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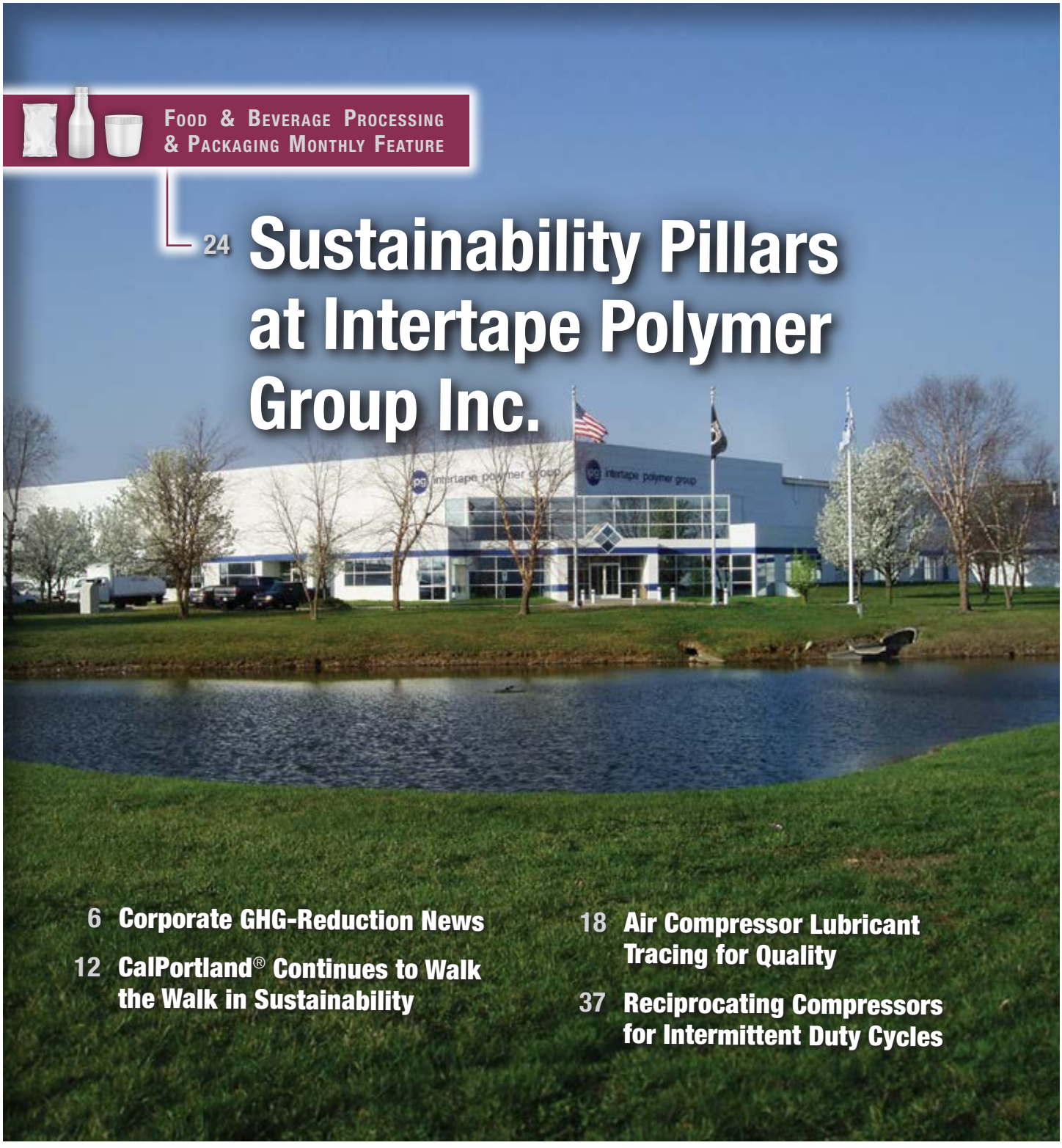

Food & Beverage Processing & Packaging Monthly Feature

24 Sustainability Pillars at Intertape Polymer Group Inc.

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SUSTAINABILITY & EFFICIENT TECHNOLOGY NEWS

EVERY ISSUE

COVER PHOTO. This month's cover features the Intertape Polymer Group Inc. plant in Carbondale, Illinois.

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FROM THE EDITOR

We have decided to begin publishing a feature article, every month, on a company in the food processing or packaging industry – including companies manufacturing packaging materials only. This is our single largest manufacturing reader segment. I hope you'll enjoy our cover story on Intertape Plastics Group Inc. This is a firm with a mature energy management program, recognized by ENERGY STAR®.

We've also begun a news section titled, "Corporate GHG-Reduction News," where we share announced Scope 1 and 2 GHG and water reduction targets and recognitions.

If you find our journalistic efforts worthwhile and want to help us, the best way to do this is to recommend our free publication to engineering firm and manufacturing personnel to help us grow circulation.

Quality, safety and reliability cannot be taken for granted. In some plants, two hours of downtime can offset the system energy-savings of an entire year. Product rejections have large scrap costs and potential liabilities. These three topics will continue to be a major focus of this publication.

I've been looking into compressed air as it relates to food safety more closely in recent months. We sent out an informal questionnaire to compressed air suppliers asking them what types of air compressors (oil free or lubricated and did they use food-grade?) and dryers (specifically what dew point capability) they supplied to food processors and packagers. The results didn't surprise me – answers varied dramatically and were heavily influenced by what product lines they represented. More to come on this topic and comments are welcome if you want to send me a note on your experiences.

Thanks go to our article contributors this month from SA Performance, Compression Engineering Corporation, the Compressed Air & Gas Institute and our own Mike Grennier who profiles another recognized ENERGY STAR® Sustained Excellence firm with his article, "CalPortland® Continues to Walk the Walk in Sustainability."

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

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CORPORATE GHG-REDUCTION NEWS*

* Scope 1 and 2 GHG Emissions from Direct Operations

McCormick Makes CDP's Prominent Climate Change "A List"

McCormick & Company (February 16, 2021) was recently recognized on the CDP's esteemed "A List" for demonstrating an unwavering commitment to environmental leadership. Recognized around the world as the gold standard of environmental reporting, CDP, also known as the Carbon Disclosure Project, helps organizations disclose their environmental impact and aims to make risk management and environmental reporting a business norm. This "A List" distinction highlights McCormick as a proven leader of corporate environmental ambition, action, and transparency worldwide.

Measuring and managing risks and opportunities on climate change, water security, and deforestation is an important part of our corporate responsibility. "We are proud to be recognized by CDP as leaders in corporate transparency on climate change for our contributions to sustainability across our industry," said Bill Schildt, McCormick's Director of Environmental Affairs. "We will continue to embed Purpose-led Performance throughout our business to positively impact society and to successfully drive our global efforts."

To benefit the planet, our Planet goals include achieving a 20 percent absolute reduction in greenhouse gas emissions, a 20 percent reduction in water use, and an 80 percent recycling and recovery of solid waste rate, and a 25 percent reduction in carbon footprint by 2025. While our 2025 goals give us significant targets to work toward, we know that our sustainability journey never complete and we remain committed to doing well while doing good.

To offset our greenhouse gas emissions, we've announced a new partnership with the Skipjack Solar Center to provide renewable electricity to power 100 percent of our current Maryland and New Jersey facilities. This new agreement will help us meet our greenhouse gas reduction goals by 2025. While McCormick is not a major user of water globally, we are now partnering with third party experts to identify opportunities to reduce our water use at targeted facilities around the world.

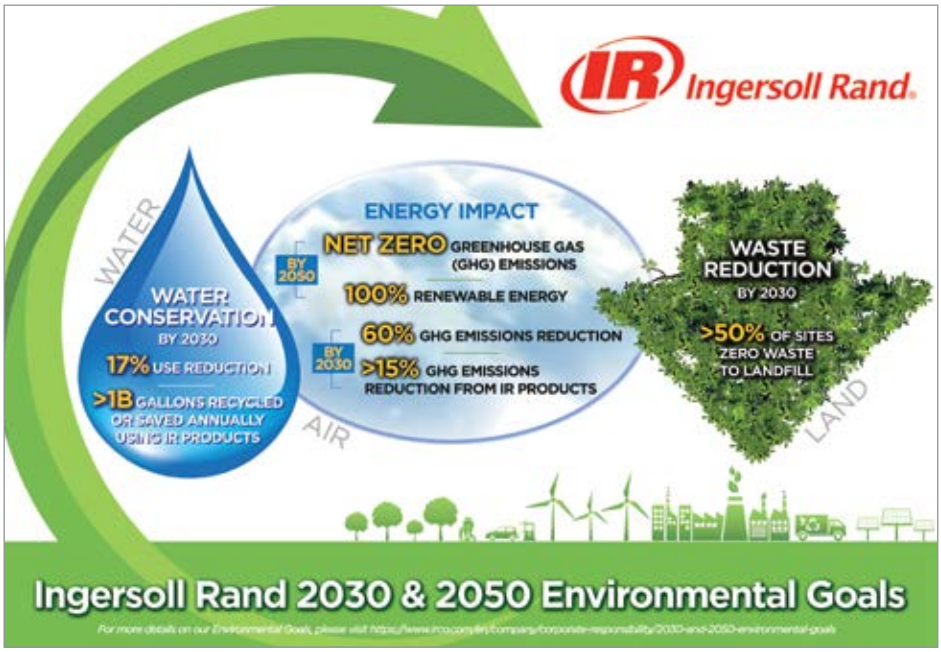
Visit https://www.mccormickcorporation.com/en

Ingersoll Rand Sets 2030 and 2050 Environmental Goals to Mitigate Climate Change

Ingersoll Rand Inc. (NYSE:IR) released on February 22, 2021, its 2030 and 2050 environmental goals designed to reduce the impact of its operations and products on the environment, and support customers and partners in doing the same. Achievement of these aggressive goals will reduce greenhouse gas emissions and save energy, create safer water for our communities and result in reduced waste to landfill.

"We are operating at a time when course-correcting the impact we have on the environment is an imperative and our collective responsibility," said Vicente Reynal, Chief Executive Officer. "On a daily basis Ingersoll Rand employees around the world live our purpose of *Making Life Better,* and with a strong culture centered on employee ownership and dedicated to citizenship, we stand ready to accelerate our environmental actions."

Ingersoll Rand commits to making a positive impact on our shared planet with these environmental goals:



- Realize net-zero greenhouse gas (GHG) emissions by 2050
- Invest in renewable energy to meet our 100% target by 2050
- Reduce GHG emissions by 60% in our operations (Scope 1 and Scope 2) *and* reduce customer GHG impacts >15% from IR products (Scope 3) by 2030
- Reduce water use 17% in our operations by 2030
- By 2030, eliminate, reduce or recycle >1 billion gallons of water annually in our customers' processes and applications through the use of our products
- Achieve zero waste to landfill at >50% of current sites by 2030

"These goals underscore our strategic priority to operate sustainably across key areas of our business where we can make a powerful, lasting impact," continued Reynal. "These commitments will further unite our 16,000 employees through a shared sense of responsibility and purpose, bring value to our customers through product innovation and stewardship and make a positive difference toward protecting our communities and the world."

The company will drive accountability and progress through Ingersoll Rand Execution Excellence (IRX), and provide transparency on our progress through its annual Sustainability Report. Ingersoll Rand's 2020 Sustainability Report is scheduled to be released in May 2021.

Visit www.IRCO.com

Corporate GHG-Reduction News

Suntory Beverage & Food Named on CDP A Lists for Both Water Security and Climate Change

Suntory Beverage & Food Limited announced (December 14, 2020) it has been named on the CDP Water Security A List for 2020. This marks the fifth consecutive year that SBF has received such high marks from CDP, the global non-profit that runs CDP's environmental disclosure system. At the same time, SBF has also been named on the CDP Climate Change A List for 2020 again this year for a fourth time.

CDP is a global non-profit that exists to measure, disclose, manage, and share critical environmental information on corporations and cities. Its annual environmental disclosure and scoring process is a widely recognized standard in corporate environmental disclosure. This year, a total of 515 investors with assets exceeding US$106 trillion and 125 major buyers with some US$4 trillion in purchasing power used the CDP platform to request environmental disclosures, while more than 9,600 corporations responded.

SBF views this year's CDP Water Security 2020 honor as a recognition of the overall success of Suntory Group's unique efforts at combining research and production through "Mizu To Ikiru," including not only the group's water conservation activities based on our Sustainable Water Philosophy, such as the hydrological cycle surveys conducted by the Suntory Institute for Water Science and the use of water cascading at our plants,[1] but also our efforts in local communities, such as our water risk assessments conducted worldwide on areas around watersheds, our science-based Natural Water Sanctuary activities to cultivate water resources, our worldwide Suntory Mizuiku-Natural Water Education Program, and our certification by the Alliance for Water Stewardship (AWS) for our sustainable water use at the watersheds around our plants.

Likewise, SBF sees the CDP Climate Change 2020 honor as an overall recognition of Suntory Group's Environmental Vision 2050, our goal of reaching zero green-house gas emissions across the entire value chain, our strong leadership on reforms to achieve a recycling-based, carbon-free society through the Suntory Group Plastic Policy, our engagement with suppliers, including on energy conservation through F-to-P Direct Recycling Technology developed in collaboration with suppliers and on SCOPE3 CO_2 reductions, and our CO_2 zero-emissions plant,[2] the Suntory Tennensui Kita-Alps Shinano no Mori Plant.

Visit https://www.suntory.com/csr/

3M to Invest $1 Billion to Achieve Carbon Neutrality, Reduce Water Use, and Improve Water Quality

3M (NYSE: MMM) announced, on February 16, 2021, it expects to invest approximately $1 billion over the next 20 years to accelerate new environmental goals: achieve carbon neutrality by 2050, reduce water use by 25% at its facilities, and return higher quality water to the environment after use in manufacturing operations.

"As we grow 3M, we will lead in environmental stewardship, social equity and justice, and corporate governance," said 3M chairman and CEO Mike Roman. "We are taking action now to bend the curve on carbon emissions and water use, and improve water quality. Our investments will make us more effective and efficient and drive growth. Today's announcements demonstrate again how 3M applies science to improve lives to help shape the world through cleaner air, better water quality, and less waste."

By applying science and technological expertise, 3M expects to further reduce carbon emissions, aiming for a 50% reduction by 2030, an 80% reduction by 2040, and 100% carbon neutrality in its operations by 2050.[3] Starting this year, as part of its ongoing review of its manufacturing facilities, 3M will also work to ensure all operations become best in class for minimizing emissions that can be produced during manufacturing operations.

3M is committed to reducing water use at its worldwide manufacturing facilities over the next decade. As it is in carbon emissions, 3M is taking immediate steps to drive reductions in water use in the coming months and over the longer-term: a 10% reduction in water use by 2022, a 20% reduction by 2025, and a 25% reduction by 2030.[3]

1. Cascading is a technique that classifies water used in the manufacturing process by grade (degree of cleanliness), such as water for cooling, water for cleaning, etc., and reuses it in stages, passing it from applications in which the highest grade is needed to applications for which the next lower grade will suffice.
2. A CO_2 zero-emissions plant is one that generates essentially zero CO_2 emissions in the manufacturing process by promoting energy conservation, adopting renewable energy, and using credits to offset CO_2 emissions from fossil-fuel sources.
3. 2019 will be the baseline measure year for these new commitments.

Through its efforts, 3M expects to reduce its overall water usage by 2.5 billion gallons (about 9.5 billion liters) per year. "We are proactively reviewing our manufacturing facilities, going plant by plant to make investments and updates that will go beyond what is required, and at the same time further improve our operations," said Roman. "We are applying 3M technologies at a broad scale, which allows us to do more to reduce, restore and reuse the water in our manufacturing processes."

Visit www.3M.com

General Motors Plans to be Carbon Neutral by 2040

General Motors (NYSE:GM) announced, on January 28, 2021, that it plans to become carbon neutral in its global products and operations by 2040 and has committed to setting science-based targets to achieve carbon neutrality. The company has also signed the Business Ambition Pledge for 1.5°C, an urgent call to action from a global coalition of UN agencies, business and industry leaders.

"General Motors is joining governments and companies around the globe working to establish a safer, greener and better world," said Mary Barra, GM Chairman and CEO. "We encourage others to follow suit and make a significant impact on our industry and on the economy as a whole."

The use of GM's products accounts for 75 percent of carbon emissions related to this commitment. GM will offer 30 all-electric models globally by mid-decade and 40 percent of the company's U.S. models offered will be battery electric vehicles by the end of 2025. GM is investing $27 billion in electric and autonomous vehicles in the next five years – up from the $20 billion planned before the onset of the COVID-19 pandemic.

To address emissions from its own operations, GM will source 100 percent renewable energy to power its U.S. sites by 2030 and global sites by 2035, which represents a five-year acceleration of the company's previously announced global goal. Today, GM is the 10th largest offtaker of renewable energy in the world and in 2020, the company received a 2020 Green Power Leadership Award from the U.S. Environmental Protection Agency.

Visit www.GM.com

HanesBrands Recognized for Sustainability Leadership by CDP

HanesBrands (NYSE:HBI) announced, on December 8, 2020, it has earned its first "A List" recognition for leadership in corporate sustainability in the CDP 2020 Climate Change Report.

HanesBrands, one of four apparel manufacturers on the 270-member global CDP A List, was recognized for its actions to cut emissions, mitigate climate risks and develop the low-carbon economy. The A score follows two superior A- rankings, placing HanesBrands among the top companies worldwide with eco-friendly operations for the last three years.

"We are proud to receive this prestigious recognition for leadership in corporate responsibility and, in particular, addressing climate change," said Steve Bratspies,

Corporate GHG-Reduction News

HanesBrands CEO. "Consumers around the world are increasingly focused on how companies operate, and this honor shows that consumers can be confident in our commitment to sustainability and feel great about apparel made by HanesBrands."

CDP's annual environmental disclosure and scoring process is widely recognized as the gold standard of corporate environmental transparency. A detailed and independent methodology is used by CDP to assess these companies, allocating a score of A to D- based on the comprehensiveness of disclosure, awareness and management of environmental risks and demonstration of best practices associated with environmental leadership, such as setting ambitious and meaningful targets.

Chris Fox, appointed HanesBrands' chief sustainability officer in November, said: "We've made significant progress, but there is much work to do. Our aggressive new 2030 goals, focused on people, planet and product will help create sustainable value for our company, our investors, our consumers, our employees and our communities."

The company, which has also earned the U.S. Environmental Protection Agency's Energy Star partner of the year/sustained excellence award for 11 consecutive years, has significantly reduced energy use and carbon emissions since implementing an energy management program in 2007. Recent achievements include optimizing biomass procedures to improve thermal efficiency and replacing HVAC systems, air compressors and lighting with more energy-efficient equipment.

Visit www.hbisustains.com

Stanley Black & Decker Recognized with "A" Score for Global Climate and Water Stewardship

Stanley Black & Decker (December 9, 2020) has been recognized for leadership in corporate sustainability by global environmental nonprofit CDP (Carbon Disclosure Project), securing a place on its 'A List' for the third consecutive year for their efforts to tackle climate change, as well as acting to protect water security – two of the three environmental themes covered by CDP.

Stanley Black & Decker has been named to the Climate A List seven times in total and the Water A list four times.

"Stanley Black & Decker is a purpose-driven company and aims to be a force for good," said Stanley Black & Decker President & CEO Jim Loree. "Abiding by the principles embedded in stakeholder capitalism, we are focused on creating a more sustainable world. This is a key pillar of our 2030 Corporate Social Responsibility strategy and aligns with our purpose – For Those Who Make The World. We are committed to sharing our progress against our environmental, social and governance goals and are honored to be recognized at the leadership level for these efforts by CDP for the third consecutive year."

Stanley Black & Decker's Corporate Social Responsibility (CSR) strategy is aligned with the United Nations' 2030 Sustainable Development Goals. The strategy focuses

the company's efforts on three key pillars: empowering makers, innovating with purpose and creating a more sustainable world. By 2030, Stanley Black & Decker plans to enable 10 million creators and makers to thrive in a changing world, innovate their products to enhance the lives of 500 million people, and, be carbon positive in its global operations, meaning its carbon capture is greater than its carbon emissions.

Visit www.stanleyblackanddecker.com

Owens Corning Earns Place on Dow Jones Sustainability Index

Owens Corning (NYSE: OC) announced, November 16, 2020, earned a place on the Dow Jones Sustainability World Index (DJSI World) for the 11th consecutive year and was named Industry Leader for the DJSI World Building Products group for the eighth straight year.

The DJSI World comprises an elite listing of the world's largest companies based on long-term environmental, social and governance criteria.

"We are honored to once again receive this recognition from the Dow Jones Sustainability World Index," Chairman and Chief Executive Officer Brian Chambers said. "At Owens Corning, we are committed to our long-term aspiration to be a net-positive company. Our 18,000 employees around the world take great pride in the work we do every day to achieve this goal."

For the fourth year in a row, Owens Corning led the building products sector in all three DJSI dimensions: economic, environmental and social. Additionally, Owens Corning earned placement on the Dow Jones Sustainability North

America Index for the third year. The North America Index tracks the sustainability leaders in the largest U.S. and Canadian companies in the S&P Global Broad Market Index.

With the increased focus from investors on companies' environment, social, and governance performance, Owens Corning welcomes the increased transparency of the DJSI's 2020 Corporate Sustainability Assessment. In its most recent annual sustainability report, the company expanded disclosures for Task Force on Climate-related Financial Disclosures (TCFD) and Sustainability Accounting Standards Board (SASB), in addition to Global Reporting Initiative (GRI) disclosures according to the Comprehensive standard.

"This year reinforced the need to continuously strive to improve in every aspect of sustainability, so that people everywhere can thrive, collaborating to broaden the responsible use of Earth's precious resources," Chief Sustainability Officer Frank O'Brien-Bernini said. "The urgent challenges we're facing today highlight the complexity of meeting the needs of the present while staying focused on the long-term solutions that the world needs. Earning a place on the DJSI reaffirms that our goals matter beyond our company."

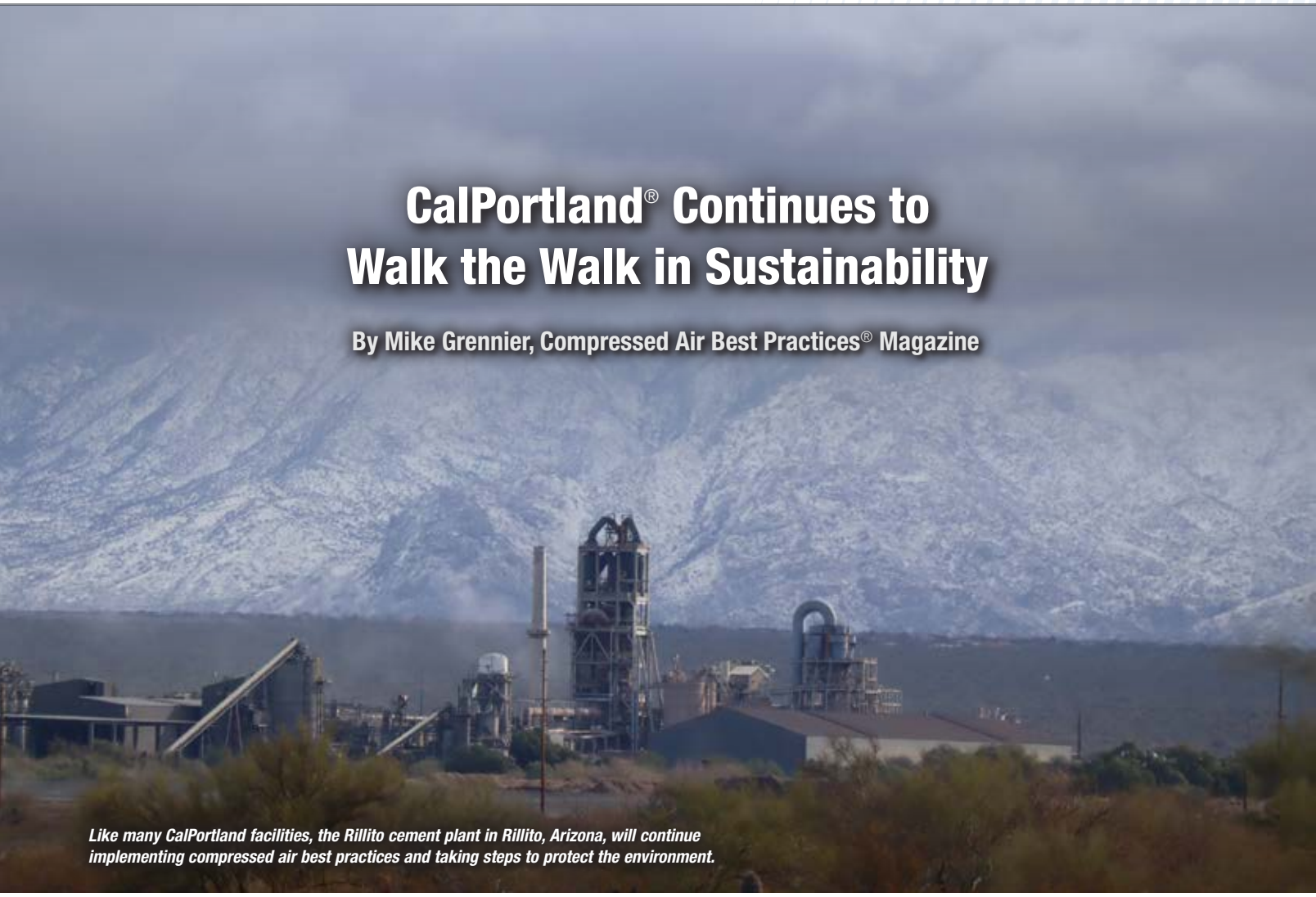
This year, Owens Corning has also been recognized for its corporate sustainability leadership, including ranking No. 1 for the second year in a row on 3BL Media's 100 Best Corporate Citizens list and recognition by the Ethisphere Institute as one of the World's Most Ethical Companies.

As a global building and industrial leader, Owens Corning is committed to delivering sustainable solutions. More detail about its programs and progress is in its 14th annual Sustainability Report published earlier this year.

Visit www.owenscorning.com

CalPortland® Continues to Walk the Walk in Sustainability

By Mike Grennier, Compressed Air Best Practices® Magazine



Like many CalPortland facilities, the Rillito cement plant in Rillito, Arizona, will continue implementing compressed air best practices and taking steps to protect the environment.

There are many companies who say they are leaders in environmental protection. And then there are many like CalPortland® that back it up time and again.

A major producer of cement and building materials, CalPortland's energy management efforts have reduced the company's overall energy intensity by 17.5% since 2003, avoiding $149 million in unnecessary energy costs – and over 3.3 million metric tons of Greenhouse Gas (GHG) emissions. In 2020, the company achieved what no other U.S. Industrial company has: It earned the ENERGY STAR® Partner of the Year Award for the 16th consecutive year.

For Steve Coppinger, CalPortland Vice President of Engineering Services, and Bill Jerald, CalPortland Chief Energy Engineer, sustainability at the company is considered a given.

"We don't just talk about sustainability; we're really doing something about it," said Coppinger, noting the great pride the company takes in its achievements. "We walk the walk. And you can see that we're doing something because we're recognized for it. We're believers in it," he said.

It's About Citizenship

Headquartered in Glendora, California, CalPortland Company (www.calportland.com) produces cement, ready-mixed concrete, aggregates, concrete products and asphalt in the western United States and Canada. In all, it employs 3,000 people at 150 facilities.

Its three cement operations in California and Arizona use a complex process that takes mined material and grinds it into raw meal. The meal is then heated in large kilns with temperatures reaching 2,700°F (1,482°C) in order to produce cement, which is the main ingredient used to make concrete. CalPortland's 76 ready mix plants produce ready-mixed concrete based on local customers' specifications and transport it to each site with its fleet of 2,500 trucks with 118 of those trucks being CNG-fueled trucks. CalPortland has three in-house CNG stations fueling the ready mix fleet and 24 newly converted CNG cement-bulk hauling trucks. In addition to cement and ready mix plants, it operates cement terminals, as well as asphalt plants and aggregate mines.

The company, founded in 1891, has carved out a leadership position in the industry with its strong commitment to quality, customer service, technical excellence and safety. It has also established itself as a proven leader of energy conservation and environmental stewardship for decades. A main reason for the company's strong commitment to sustainability, said Coppinger, is because it cares.

"We want to be responsible citizens," he said. "We have industrial facilities in communities where we live and work and we want to make sure we're serving as leaders in helping the environment and demonstrating what we do."

Annual Energy Costs of $126 Million

Producing cement is an energy-intensive business covering multiple aspects of materials processing, including mining, crushing, grinding, pyro-processing, conveying and pumping. CalPortland spends over $126 million per year on energy with costs equally divided between electricity, diesel fuel and fuel for its kilns, which includes natural gas, coal and coke.

"The cement process represents about 40% of our variable costs. Obviously, we're trying to reduce our costs and when we can be more efficient and produce fewer emissions it's a good thing that helps everyone," Coppinger said.

The electrical load at a CalPortland cement plant can reach 35 MW, consuming as much as 205 million kilowatt hours of electricity per year. Jerald said compressed air is considered a major consumer of energy, and more importantly, represents an excellent opportunity for low-cost improvements in energy. He also said the company's focus on compressed air has changed considerably since he joined the company 27 years ago.

"It's a night-and-day difference. Now, we look at compressed air holistically and it's to the point where it's ingrained as far as people thinking about it and how we can use it efficiently," Jerald said.

"In the past, an employee might hear a compressed air leak walk right by it, saying, 'It's just a compressed air leak. It's no big deal. That's normal.' But with proper awareness and training, it's second nature for people in that situation to say, 'Whoa. That's a leak. We need to tag it and address it. It's costing us money.' When we see something that looks unsafe, it's second nature for us to correct it. We have the same type of thinking with energy."

Top-down Approach

CalPortland owes much of its success with compressed air efficiency and sustainability to an organized approach and a top-down commitment to it, said both Jerald and Coppinger.

Energy use and consumption at the company is regularly evaluated and action plans formulated and consistently updated on a plant-by-plant and regional basis. The plant engineer at each cement plant, for example, serves as both plant engineer and energy manager. Each plant also has a cross-functional energy team consisting of 10 to 15 people with a diverse range of experience

CalPortland® Continues to Walk the Walk in Sustainability

and expertise, ranging from Information Technology to marketing and more. The team typically meets on a weekly or monthly basis to evaluate the operation's energy data to gauge overall energy performance. Quarterly reviews are then held locally and at the corporate level to share information and ideas.

"How much energy have we consumed? Are we doing better or worse than our goals? How is the kiln doing? How are the air compressors doing? If we're not doing something well, what are we doing to correct those issues?'" Jerald said.

The commitment of senior management, including CalPortland CEO Allen Hamblen, plays a major role in helping the company lead the way in sustainability, said both Jerald and Coppinger.

"To make something like this a success, you need your CEO to support the program. You've got to have that guy," said Jerald. "When employees get a personal email from the CEO congratulating them for sustainability successes like we do, it means a lot."

Treasure Hunts Prove Invaluable

Improvement in the management of compressed air is ongoing at CalPortland, which is not surprising since it's a utility found at most operations. The mix of air compressors used is also diverse, ranging from small rotary vane air compressors for pneumatic conveying at ready mix plants to large reciprocating air compressors rated to deliver up to 2,000 scfm each at its cement plants.

When it comes to making changes in compressed air systems, CalPortland is a proponent of regular system assessments and ENERGY STAR Energy Treasure Hunts across its facilities. It's all with an eye toward positive outcomes, said Coppinger.

"We're not trying to find things wrong with a plant. It's finding treasure and finding opportunities to improve efficiencies," he said,

Rotary screw air compressors are used to power a wide variety of applications at CalPortland cement and ready mix plants.

noting the significant value in being an EPA ENERGY STAR Partner. "It's a great program and a great forum for working with others who conduct energy programs and to learn and share best practices," Coppinger said.

Both Coppinger and Jerald consider Treasure Hunts to be invaluable. Jerald points to a relatively recent project involving a compressed air system at a ready mix plant that was not keeping pace with demand.

The team at the plant determined it needed to replace an existing air compressor with a new one to remedy the issue. Before taking action, however, Jerald helped the plant facilitate a planned treasure hunt to further assess the situation before proceeding. As part of the treasure hunt, Jerald searched for compressed air leaks using an ultrasonic leak detector. He said he appreciated wearing the leak detector headphones given the size of the leaks discovered, along with other issues.

"My headgear was actually protecting my ears from the noise with one leak," he said. "But we fixed these things and guess what? They didn't need an air compressor anymore and the capital project was canceled, saving at least $50,000."

Jerald said the team at the plant was happy to resolve the issue given their focus on continuing to meet production goals. They also appreciated saving costs and learning about opportunities for compressed air improvements.

"After you do these activities you can see the level of knowledge growing," Jerald said. "When you know the plants are aware and stuff is being done to improve things, it's really exciting to see."

Better Managing Compressed Air

Treasure hunts augment CalPortland's steadfast approach to routinely implementing compressed air best practices, such as updating aging reciprocating air compressors with rotary screw air compressors where appropriate, better sequencing air compressors, delivering compressed air at a lower pressure plantwide where feasible, and installing small air compressors or receiver tanks to better handle specific loads. At CalPortland, the list of best practices is long.

"In the past, some of our cement plants would keep compressed air for the entire plant at an unnecessarily high pressure because they thought they needed to keep it at a certain psi level, or the whole plant would shut down," said Coppinger, citing one example of understanding how compressed air is used and finding ways to better manage it.

"We did some digging and we found we have certain applications that require high pressure air to run equipment, such as in our laboratory. In this case, we've installed a small, dedicated air compressor in the lab so we could lower the pressure for the whole plant since we only needed high-end pressure for this one application," he said.

Another example of compressed air best practices involves the use of compressed air to blow off buildup of material in the cement plants' pre-heater towers before the fine, powdery material enters the operation's rotary kiln for further heating and processing. Without using compressed air for blow-off,

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CalPortland operations, such as the company's cement plant in Oro Grande, California, have been long recognized for success in sustainability.

the material flowing through tower vessels can build up and harden, causing a potential disruption in production. While the use of compressed air prevents the issues from occurring, it had created pressure drop that sapped energy and threatened production. As such, CalPortland has since installed receiver tanks in strategic locations near the kilns.

"With receivers working as a buffer we can supply that high level of compressed air when needed intermittently for this application without causing pressure drop in other areas of the plant," he said.

The cement plants even participate in an annual "Energy Cup Competition" designed to track and recognize sustainability success.

The plant with the best energy measures and overall performance receives a coveted plaque that travels to the winning plant each year. CalPortland's CEO awards the plaque to the winner at an annual meeting.

"It's very competitive and very effective," Coppinger said, noting that CalPortland's approach not only includes numerous best practices, but also ongoing training in energy savings measures, participation in ENERGY STAR's cement plant certification programs, ENERGY STAR Challenge for Industry initiatives, and community outreach efforts.

Sustainability Becomes Embedded

Whether it's implementing best practices or participation in ENERGY STAR programs, achieving success in sustainability will remain a priority and continue to increase in importance for CalPortland, Jerald said.

"It's always growing. It's not perfectionism. It's realism," Jerald said. And, while it's never-ending, he said the progress in sustainability is clear. He cites yet another recent example where a plant decided to invest in mechanical conveying rather than using compressed air to transport cement at a truck-loading station.

"We could've gone with an air compressor, a pump and some piping and got the project done with relatively low capital cost, but we decided to put more money in upfront because we knew mechanical conveying would be more efficient and our operating costs would be lower versus using compressed air," Jerald said. "That's our culture. It's embedded now."

Today, CalPortland has every intention of improving on its sustainability track record.

"We've been around for more than 100 years and we plan to continue to be around for another 100 years or longer, "Coppinger said. "We're excited about the prospect of improving our efficiencies and minimizing our environmental footprint going forward." BP

All photos courtesy of CalPortland.

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Air Compressor Lubricant Tracing for Quality

By Michael Parker, SA Performance

A system for documenting and easily recalling unique identifiers, should be implemented at every level of distribution, all the way down to the end user.

Batch tracing is a critical process for any business that is interested in quality management. The importance of this process goes well beyond the manufacturing stages of a product. As it relates to air compressor lubricants, the ability to trace a product throughout its useful life, has a direct impact on the distribution and servicing organizations that use these products in the field. Service contractors, distributors, resellers, and even online wholesalers all have a responsibility to both protect themselves from liability, as well as their customers, by ensuring that traceability systems are in place and maintained down to the end user.

An individual production of any given lubricant can go by several unique identifying names, including batch number, blend number, serial number, or lot number. This unique identifier is given to a lubricant, or other consumable, for proper identification of a batch or group of products from a single production run. All resulting products from the same run should have the same identifying number. When everything is operating business as usual, managing a system of unique identifiers might seem like an unnecessary administrative task, but as soon as a customer or service technician identifies a concern, the time taken to implement traceability across all products pays itself back many times over.

The benefit of unique identifiers is that they provide the ability to trace the movement of a product through and across businesses. Without such a system in place, there would be no documented way of tracking when an item was manufactured, sold, stocked and where it was used. Having multiple suppliers for the same product, especially common with lubricant, filters and desiccant, make tracking unique identifiers even more important.

A unique identifier can go by different names, including Batch Number, Blend Number, Serial Number or Lot Number.

Traceability at the Manufacturing Level

Many manufacturers of consumables in the compressor industry have ISO certification, some are compliant, and others follow their own guidelines. ISO 9001:2008 requirements state that where traceability is required – a product's unique identifier must be recorded. This includes establishing and maintaining the identity and status of a product as well as maintaining records of their unique identifier. A lubricant's unique identifier should allow for traceability from the finished product all the way back to incoming material records, including raw material manufacturers, component types, and concentration rates.

Lubricant manufacturers, who are ISO 9001 compliant, maintain strict control over the production process to ensure that each production run of a lubricant is consistent from one to the next. These standards include:

- Raw Material Testing – Whether it be small volume additives brought in via a five-gallon pail or large volume base fluids brought in via rail car, each additive must have a predetermined set of quality control testing standards in place to be benchmarked against before becoming eligible for use in production.

- Equipment Calibration – Blend tanks, control boards, meters, gauges, pump transfer systems, and packaging lines all must be in proper working order to ensure accurate blending temperatures, equipment timing, volume (amount of raw material) control and cleanliness. Calibration logs should be maintained and traceable to NIST standards.

- Product Blending – Vessels should be cleaned and inspected between each production batch. Each component should be added in the appropriate quantity with adequate mixing and temperature as specified by the blend sheet. During the blending process, a batch of lubricant can range from a single five-gallon pail up to many thousand gallons in a larger blending tank. The smaller the batch, the more critical it is to ensure each amount of additive is precisely accounted for. An anti-foam additive for example, is just a fraction of a percent of the overall

Air Compressor Lubricant Tracing for Quality

formula – a couple of milliliters per pail of finished fluid.

- Finished Fluid Testing – Once each batch of lubricant is finished being produced, laboratory analysis begins to validate that the finished product meets minimum standards. This can range from simple viscosity, flash point density and total acid number analysis, which can then be used on a Certificate of Analysis if required, all the way to a much more comprehensive evaluation that also includes pour point, anti-wear performance and oxidative analysis.

- Lot Traceability – Once the product is validated from the manufacturer's laboratory, a retain of 4-16 ounces of the finished fluid is kept on hand for two to three years from the documented date of manufacture.

Testing each finished product and retaining a sample meets ISO 9001 procedures for ongoing validation of each batch.

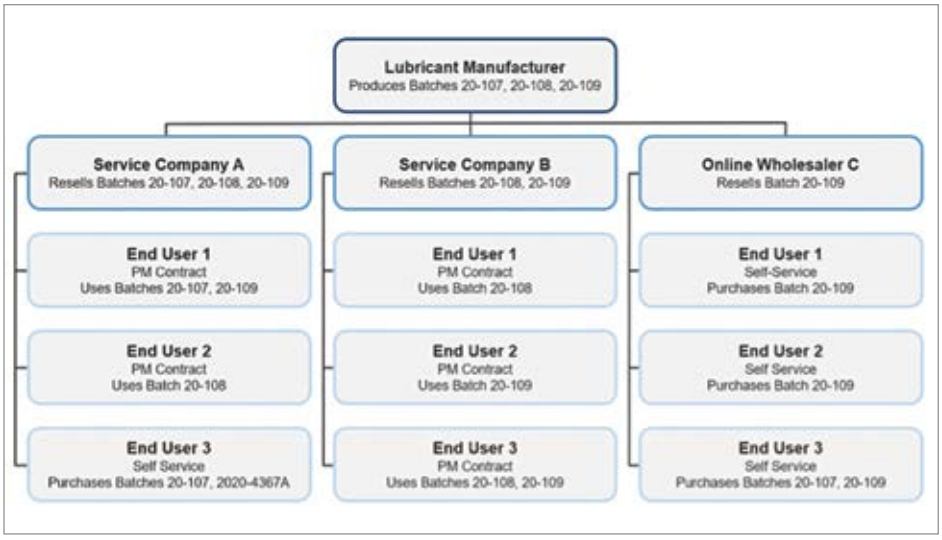

Figure 1.

Each production batch of lubricant sold is given a unique identifying number, which is labeled on every container the lubricant is packaged in, as well as the retain sample. This traceability system allows for any batch deemed at risk of concern in the field to be further analyzed with the retain kept in-house. Using the unique identifier, manufacturer records will show the date of manufacture, type and viscosity of the product, size of the batch that was originally made, testing performed on the batch to date, and which raw material components (along with their batch numbers) that were used to create the product.

Beyond Manufacturing – The Benefits of Traceability

Once product is manufactured, packaged, and hits the shelves, a system for recording unique identifiers should be put into place. Lubricants do indeed have a finite shelf life, and traceability of these products can play a valuable role in capturing inventory information and avoiding potential problems. Some of these benefits include:

- Improved Product Identity – Traceability measures allow for the tracking of a lubricant beyond its product name, by segmenting each batch individually.
- Shelf Life Tracking – Most compressor fluids have a shelf life of one to three years. Traceability allows for ensuring older batches of product are used first. This also helps to reduce stock wastage from expired product.
- Efficient Product Recall – In the rare and unfortunate event a batch of lubricant must be recalled, traceability allows for a higher degree of certainty on where the product is stored or in use currently.
- Greater Business Analysis – Traceability also provides insight into inventory turns per year, days on shelf, parts management habits, and supplier batch variances.

The Distributor & Service Contractor's Role

The flowchart (figure 1) shows a lubricant manufacturer who has produced three batches of lubricant and sold these products to their customers, who in turn sell the products

Air Compressor Lubricant Tracing for Quality

to their end users. From the distributor perspective, working with the customer to track three key pieces of information will prove invaluable should a problem arise:

1. Who is receiving which batch of fluid
2. Whether the fluid was put in the machine by a trained compressor service technician
3. Where the fluid was used by those self-service customers

(LEFT) Example of two Compatible Fluids – once mixed, the fluid remains clear and bright with no residual film left above the fluid line. The green dye used in one of the fluids has had no significant impact on the fluids compatibility. The bubbles shown in the jar are what's known as air entrainment. These bubbles will rise to the surface and burst. (RIGHT) Example of Two Incompatible Fluids with Adverse Consequences – the common color and clarity impact can be seen in this example of incompatibility. The mixing of these two fluids have caused significant foaming to occur. Foaming can result in substantial fluid loss downstream, and cause the compressor's temperature to spike.

With so many types of compressor lubricants, chemistries, qualities, life expectancies, as well as sources, it can be very challenging to truly understand the product being used in a piece of equipment. Proper record keeping can protect the user in the event of untimely issues or even system failure.

In the below scenario, Online Wholesaler C's customer, End User 3 raises concern about lubricant performance.

End User 3 states that they just performed service on a machine and the fluid has turned black and cloudy almost immediately. When asked to report the batch number in question, End User 3 reports back with batch number 20-107. Online Wholesaler C knows immediately that while the reported numbers are similar, there is no record of the company ever supplying this batch number to the end user. End User 3 must have another lubricant source they received this product from.

Service contractors commonly buy pails of lubricant in pallet quantities, meaning hundreds of gallons spread across many five-gallon pails. With the average compressor using one to two pails of fluid for its annual service, they could have dozens of machines running the same batch of lubricant at any given time. If a concern is generated at a customer site, it's invaluable to know those other customers who could also be susceptible. Additionally, if one site is having a concern, but no others, it could mean other factors are at play with that customer, and the issue should be further investigated.

While not very common, a sample of each lubricant batch is ideally taken and maintained by the service contractor/end user for the length of time the fluid is in service. This can be the 4-8 ounces of remaining fluid from a five-gallon pail. This retain sample should be documented with the following information; product name, manufacturers unique identifier, date the fluid was put in service, and the machines using the fluid. Retain samples should be stored in an environment that would prevent deterioration and contamination.

Oil Analysis

There are many best practices when it comes to taking samples for oil analysis. Some of these include documenting the equipment the sample was taken from with the lab and on sample jars, taking the sample under similar conditions and from the same location, and having a baseline sample registered with the lab to compare against. Prior to a transition of lubricants, a best practice for oil analysis is to take a "-1" sample of the old fluid, especially when transitioning away from an unknown product, or when working on a new machine. After the fluid change, another sample should be taken once the machine has run up to temperature, to ensure an adequate drain/fill has been performed.

When it comes to cross contamination concerns, there are some limits as to the information an oil analysis report will provide. For example, if one fluid is topped off with another, the two may be compatible but still result in undesirable results such as foaming. This wouldn't be highlighted on the oil analysis report. With proper traceability, however, samples of the new fluid will be on hand to validate whether foam is exhibited or not.

The End User's Role

Regardless of whether an end user is having service work performed on their system by a third party or performing the service themselves, traceability of lubricant is just as important for their records.

Figure 1 shows Service Contractor A supplying lubricant to End User 3 to perform their own service work. A problem occurs when the machine starts one cold winter morning and it appears to have seized. End User 3 believes the lubricant is unable to flow in such cold temperatures, and they intend to call their supplier with the concern. Being that they have two machines, when asked to provide the lot number of the lubricant, they must be careful to provide the correct unique identifier for the fluid that is in the machine with issues.

Most end users are not lubricant experts and expect their suppliers to provide a quality product that will perform without question. Creating a system for tracking unique identifiers by machine, or requesting service records with this information already documented, will help to ensure all parties have a detailed account of parts and lubricant used, in case a concern rises. BP

About SA Performance

SA Performance offers a complete line of high-performance compressor lubricants, all manufactured in facilities with ISO9001 and ISO21469 certifications, with multiple distribution points across the United States, to best serve their customers. SA Performance also offers complete air end remanufacturing services including rotor balancing and machine work, performed in-house at their own specialized facility. Pairing compressor expertise with lubricant knowledge has helped SA Performance become a leading partner across the compressed air industry. For more information, visit www.saperformance.net. All photos courtesy of SA Performance.

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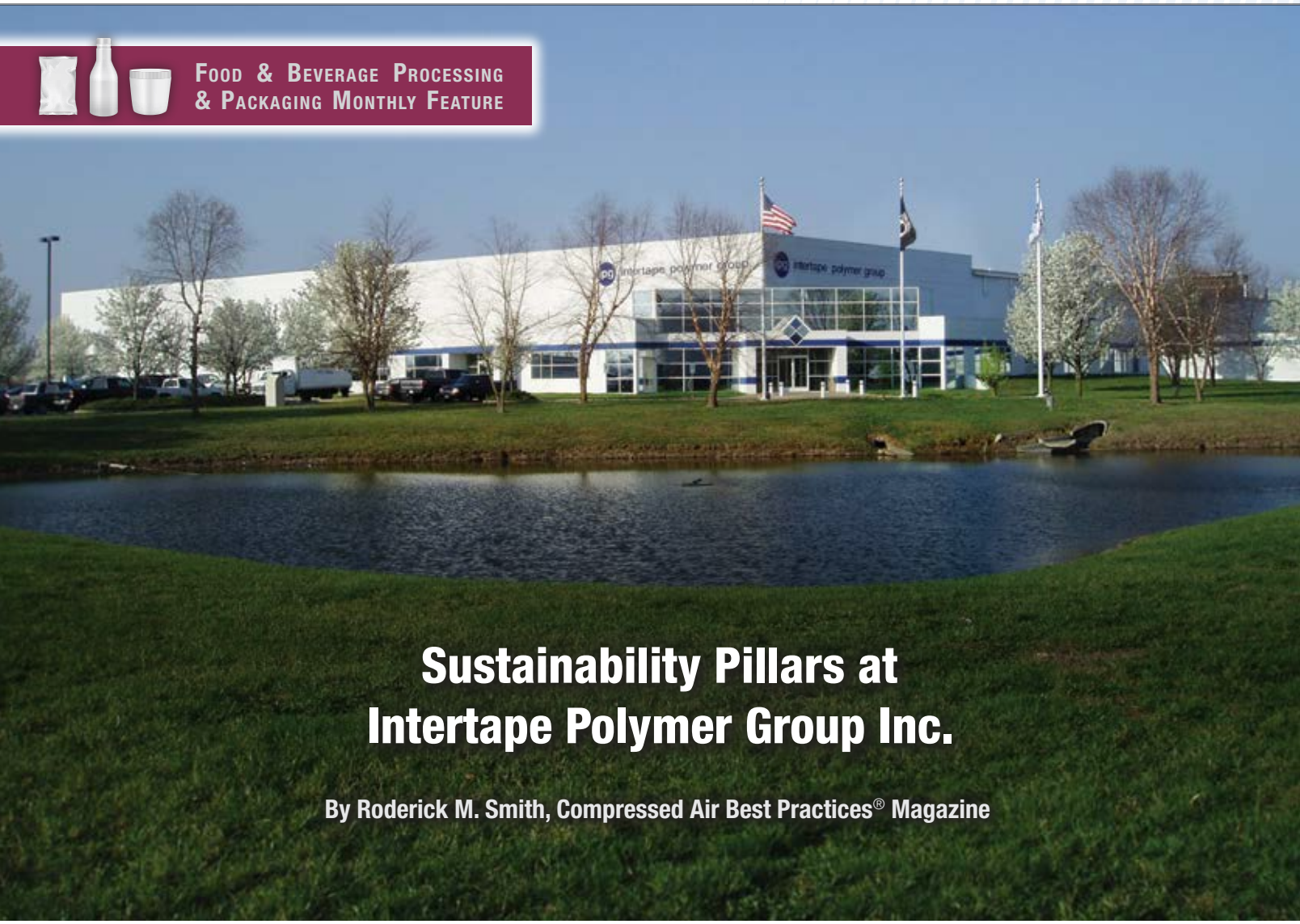

Sustainability Pillars at Intertape Polymer Group Inc.

By Roderick M. Smith, Compressed Air Best Practices® Magazine

In February 2021, Compressed Air Best Practices® Magazine interviewed members of the Intertape Polymer Group Inc. (IPG) Sustainability Pillars team to gain an understanding of the work being done to improve energy efficiency. The team members interviewed were Michael Jones (Director of Corporate Energy), Michael Deitering (Senior Project Engineer), Jarrod Knapp (Maintenance Manager) and Mark Secord (Engineering Group Leader).

Good morning, can you briefly describe IPG?

Good morning. IPG is a leader in the development, manufacture and sale of a variety of paper and film-based pressure-sensitive and water-activated tapes, polyethylene and specialized polyolefin films, protective packaging, engineered coated products and packaging machinery for industrial and retail use. For more information visit https://www.itape.com.

The Company employs approximately 3,600 employees with operations in 31 locations, including 21 manufacturing facilities in North America, four in Asia and one in Europe.

How does IPG approach sustainability and please describe your "Sustainability Pillars".

For IPG, embracing sustainability is a key strategy of doing business to drive operational excellence and realize our company vision of global leadership in packaging and protective solutions while also doing what is right for our employees and communities.

Optimizing our operational footprint is one of the four pillars of our sustainability strategy. This means we are managing environmental impacts like energy, greenhouse gases (GHG), water, waste, and other emissions.

Within our Intertape Performance System, there are many steering teams with different objectives. We have Sustainability Pillar Teams, in each plant, focused on energy/GHG, water and waste reduction. Sustainability Pillar Teams meet every other week, in each plant, and include members of plant management, engineering and plant maintenance.

How are projects identified and goals established?

Each plant has a 1 and 5-year Energy Action Plan (EAP). We use the A3 methodology (developed by Toyota) for our corporate energy action plan. This is a "plan-do-check-act" methodology which all fits on one A3 size page. You can pin it up on a cork board and has been popular in Lean Manufacturing techniques. In addition, we use the A3 methodology for solving problems and for planning. You state current condition, set a goal, do root cause analysis, state the action plan, and then track progress by keeping score.

Each plant prepares a deployment plan for the year, which identifies projects designed to help them achieve their EAP goal. We conduct a monthly Corporate Sustainability Pillar call with the leaders of all the plants. Leaders of each plant share best practices and progress towards our Sustainability and EAP goals. Sharing Best Practices rapidly is key and this call is how we share successes quickly. It might be something as seemingly simple as discovering a new compressed air ultrasonic leak detector. We put all our documents on our Microsoft Teams shared site and our team can access all the documents there with the details of the Best Practice.

What are some key tactics IPG uses to raise the profile of energy conservation projects?

The U.S. Environmental Protection Agencies' ENERGY STAR® program has made a big impact. In 2020 we were recognized as ENERGY STAR Partner of the Year-Sustained Excellence for the 5th year in a row. Across our plants, we achieved a 3.7% reduction in energy intensity in 2019 vs 2018.

We achieved the ENERGY STAR Challenge for Industry at IPG's Carbondale, IL manufacturing facility for the 4th time. In order to be recognized, a plant has to measure and reduce their energy intensity by 10% over a 5-year period. Since 2009, our individual plants have received this recognition 14 different times. Carbondale has been a leader in pursuing this recognition. Our plants tell us the ENERGY STAR Challenge for Industry program creates some healthy internal competition

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and satisfaction for being recognized for accomplishments in cost reduction and doing what's right for sustainability.

We have also held an annual IPG Energy Summit since 2007. All plants come and benefit from team building and educational opportunities. In 2020 we gave out awards juried by an awards committee consisting of the Director of Corporate Energy (Michael Jones), a VP of Operations, an SVP of Operations and a Continuous Improvement Leader. Specific criteria for each of the following awards were developed. The awards were:

a. Sustainability manager of the year

b. Best plant sustainability program

c. Best plant sustainability project

d. Lifetime achievement award

e. Sustainability impact award for the new acquisition plants (one which really knocked it out of the park)!

Please describe your "Air Strike Teams" and their focus on eliminating compressed air leaks.

The rotary screw air compressor installed at the Carbondale, Illinois plant.

Some of our plants have created Air Strike Teams to focus on compressed air, particularly compressed air leaks. The teams have purchased ultrasonic leak detectors, and we expect these will help us with our Energy Treasure Hunts. We have a newer acquisition (PolyAir), with 7 plants, and all have formed teams and bought leak detectors.

We have a deployment plan that we use which schedules a quarterly strike team to go look for leaks. Leak surveys are usually scheduled during plant down-time when it's quiet in the plant, and easier to hear the leaks. Additionally, some leaks can only be repaired when the production equipment is not operating.

A typical three to four-person Air Strike Team is made up by plant and production line supervisors, production equipment operators, and maintenance mechanics. During a leak survey, normally production personnel (equipment operators) will identify leaks. A second person logs the leak using the application provided by the ultrasonic leak detector vendor. The application (which is very useful and downloaded on iPhones) automatically tabulates data and gives you a spreadsheet containing information (size, location, dollar value, etc.…) on each leak. The third person involved is normally from maintenance to fix the leak on the spot if possible. An extra fourth person may be there for training to learn how to use the equipment. COVID-19 has forced us to use smaller teams with only one person using the meter.

Most of the time, repairing compressed air leaks is simple and the majority of the leaks are generally repaired during the leak survey. Maintenance is using wrenches, channel

locks, screw drivers, and tightening up hoses. The team will carry some extra hose to replace pneumatic tubing and hoses-we don't patch. Having a parts strategy really helps with repairing leaks. Several of our IPG maintenance shops have a Fastenal vending machines carrying most of the air fittings we need. We also try to standardize certain brands of hoses, tubes and push-to-connect fittings. Some brands work significantly better than others and the premium is well worth the cost in compressed air leaks.

We have a red-tag system for the unrepaired leaks (after a leak survey) so we don't lose sight of them. We try to use same person who was originally there to follow up and fix the leak. When maintenance technicians are doing preventative maintenance, on production equipment, and see a red tag, they can quickly look up the leak value in terms of dollars. We hold fun competitions, within the maintenance staff, on the dollar value of leaks fixed in a given month.

Your Carbondale, Illinois plant has achieved the ENERGY STAR Challenge for Industry recognition for the 4th time. Can you share some of the projects driving this?

Sure, let's ask Jarrod Knapp (Carbondale Maintenance Manager) to comment on that. In 2019, the Carbondale Facility was awarded the ENERGY STAR Challenge for Industry by reducing its energy intensity 11.8 percent within two years vs. the baseline. A minimum of a 10 percent reduction was required for recognition. We have established baselines which we keep rolling forward and working on. Here are some of the projects.

1. We did a complete plant lighting retrofit in 2016 in both the plant and our office space. This involved replacing our existing T12's with LED retrofit kits.

2. As mentioned, we do regular compressed air leak studies, which always give good results. We noticed, as the plant grew, we were running our 100 hp rotary screw air compressor always at full capacity and a 75 hp rotary screw unit (both were older

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fixed-speed) units, at part-load to trim. We also had some shut-downs with these air-cooled units due to high ambient temperatures. We asked John Henry Foster, out of St. Louis, to do a complete compressed air system assessment to analyze things. Their analysis confirmed the dollar costs to run the 75 hp fixed speed unit inefficiently at part-load. Based upon the assessment, we installed two twin water-cooled 150 hp variable speed drive units – the second unit is for redundancy and we alternate them daily. John Henry Foster also recommended a receiver tank to smooth out our compressed air demand and a cycling refrigerated dryer.

3. We optimized our turn-off/shut-down procedure for our gas-fired regenerative thermal oxidizer (RTO). Our RTO unit has a 250 hp motor which was running at 40 Hz when idle due to individual dampeners being left open. We modified it to run off of duct pressure and now it runs at 20 Hz when closed and in idle. This has really helped us to reduce natural gas consumption.

Congratulations. Do you have any chiller/cooling water projects to comment on?

Yes, there have been many, we had a successful centrifugal chiller project using free-cooling, at our Turo, Nova Scotia plant. We've asked Michael Deitering (Senior Project Engineer), to quickly review a successful winter cooler project done at our Marysville, Michigan plant.

At our Marysville plant, we'd been running a 200-ton chiller year-round to provide glycol cooling for the extruders in our adhesives

The free-cooling winter cooler installed at the Marysville, Michigan plant.

production department. The system was reliable but we thought we could take advantage of the low temperatures in southeast Michigan, seven to eight months per year, with free-cooling concepts. Our original chiller layout had glycol going through the plant.

We installed two roof-mounted "dry-cooler" coils with staged banks of 10 fans each to cool glycol. We separated the system to cool glycol to 50°F (10°C) which then cools plant water to 55°F (13°C). We had to add a pump tank and a heat exchanger to separate the system. This system has 30 hp of fans and a 20 hp pump running fluid to the roof.

The system went on-line in January 2020. We now turn off the 200-ton rated refrigerated chiller, whenever we see temperatures below 57–60°F (14–16°C). The chiller is replaced by coils and fans to produce same amount of tonnage using only 20 hp in pumps and 30 hp in fans. We run this 7-8 months out of the year. The 200-ton chiller runs during the warmer months. Today we are at 6°F (-6°C) ambient and we can turn off the fans, just run the fluid pump – and we are providing 41°F (5°C) water temperatures. The project was fairly straight forward. We feel it's underutilized technology – most plants aren't doing this sort of thing.

Thank you for sharing Best Practices and congratulations on your progress with energy efficiency. BP

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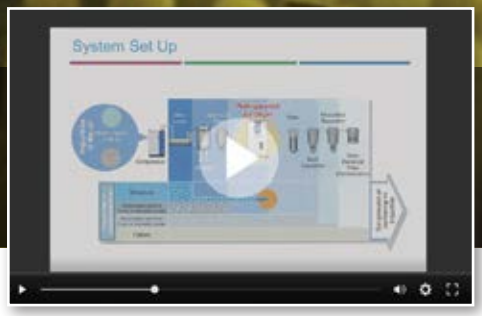

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High Flow 'On-demand' Controls for Sandblasting Saves Energy Over Traditional Control

Efficiently Controlling Huge Flow Variations in Sandblasting Compressed Air System

Tim Dugan, P.E. President, Compression Engineering Corporation

➤ Introduction

Most industrial systems like compressed air have essentially random demand if you look at the long-term life cycle of the system. Hundreds, even thousands of independent small and large subsystems require constant or varying flow. These demands are typically not timed or synchronized with each other, so they aggregate to a fairly random flow profile, within a range. That range changes significantly when production processes change. Certainly a 2-week audit might show some patterns that appear predictable for demand A ("production") and demand B ("non-production") or day type, but they change over time as the plant adapts to new production systems and removes old ones. If demand was that profile forever, a lesser experienced auditor might be tempted to size one set of compressors that work perfectly for that profile but not for alternates.

Thus, typical industrial compressed air systems should be designed for the full range of flow, plus growth, with all flow changes and ranges possible, at one constant pressure, not just the flow ranges and changes seen in one 2-week audit. This usually results in a multiplex system of some type, typically with similar size and type compressors that are rotated and staged by an automation system. In the cases where VFD or centrifugal compressors are included, special design criteria exist (see previous ABP articles on "Screw Compressor Control Gap", "Centrifugal Compressor Control Gap" and "VFD and Master Controls").

Figure 1. Sandblasting Pot

In some general compressed air systems, one dominant process "shocks" the system, creating a peak that is 2X or more of the normal peak, special design criteria will make the above system less than ideal. It could be transport air in a materials processing company, test air in a microelectronics fab system, or sandblasting in large metal fabrication. In the case of large sandblasting systems, the peak can be well over 10X the non-sandblasting demand. In this article, I will discuss a real system that has a 34:1 peak to average, and how to save 70% energy even beyond "best practices" with a VFD compressor. There is no VFD compressor on the market that can flow that range! A different type of system design is needed for these large sandblasting systems.

System Description

In the heavy fabrication business, large weldments are created for structures so large that they can only be transported by barge, so they are located at port facilities. These huge fabrication shops build or repair large boats or structural weldments for permanent structures. In this example, the final product is a bridge structure over 100 ft long by 30 ft long weighing more than 10 tons. Before welding, the large pieces need to be sandblasted. Sometimes they are blasted afterwards also. Huge sandblasting areas which the workers work inside of are built, and dedicated sandblasting "pots" are designed and installed. In order to blast a larger surface area in a time-efficient manner, the nozzles used for these types of systems are often quite large, sometimes more than 0.50" diameter. The system we are looking at in this article had four large nozzles. At the time of the audit, 0.625" nozzles with air flow demands of about 500 scfm each were tested. These were the largest ones in inventory.

See Figure 1. At the time of the photo, small sandblasting was occurring, using a much smaller pot and nozzles.

Since the large pot was designed for four 500 scfm nozzles, 2,000 scfm peak, a 2,900 scfm compressed air system was matched to it. That same system provides general air for small demands such as maintenance and the dust collector. The system had the best-available efficiency compressors, 2-stage oil-lubricated screw with a VFD. However, it was designed

Compressed Air Supply Equipment

Equipment	Location and ID	Part-load Control	Main Motor, hp	Rated Pressure psig	Misc kW	Aftercooler Type	Estimated Capacity* scfm	Rated Pressure, psig	Full Load Power at Rated Pressure kW	Min Speed Power kW	No-load Power kW
Two-stage Lubricated VFD Screw Compressor	Comp 1, Main Sandblasting Compressor Room	Variable Speed with Unloading	350	125		Air cooled	1,450	125	325	106	22
Two-stage Lubricated Screw Compressor	Comp 2, Main Sandblasting Compressor Room	Inlet Modulation with Unloading	350	125		Air cooled	1,428	125	311	N/A	66
Cycling Refrigerated Air Dryer	Main Sandblasting Compressor Room	Cycling Refrigeration Compressor, Thermal mass		100	170	N/A	3,250	100	26	N/A	4
Single-stage Lubricated Screw Compressor	General Manufacturing Building	Load-unload	50	100		Air cooled	241	125	44	N/A	7
Total Compressed Air Capacity							**3,119**				

Table 1. Equipment Inventory

Efficiently Controlling Huge Flow Variations in Sandblasting Compressed Air System

for peak, not the off-peak times. The largest available unit from the local supplier was rated for 1450 scfm, so two units were installed, one with a VFD and the other fixed speed. They were plumbed to a 3,250 scfm cycling refrigerated dryer and mist eliminator. See Figure 4 for a system diagram.

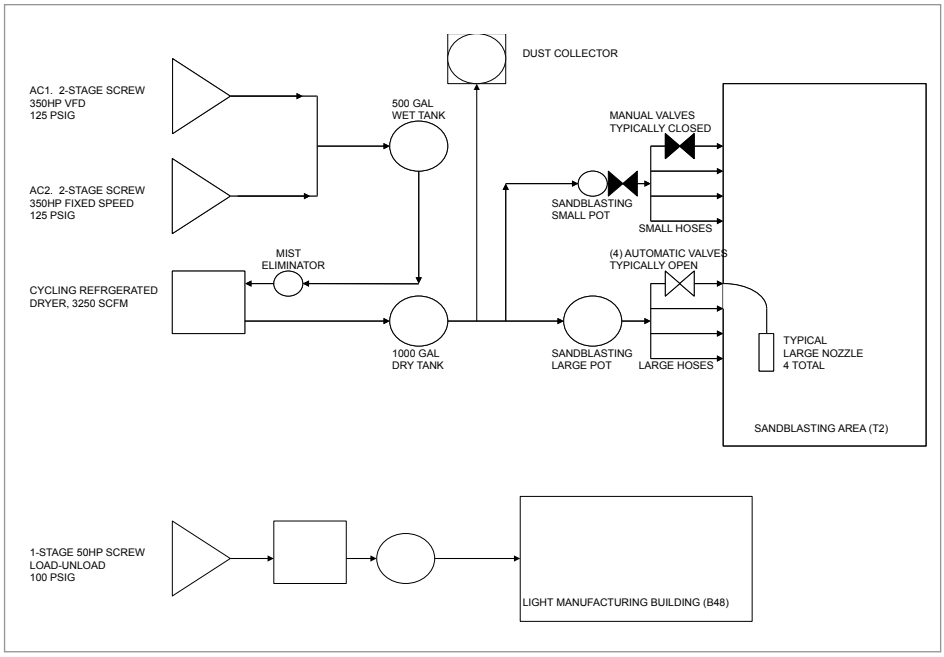

Figure 2. Existing System Diagram

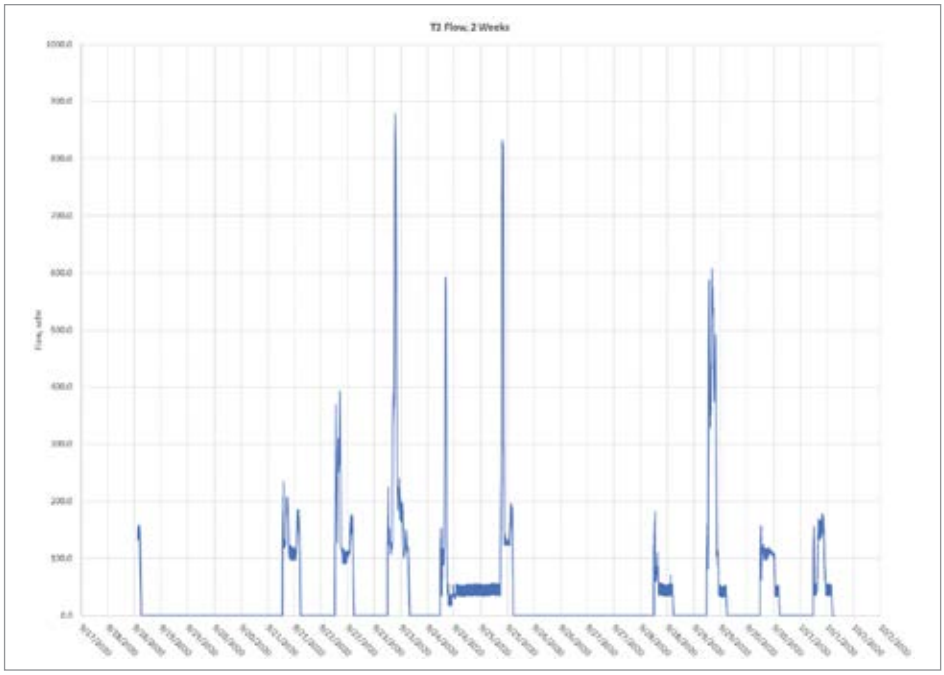

Figure 3. Flow, 2 Weeks

In a nearby light manufacturing building, a 50 hp load-unload compressor with dryer is installed. The compressor was very lightly loaded. See Table 1 for a summary of equipment and Figure 2 for a system diagram.

Data Collection and Analysis

At the beginning of the audit, it was not clear how often the large sandblasting would occur, if at all. Production orders for larger fabrication items was less at the time. The small pot was being used most of the time, however. Since a preliminary measure was to use an on-demand control system with a smaller compressor running most of the time, and there already was a smaller system nearby that might be integrated, we monitored both systems at the same time. The following data collection, together with testing was done:

2 week Data Collection, 8-second sample rate:

- AC1 (VFD) power
- AC1 (VFD) inlet pressure
- AC2 (fixed speed) current
- AC2 (fixed speed) inlet pressure
- Sandblasting system pressure
- 50 hp power
- 50 hp system pressure

One-time tests:

- Ran fixed speed unit, AC2, in “hand” (inlet modulated) at first. This gave a stable flow metric (in modulation).

- Ran VFD, AC1, if demand was high enough to keep it in speed range.
- Opened one large nozzle at a time, while datalogging.

The trend data showed that the large pot was used only four times in two weeks, a total of 1.8 hours, or only 1.1% of the time! The small pot was used only 14 hours, only 8.4% of the time. The system was pressurized 49.5 hours/week, 29.5% of the time. A large VFD compressor was running at min speed and loading. Although the large compressor is fairly efficient in its peed range, it is not at the low end, requiring an average of 32 kW to supply 42 scfm of mostly leaks. If the primary compressor was not a VFD, it would be far worse, about 200 kW at that load. Trend data also showed that the large nozzles leaked, and were not de-pressurized automatically. See Figures 3 to 4 for a summary. "T2" is the name of the large sandblasting system.

The general manufacturing system was also very lightly loaded, with no large peaks. Its compressor had a much lower no-load power, only 7 kW, however. "B48" is the name of the general manufacturing system building.

The critical problems are the size of the compressor being run during non-peak periods, the need to stay pressurized during non-peak times, and the false leak load during that time. The compressor is far too large and is wasting most of its energy most of the time. Before the reader thinks this is an outlier, they should think about the process that a large sandblasting compressed air system serves. By nature, it is a large, intermittent demand. The larger the peak flow needed, the larger the compressors designed to serve it. But if the same system serves general air needs, it could be pressurized much longer than this system.

The existing system performance is as follows:

Average total flow:	66 scfm
Peak total flow:	2290 scfm
Total hours/yr:	5,296
Average pressure:	131 psig for sandblasting and 103 psig for general air
Total average power:	37 kW
Efficiency:	1.79 scfm/kW (55.9 kW/100 scfm)
Energy usage:	196,668 kWh/yr

Recommended Improvements

Somehow, the large compressor has to be shut off somehow during non-peak periods. This seems simple, but it is not. Operators would not be allowed to randomly start and stop a large system like this. It has to serve other needs, and operations usually does not have the authority to start and stop compressors anyway. The system has to be automatic and reliable.

A conventional control system with adding compressors as demand increases and removing them as it decreases would not work well with these sized compressors, even if T2 and B48 were integrated. The small compressor could be put in position 1, but then the large compressor would end up

Efficiently Controlling Huge Flow Variations in Sandblasting Compressed Air System

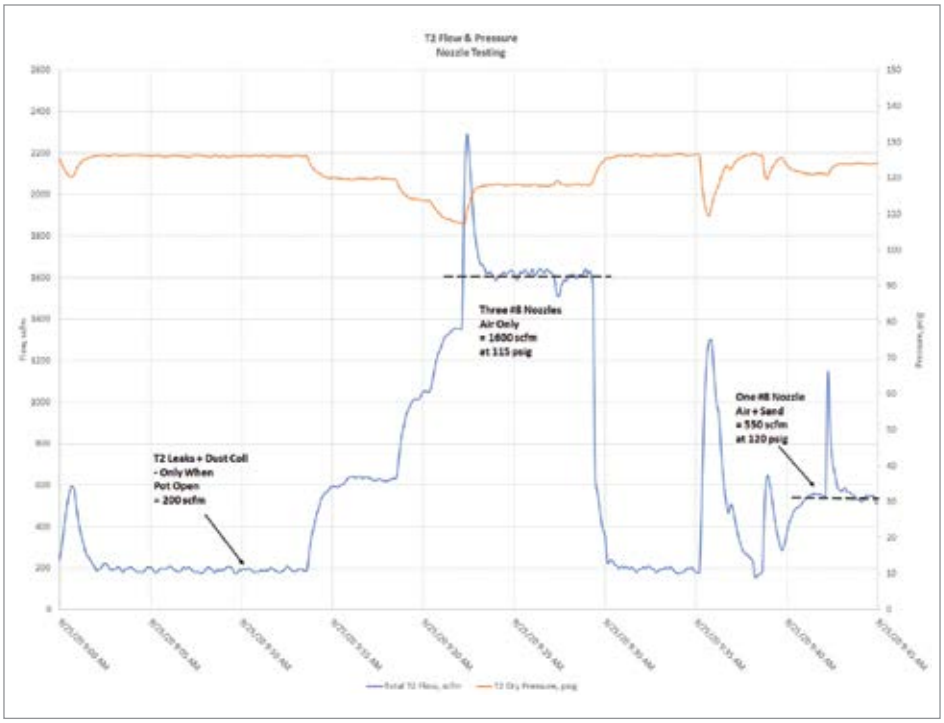

Figure 4. Flow and Pressure, Peak Flow Test

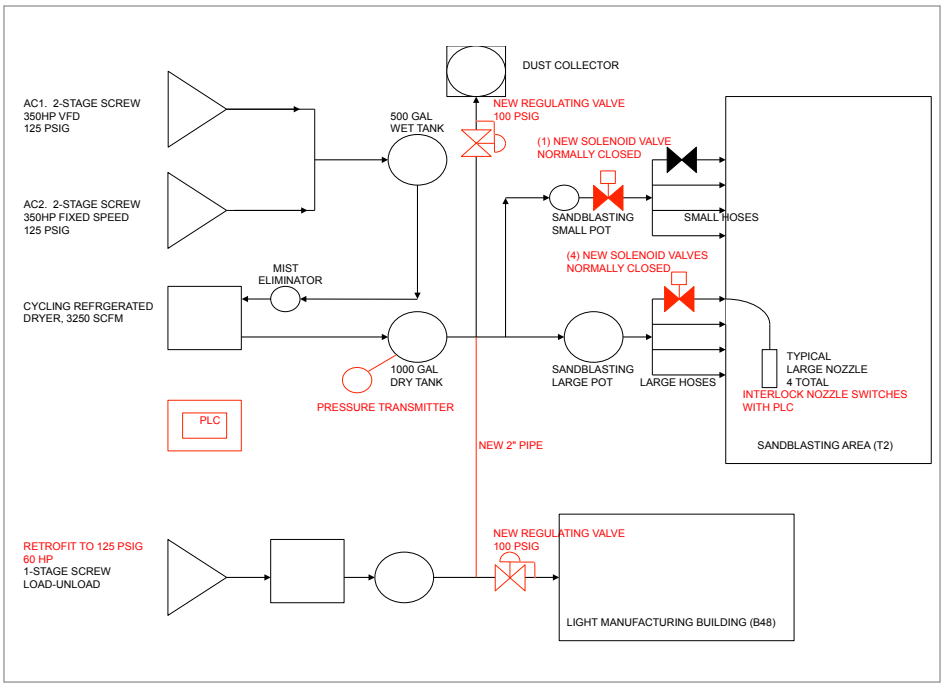

Figure 5. Recommended Improved System Diagram

being "bumped" often for small peaks, and starting and stopping too often. What it needed is an "on-demand" automation system that accomplishes the following functions:

- Use a very reliable indicator of peak demand. This is best done with the safety electrical switches on the nozzles, not flow or pressure. These electrical switches are part of the larger nozzle systems, right on the handle of the nozzle. When the first automatic nozzle switch depressed, large sandblasting has started. After the last one has been opened, it would indicate that large sandblasting is over.
- Minimize dead load by automatic valves when no peak is occurring
- Run the small compressor load-unload when no peak is occurring
- Run only the larger compressor (or compressors) when the peak is occurring. And run them in the right mode, the VFD in trim at all loads.

This is a custom control system. To the best of our knowledge, no compressed air OEM or automation company offers a standard sandblasting on-demand control like this. However, this could be a system design that could adapt to many different configurations of sandblasting systems. That is why we think this article is necessary.

The specific elements of this project that would accomplish the above functions are as follows (see Figure 5):

- Install a 2" pipe between the B48 and T2 systems.
- Install valves to run parts of system at lower pressure and isolate leaky sandblasting hoses during non-use:
  - Install a pressure regulating valve for B48, set at 100 psig
  - Install pressure regulator for the T2 dust collectors, set at 100 psig
  - Install four reliable normally-closed electrical solenoid valves for large pot lines, one per large nozzle.
  - Install one solenoid valve for the small pot compressed air supply
- Upgrade the B48 compressor for 125 psig, as follows:
  - Purchase new motor: 60 hp 1800 rpm ODP 3/60/460V 364TSC (C-flange) frame
- Upgrade B48 and T2 compressors for remote control, as follows:
  - Remote set point of VFD.
  - Remote load and start.
- Install a custom automation system, as follows:
  - Industry-standard PLC with a display in the T2 compressor room.
  - Install remote I-O at B48 & T2, with relays for load and start.
  - Install pressure transmitter in T2 (high pressure).
  - Adjust local modulation for all three compressors to 130 psig
  - Wire large sandblasting nozzle electrical switches through relays to the automation system, so it knows when each nozzle is being used by an operator. The first one to close would put the system into “large sandblasting” mode, and after the last one is open and a timer expires, it would go back to “off peak” mode.
  - Install 1-hr timed start button for small pot air.
  - Wire small and large sandblasting pot solenoid valves to PLC.
  - Isolate sandblasting hoses when not in use by closing the solenoid valves automatically.
  - Stage compressors differently based on whether the system is in “large sandblasting” of “off-peak” mode.
  - Tune and commission the system in all modes and transitions.

Efficiently Controlling Huge Flow Variations in Sandblasting Compressed Air System

Energy Savings

The improved system performance is as follows:

Average total flow:	12 scfm
Peak total flow:	2290 scfm
Total hours/yr:	4,505
Average pressure:	128 psig for sandblasting and general air (before regulators)
Total average power:	12 kW
Efficiency:	4.37 scfm/kW (22.9 kW/100 scfm)
Energy usage:	23,365 kWh/yr
Savings:	173,303 kWh/yr

Savings are 85%! In this system, total energy cost was about $9,200/yr. They only paid $0.047/kWh (Washington, large industrial). But the above project which required no new compressors could save about 85% of the energy, $7,800/yr, plus about $5,000 in maintenance, $12,820/yr total. The project cost could be as high as $75,000, doing it all right. With incentives, the payback was reduced to about 3 years. But remember that this system **already had a VFD compressor,** and only operates **2,500 hours per year.** For other systems that are not VFD-driven now, that operate longer, and have higher energy costs, the payback could be lower than 2 years even without an incentive.

Conclusions

An "on-demand" system that switches between two different modes is needed to optimize high peak sandblasting systems. By operating a small compressor with low no-load power during non-peak times and the optimal large compressors only when sandblasting is occurring, significant savings can be had. If a large VFD compressor is currently being used, this system will save lots of energy and reduce running hours, lowering maintenance and operating the compressor in its more reliable range. BP

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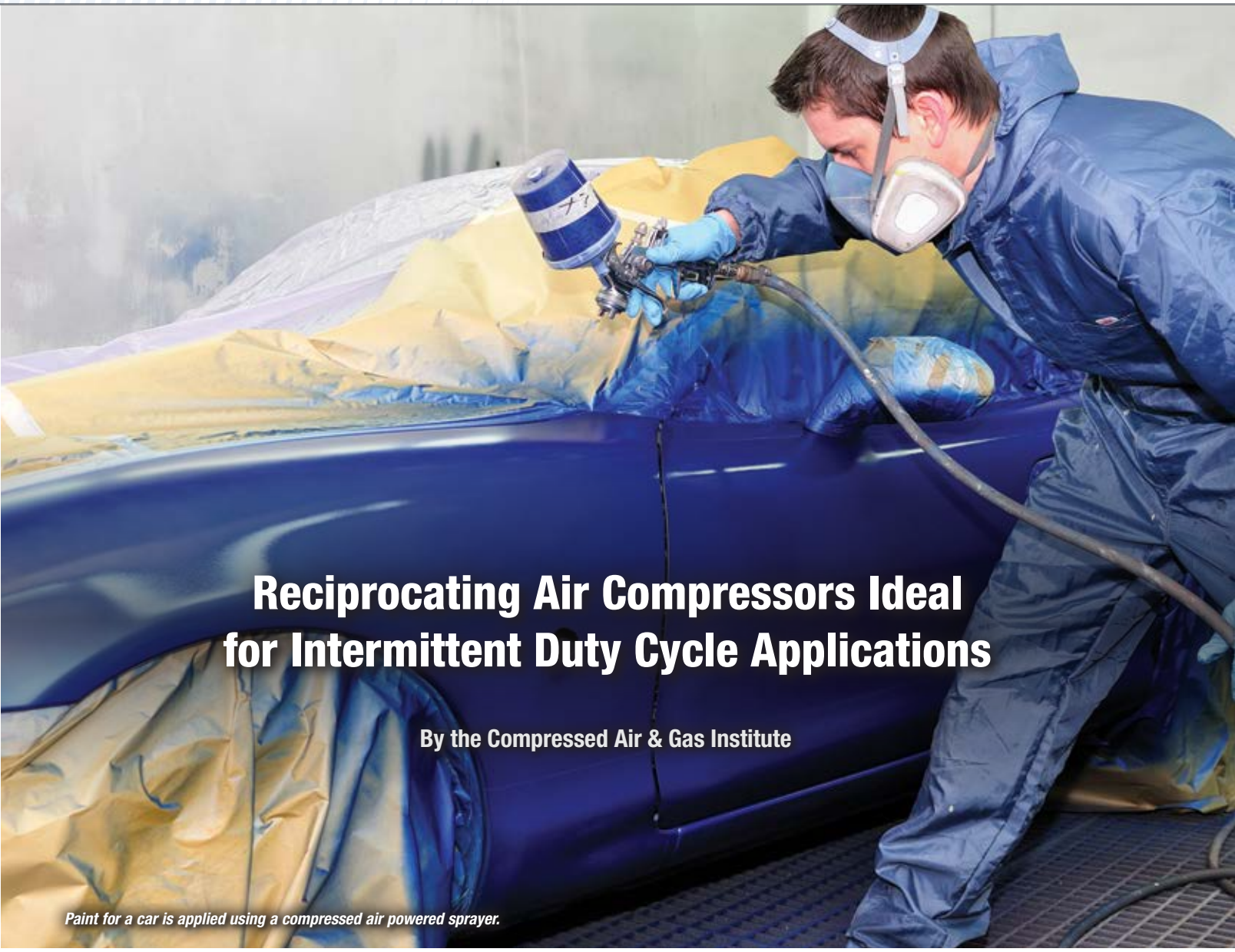

Reciprocating Air Compressors Ideal for Intermittent Duty Cycle Applications

By the Compressed Air & Gas Institute

Paint for a car is applied using a compressed air powered sprayer.

➤ Compressed air is often referred to as the fourth utility, behind electric, gas and water, because it is used in so many applications in numerous industries, from auto service facilities to construction sites. Air compressors are designed to compress air to higher pressures and harness this potential energy source. Compressed air is a utility that is generated in-house, so owners have more control over it than any other utility.

There are many options for what kind of air compressor you can select for the intended application. In many cases, reciprocating air compressors can provide an economical compressed air solution with designs ranging from inexpensive consumer duty models to more rugged industrial products. They are ideally suited for intermittent duty cycles and are simple in design. Timely/consistent routine maintenance and proper installation as outlined in the equipment operator's manual will help maintain their useful life.

Reciprocating compressors are ideal for intermittent duty cycle applications

Reciprocating air compressors are designed for variable up and down duty cycle applications as the full power of the

Reciprocating Air Compressors Ideal for Intermittent Duty Cycle Applications

Roofer using an efficient pneumatic nail gun operating from a small gasoline powered or electric powered air compressor.

Pneumatic impact wrench installing tires.

compressor is available when needed. When demand stops, a reciprocating compressor shuts off automatically to reduce consumption of power. In selected cases where the high demand for air is short term, a tank mounted system provides air flow bursts that exceed the capacity of the compressor by using stored up compressed air from the tank. These features contribute to reduced energy usage, less wear and tear on the compressor, while allowing for an air compressor design that is simple to operate and maintain.

Reciprocating compressors are low cost in maintenance

The basic features of reciprocating compressors include common mechanical components and simple electrical controls. In addition to the compressor pump, basic mechanical components include an electric motor, pulley, belts, air tank, pipe and fittings, check valve and a discharge valve. Electrical controls include a simple motor overload protector and pressure switch. The simplicity of this design usually requires less technical training to perform maintenance or repairs. Compressor manufacturers typically offer packaged maintenance and service kits that include the proper parts needed to allow for DIY (do it yourself) service and aid in keeping the compressor in top running condition.

Reciprocating compressors last longer with proper installation

The air compressor location should be as close as possible to the point where the compressed air is to be used. It is also important to locate the compressor in a clean, dry, cool and well-ventilated area away from any source of heat.

Although reciprocating compressors contain intake filters to improve the quality of intake air, it is always best to start with the cleanest intake air possible. Many applications create dust, or project particulates into the air. Likewise, if the natural air is smoggy or pollen filled, these particles can stick to the compressor valves or score the cylinder walls and reduce the life of the compressor pump.

In the case of high humidity, once the air has been compressed, a portion of the water vapor will condense into liquid in the tank or downstream compressed air pipes. This results in water that must be removed and discarded somewhere. By starting with lower humidity intake air, the issue with downstream water removal is reduced.

Heat is a natural bi-product of compression, as the act of compressing air increases friction of the air molecules. The result, when air is compressed into a smaller space, the air temperature rises; and as air is de-compressed, its temperature drops. In cases where operating temperatures are a concern, a lower input air temperature results in a lower discharge temperature once the air is compressed. Ventilation also helps cool the system by removing heat from the compressor area and replacing it with cooler air. In the event that heat changes create water contamination in the compressed air line, the topic should be discussed with the local compressed air equipment provider who can assess whether other issues/gaps need to be addressed in order to eliminate the problem.

The Compressed Air and Gas Institute (CAGI) is the united voice of the compressed air industry, serving as the unbiased authority on technical, educational, promotional, and other matters that affect compressed air and gas equipment suppliers and their customers. CAGI educational resources include e-learning coursework, selection guides, videos and the Compressed Air & Gas Handbook.

The Reciprocating Compressor Section consists of the following member companies:

- Atlas Copco Compressors LLC
- FS-Curtis
- Gardner Denver, Inc.
- Ingersoll Rand
- Quincy Compressor
- Saylor-Beall Manufacturing Co.

Visit www.cagi.org

Through timely/consistent routine maintenance and proper installation, coupled with a simple design, reciprocating air compressors will last longer and will have optimum performance for intermittent duty cycle applications. BP

All photos are courtesy of the Compressed Air and Gas Institute. For more information, visit the CAGI web site at www.cagi.org.

To read more ***Air Compressor Technology*** articles, visit https://www.airbestpractices.com/technology/air-compressors.

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COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

Sullair Announces CEO Transition

Sullair, an industry leader in innovative compressed air solutions since 1965, announced that John Randall will be appointed President and Chief Executive Officer, effective April 1, 2021. Current Sullair President and CEO Charlie Takeuchi has been promoted by Hitachi, Ltd., and will become President of Tokyo-based Hitachi Industrial Equipment Systems (HIES), effective April 1, 2021. Mr. Takeuchi joined Sullair in July 2017 as Chief Operating Officer and was promoted to President and Chief Executive Officer on April 1, 2020. Mr. Takeuchi's leadership was instrumental in the integration efforts between Sullair and Hitachi, following the acquisition in 2017. Mr. Randall becomes President and Chief Executive Officer of Sullair after serving as President of Sullair Asia for more than two years. He will relocate back to the Chicago area from Suzhou, China. Prior to this role, Mr. Randall was Vice President of Global Engineering for Sullair, a role he held for nearly five years.

Sullair, www.sullair.com

Atlas Copco Partners with Stewart-Haas Racing

Atlas Copco Compressors has announced it will once again partner with Stewart-Haas Racing for the 2021 NASCAR season. Atlas Copco will also renew its association with Chase Briscoe, who was promoted to SHR's NASCAR Cup Series program in 2021 after a nine-win NASCAR Xfinity Series campaign last year. Atlas Copco will be featured on the lower-rear quarter panel of Briscoe's No. 14 Ford Mustang as he competes for the Cup Series rookie-of-the-year title. "We are excited for what 2021 holds for Atlas Copco, Stewart-Haas Racing and Chase Briscoe," said Paul Humphreys, vice president of communications and branding at Atlas Copco. "Last season was difficult for everyone to navigate, but NASCAR's commitment to operating safely by adhering to strict COVID-19 protocols allowed racing to return and it simultaneously took care of communities and staged some great events. It's an association we're proud to maintain in 2021."

Atlas Copco Compressors, www.atlascopco.com/air-usa

C.H. Reed Announces New Majority Owners

C.H. Reed, an industry-leading compressed air, paint finishing, and fluid handling solutions provider, is pleased to announce its new majority owners, Bob Shields and Mark Kauffman. Bob Shields has been C.H. Reed's President and Chief Executive Officer since December of 2016. Prior to that, he was the Director of Sales and Service for the Compressed Air Group. He joined C.H. Reed in January of 2015. Since becoming President, his strategic leadership has helped C.H. Reed increase sales and service revenue, expand into new states and territories, and recruit the industry's best talent. Mark Kauffman has been C.H. Reed's Chief Financial Officer since September of 2012 and has contributed greatly to the company's growth trajectory over the years. Involved in many aspects of the business, he has helped build a strong team of management and improved both profits and cash flow. As a part of this transition, Mark will also be serving as C.H. Reed's new Chief Operating Officer.

C.H. Reed, www.chreed.com

Tamturbo Introduces 20-Foot Modular Compressor Room

Tamturbo has delivered multiple containerized compressed air systems for customers needing a modular, movable and flexible solution that is shielded from the elements like rain, snow, heat, contamination, etc. When a large global food industry customer requested an all-inclusive modular compressor room for their factory, we decided to go 'all in'. We packed a 20-foot container with all of the winning features of the compressed air system, including after treatment, controls and compressor optimization options. This is also the most compact solution for max flow of 1,872cfm (53 m^3/min) with variable flow and wide turn-down. In situations where plant space is at a premium, customers may prefer to place their compressor room outside. At other times customers may want to configure a compressor's installation for a more turnkey operation for securing production uptime.

Tamturbo, www.tamturbo.com

COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

Sullair Mid-Range Series Portable Air Compressors

Sullair, an industry leading provider of compressed air solutions, launched its Mid-Range Series of Tier 4 Final portable lubricated rotary screw air compressors – the first of its portable air compressors to incorporate electronic spiral valve technology. The Mid-Range Series is designed for flexibility and efficiency, with the 800HH/900H model delivering 800–900 cfm at 150–200 psi, and the 920H/1100 model delivering 920–1100 cfm at 100–150 psi. "Electronic spiral valve technology is a game changer in our portable air compressors," said Jerel Cole, Senior Product Manager at Sullair. "Sullair electronic spiral valve technology helps maximize fuel efficiency and extend runtimes by matching air supply to demand. It allows an operator to quickly and easily input the exact pressure they want, anywhere between 100 or 200 psi, and the machine calibrates to give maximum flow at that pressure. It gives users all the air they want, at the pressure they need."

Sullair, www.sullair.com

LE Offers Virtual MLT I Training Opportunity April 20-22

Together with trainer Paul Dufresne, Lubrication Engineers is offering a virtual MLT I class April 20-22, with optional online certification exam April 23. Participants will receive the same content they would in our traditional onsite classes but with the convenience of online instruction. In this course, managers, engineers and technicians alike will learn the impact that best-in-class lubrication practices can have on machine health and reliability. They will see why machine lubrication activities should be moved from modest and reactive to thorough, accurate and proactive. Anyone who works in a facility with one or more pieces of the following equipment would benefit from this class: blowers/fans, compressors, gas turbines, gearboxes, hydraulic systems, motor bearings, paper machines, process pumps, rolling mills and steam turbines.

Lubrication Engineers, www.LElubricants.com

SOLBERG Expands into Canada

After decades of a successful partnership with Cameron Products Limited (CPL), SOLBERG is excited to announce its expansion in Canada with a direct sales and distribution company, Solberg International Canada ULC, located in the Greater Toronto Area. We are working on a seamless transition from CPL. We are moving towards a paperless, electronic invoicing and payment system and are pleased to announce the acceptance of e-transfers and wire transfers.

SOLBERG, www.solbergmfg.com

WEG Receives CSA Qualification for Certification Program

WEG Motors, one of the WEG Group Business Divisions that manufactures motors and gearboxes, has been requalified by CSA Group Testing and Certification Inc. as a Testing Facility for electric motors. Within its Certification Program, CSA has granted WEG the certificate for Qualification of Test Laboratories, which qualifies the company to perform its own electric motor tests, including tests for explosive atmospheres, aiming at safety and energy efficiency, in line with the standards applicable in several markets. WEG has had this accreditation for over 25 years, which proves a long-standing partnership. The CSA (Canadian Standards Association) Group is a global organization dedicated to safety, social assistance and sustainability. It is a leader in standards development and testing, inspection and certification worldwide, including Asia, Europe, Canada and the US, where the company also has accreditation from the Occupational Safety and Health Administration (OSHA), allowing certification of equipment for the North American market.

WEG, www.weg.net

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