops and other small facilities.

The Sullivan-Palatek C-Series

The C-Series are single phase 5-10 hp, tri-voltage 10-30 hp. Other features include TEFC motor, multi-point measuring and protection of pressure and temperature, E-Stop, RS-485 communication interface function, a seven function maintenance schedule/monitoring system, and fully functional electrical control for motor protection.

About Sullivan-Palatek

Sullivan-Palatek Inc., a leader in innovation and design, offers the industry's widest range of electric and portable rotary screw air compressors. From it's beginning in 1984, Sullivan-Palatek has grown from providing engineering services to existing clients, to a company that manufactures the most rugged and reliable machinery available in the market. Assembled in the USA, Sullivan-Palatek machines are as tough as the people that build them. For more information visit www.sullivan-palatek.com

New CS-Instruments LD 500 Ultrasonic Leak Detector with Camera

CS-Instruments GmbH, with a North American Office in Grand Rapids, Michigan, is introducing the new LD 500 ultrasonic leak detector with an integrated camera, leakage calculation and optional Leak Reporter Software.

The optional Leak Reporter Software easily locates and documents small leaks at far distances.

The LD 500 can be upgraded to the LD510 with an additional freely assignable sensor input for use with all CS sensors. In addition to compressed air leak detection, it also can measure and document dew point, flow, pressure and temperature.

TECHNOLOGY PICKS

Special features of Ultrasonic Leak Detector LD 500/510

- Find out leak size (cfm) and potential savings ($/year)
- Find the smallest of leaks – even at far distances
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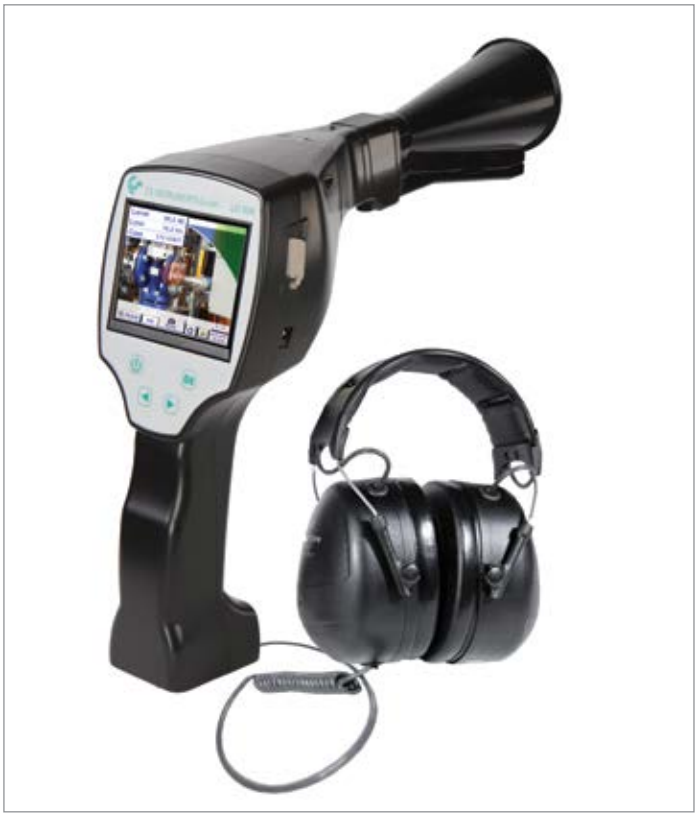

The new CS-Instruments LD 500 ultrasonic leak detector with an integrated camera.

Aventics Completes Rodless Cylinder Product Line

As with the other double-acting rodless cylinders from Aventics, at the heart of the RTC-SB (slide bearing) is its oval piston shape. In relation to its size, it offers a very high load capacity. As a result, engineers can draft even more compact machine designs. Equipped with a lubrication-free slide bearing, the cylinder is maintenance-free and resistant to water, chemicals and dirt. The slide play is optimally adjusted at the factory.

The new RTC-SB rodless cylinder is designed for a maximum speed of 6.5 m/s (21.3 ft./s). The maximum stroke is around 6,000mm (21.6 ft.). A wear-free magnetically attached exterior strip, scraper and sealing strip protect the cylinder from dust and dirt. Adjustable pneumatic cushioning extends the service life and ensures precise and gentle operation. The RTC precision cushioning can achieve what Aventics describes as "Ideal Cushioning" with the proper tools and adjustment. Form-fit connection technology from Aventics with standardized mechanical interfaces simplifies machine design and speeds up assembly significantly since no re-adjustments are necessary.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

The new RTC-SB rodless cylinder is designed for a maximum speed of 6.5 m/s (21.3 ft./s)

The RTC cylinder completes the Aventics range of double-acting rodless cylinders. The new RTC-SB version with bore sizes ranging from 25 to 40 mm closes the previous gap between the basic version (RTC-BV) and the versions designed for higher loads, the RTC-CG (compact guide) and RTC-HD (heavy duty). RTC cylinders can be easily configured online with a part number assigned, CAD drawings and other documentation available in minutes. More information and links to tools for the RTC are available at: www.aventics.com/us/RTC

About Aventics

Aventics is one of the world's leading manufacturers of pneumatic components and systems. The pneumatic engineering company provides products and services for industrial automation, as well as the food, packaging, medical, and energy technology industries. The company also develops solutions for the commercial vehicles, marine, and railway technology sectors. By integrating electronics, the use of state-of-the-art materials, and focusing on machine safety and the Internet of Things (I4.0), Aventics is a pioneer in applied and environmentally-friendly solutions. Aventics is preparing for the future by expanding its approach to digitalization.

With around 150 years of expertise in pneumatics, Aventics employs over 2,000 associates worldwide. From production sites in Germany, France, Hungary, the USA, and China, Aventics markets its products in over 100 countries through direct sales and sales partners. The Aventics Group has received multiple certifications, including ISO 9001 and ISO/TS 16949 for quality, ISO 50001 for energy management, and ISO 14001 for environmental management. Further information is available at www.aventics.com/us

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TECHNOLOGY PICKS

Gen4 Ionizing Point from EXAIR Delivers Precision Static Elimination

EXAIR's new Gen4™ Ionizing Point delivers a high concentration of positive and negative ions to neutralize static electricity without requiring compressed air. This compact and shockless static eliminator is the ideal way to eliminate static electricity problems occurring in small spaces. They are ideal to keep small parts or products separate, or from sticking to other surfaces. Gen4 Ionizing Points can protect sensors, eliminate improper readings of sensitive electronics, and keep powder filling nozzles clear of clogs. They also prevent jamming, tearing or dust attraction on slitting, winding, rewinding, ink jetting and silk screening applications.

The Gen4 Ionizing Point has undergone independent laboratory tests to certify it meets the rigorous safety, health and environmental standards required to attain the CE and UL marks in the U.S.A., European Union and Canada. It is also RoHS compliant. New design features include a metal armored high voltage cable to protect against abrasion and cuts, a replaceable emitter point, integrated ground connection and electromagnetic shielding.

A new 115V/230V selectable voltage power supply has been designed to operate the Gen4 Ionizing Point. Visit EXAIR.com to see the entire static elimination product line, including static eliminating Gen4 Super Ion Air Knives, Gen4 Super Ion Air Wipes, Gen4 Ion Air Cannons, Gen4 Ion Air Jets and a handheld Gen4 Ion Air Gun for manual operations. The price is $211.

For more information, visit www.EXAIR.com or call: (800) 903-9247.

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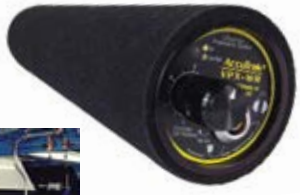

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