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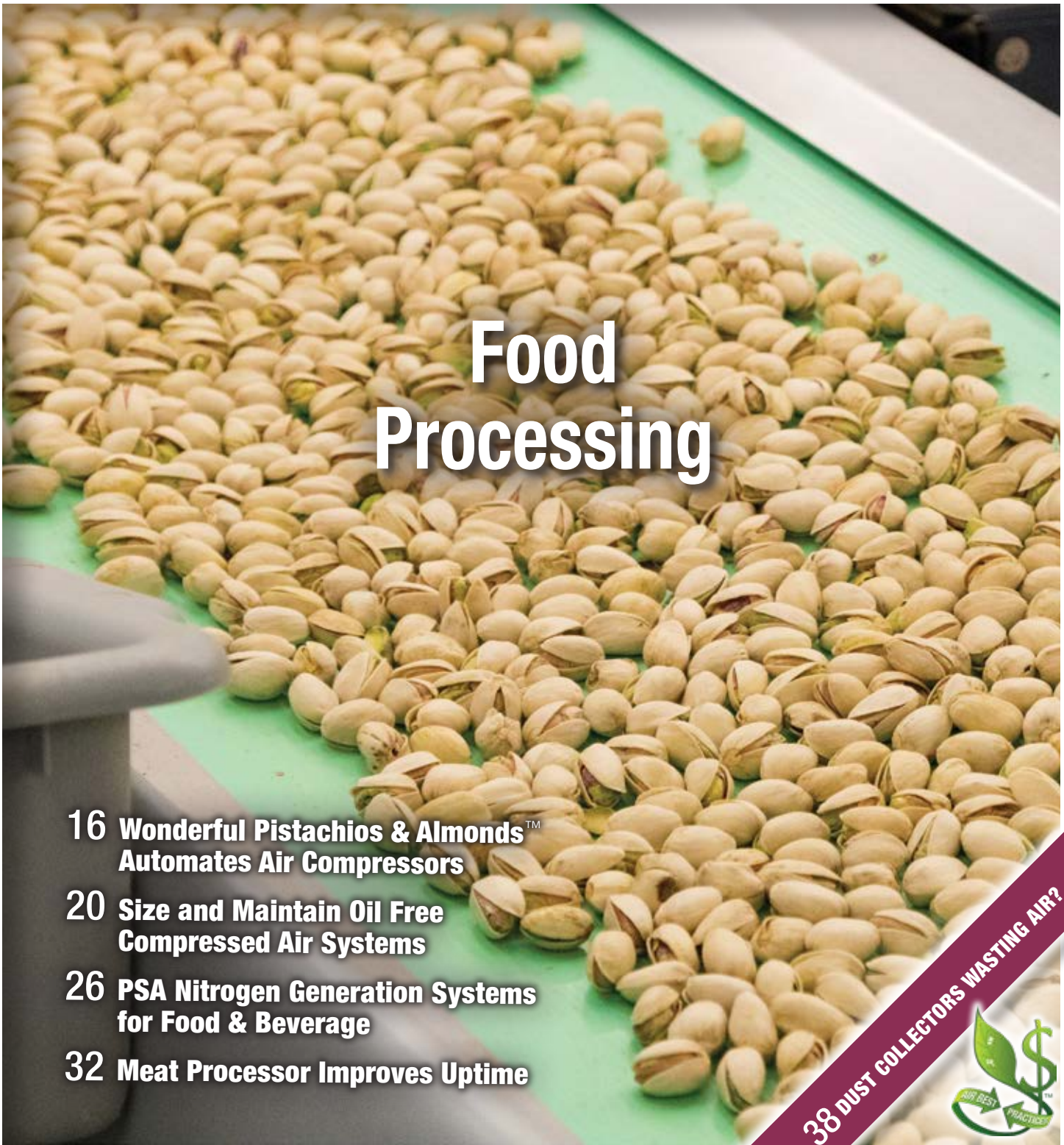

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FROM THE EDITOR

The food and beverage industry is an intense user of compressed air, nitrogen, blower, vacuum and cooling system technologies. These onsite utilities have a large impact on product quality and the energy/water footprint of each plant.

Quality, Safety and Reliability

Demand for oil-free air compressors continues to grow. I speculate more plants are ascribing to the idea of, "if you don't introduce lubricants into the system, you don't have to worry about removing them." There are many oil-free air compressor technology-types to consider and we thank Nav Sharma, from Sullair, for providing a neutral article titled, "How to Size and Maintain Oil Free Compressed Air Systems."

Onsite nitrogen generation is also in high demand as food and beverage manufacturing plants realize cost savings and carbon footprint reductions vs. delivered nitrogen (bulk liquid or pressurized cylinders). Alan Hopkins, from Purity Gas Inc. in Canada, performs "nitrogen system assessments" and has sent us an excellent article about how to design efficient PSA systems – at the right nitrogen purity.

We truly welcome receiving articles from around the world. A success story has arrived from BOGE Compressors U.K. about their work for a major meat processor and packager in Northern England. The plant had grown significantly, adding de-centralized air compressors and dryers all over the plant. This approach was causing production equipment to malfunction leading to production shutdowns. This case study reviews how a new centralized piping network and compressed air system eliminated reliability problems while providing significant energy savings.

Productivity, Sustainability & Energy Conservation

Wonderful Pistachios & Almonds™ processes and packages their delicious products out of their 4 million square foot manufacturing campus, located in Lost Hills, California. Tyler Costa, from ALD, Inc., has sent us a "wonderful" compressed air system assessment success story detailing how they transformed a system running eleven air compressors operating in five different independent systems. After deploying significant piping changes and an air compressor automation platform, the firm now runs one system while profiting from $382,000 (2,729,310 kWh) in annual energy savings and 312 kW in peak demand reductions.

Many of our readers own and operate hundreds of dust collectors across their manufacturing plants. Dust collectors take in dust-laden air and exhaust clean air. What many also do is waste a lot of compressed air. I highly recommend every maintenance department get a copy of the article sent to us by Kevin Cardwell, from Airdusco Engineering, titled, "Are My Pulse Jet Dust Collectors Wasting Compressed Air?"

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

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INDUSTRIAL SUSTAINABILITY NEWS

PepsiCo Doubles Climate Goal Targeting 40% GHG Emission Reduction

PepsiCo, Inc. (NASDAQ:PEP) announced on January 14, 2021, plans to more than double its science-based climate goal, targeting a reduction of absolute greenhouse gas (GHG) emissions across its value chain by more than 40% by 2030. In addition, the company has pledged to achieve net-zero emissions by 2040, one decade earlier than called for in the Paris Agreement.

Specifically, PepsiCo plans to reduce absolute GHG emissions across its direct operations (Scope 1 and 2) by 75% and its indirect value chain (Scope 3) by 40% by 2030 (2015 baseline). This action is expected to result in the reduction of more than 26 million metric tons of GHG emissions or the equivalent of taking more than five million cars off the road for a full year.

"The severe impacts from climate change are worsening, and we must accelerate the urgent systemic changes needed to address it," said PepsiCo Chairman and CEO Ramon Laguarta. "Climate action is core to our business as a global food and beverage leader and propels our PepsiCo Positive journey to deliver positive outcomes for the planet and people. Our ambitious climate goal will guide us on the steep but critical path forward – there is simply no other option but immediate and aggressive action."

PepsiCo's sustainability strategy, informed by leading science-based measures and cost-benefit analysis, focuses on the areas where it can have the most impact, while creating scalable models and partnerships for accelerated progress across the full value chain. The company's emissions target aligns to the Business Ambition for 1.5°C pledge and has been approved by the Science Based Targets initiative as the most ambitious designation available through their process.

"We congratulate PepsiCo on setting an emissions reduction target consistent with limiting warming to 1.5°C, the most ambitious goal of the Paris Agreement," said Nate Aden, Senior Associate at World Resources Institute, one of the Science Based Targets initiative partners. "Companies have a vital role to play in driving down global emissions, and it is encouraging to see major players, such as PepsiCo, taking ambitious action."

PepsiCo's action plan is centered around both mitigation, reducing GHG emissions to decarbonize its operations and supply chain, and resilience, reducing vulnerabilities to the impacts of climate change by continuing to incorporate climate risk into business continuity plans. With operations in more than 200 countries and territories around the world and approximately 260,000 employees, the company's emissions reduction plan will be comprehensive across priority areas such as agriculture, packaging, distribution and operations.

"Our climate ambition is at the very heart of accelerating our global sustainability progress, and we are using our scale and reach to build a more sustainable and regenerative global food system," said Jim Andrew, Chief Sustainability Officer, PepsiCo. "It's long overdue that companies move beyond just minimizing their environmental impact, they must actively work to improve and regenerate the planet."

PepsiCo was recently named to CDP's Climate A List and is also engaged in multiple partnerships and coalitions aimed at driving action on climate change, including the One Trillion Trees initiative, The Climate Group's RE100, Renewable Energy Buyers Alliance, We Are Still In and the U.S. Climate Leadership Council. For more on our collaborative work to address climate change, visit our ESG Topics Climate page.

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Industrial Sustainability News

Unilever to Seek Shareholder Approval for Climate Transition Action Plan

London, December 14, 2020 – The Unilever Board announced the intention to put its climate transition action plan before shareholders and seek a non-binding advisory vote on the company's ambitious emissions reduction targets and the plans to achieve them.

The plan will set out the company's climate strategy to reduce emissions within its operations, through its value chain, as well as describe how the company is managing risks and meeting consumer needs connected with climate change and societal responses to it.

It is the first time a major global company has voluntarily committed to put its climate transition plans before a shareholder vote. Unilever believes that the economy-wide shift to net zero emissions will require a greater and deeper level of engagement between companies and their investors about their climate transition plans. In setting out our plan, we hope this increased level of transparency and accountability will strengthen the dialogue with our shareholders and encourage other companies to follow suit.

Unilever's science-based targets include:

- Zero emissions from its own operations by 2030[1]
- A 50% reduction in the average footprint of its products by 2030[2]

In addition, in June this year, Unilever announced a new net zero target:

- Net zero emissions from sourcing to point of sale, by 2039.

Achieving these targets will require a range of measures including decarbonizing the raw materials it sources, completing the transition of its operations to 100% renewable energy, advocating for the accelerated decarbonization of the global energy grid, eliminating deforestation from its supply chain, and innovation and product

reformulation through compaction and concentration.

In addition, to achieve its net zero by 2039 target, Unilever will require high quality carbon removal credits to balance any residual emissions from sourcing to point of sale.

Alan Jope, Unilever CEO said, "Climate change is the most pressing issue of our time and we are determined to play a leadership role in accelerating the transition to a zero carbon economy.

"We have a wide ranging and ambitious set of climate commitments – but we know they are only as good as our delivery against them. That's why we will be sharing more detail with our shareholders who are increasingly wanting to understand more about our strategy and plans.

"We welcome this increased transparency and in the plan we present, we will be clear both about the areas in our direct control where we have a high degree of certainty of our route to net zero, as well as more challenging areas across our value chain where systemic solutions will be required to achieve our targets."

Unilever will share its climate transition action plan in Q1 2021, ahead of its AGM on May 5. The plan will be updated on a rolling basis and Unilever will seek an advisory vote every three years on any material changes made or proposed to the plan. The first year the company will report on its annual progress against the plan will be 2022.

Visit https://www.unilever.com

1 Unilever commits to reduce scope 1 and 2 GHG emissions 100% by 2030 from a 2015 base year.

2 Unilever has committed to reduce GHG emissions from the life-cycle of their products 50% per consumer use by 2030 from a 2010 base-year

Industrial Sustainability News

Ardagh Group Earns A- from CDP

January 12, 2021 – The Carbon Disclosure Project (CDP) has awarded Ardagh Group its Leadership Class ratings for sustainability performance – scoring Ardagh Group A- for climate change and A- for water management. The CDP is a not-for-profit that runs a global disclosure system which helps different stakeholders to manage environmental impacts.

"Ardagh's teams are focused on driving our sustainability strategy across all its dimensions," said John Sadlier, Ardagh's Chief Sustainability Officer. "The ratings from CDP evidence our constant focus on minimizing our environmental footprint. While doing so, we actively support our customers in their own sustainability activities."

Ardagh's consistently strong CDP climate change rating and its increased rating for water management, place it among the highest-rated companies in all industries by CDP.

"We are delighted to receive this Leadership Class rating" said Shaun Murphy, Ardagh's COO. "Environmental responsibility is at the heart of everything that we do. Our new sustainability strategy sets higher standards to help drive Ardagh to meet our customer and end consumers' high expectations of sustainable packaging. We are very excited about the road ahead".

Ardagh's vision is to be the preferred packaging partner to the world's leading brands, supplying sustainable and infinitely recyclable metal and glass packaging. Sustainability is at the core of Ardagh's activities and involves not only delivering a reduced environmental impact but also achieving sound economic performance while making a positive social contribution.

For more on Ardagh's sustainability journey please visit https://www.ardaghgroup.com/corporate/sustainability

ADM, InnovaFeed announce construction of world's largest insect protein facility in Decatur, Illinois

CHICAGO & PARIS, November 19, 2020 – ADM (NYSE:ADM), one of the world's leading human and animal nutrition providers, and InnovaFeed, the world leader in producing premium insect ingredients for animal feed, today announced plans to collaborate on the construction and operation of the world's largest insect protein production site, in Decatur, Illinois. The facility will be owned and operated by InnovaFeed and will co-locate with ADM's Decatur corn processing complex, with ADM supplying feedstocks, waste heat and more. Together, these investments will bolster economic growth and job creation in Decatur and central Illinois while continuing to strengthen the state's position as a center of innovative, sustainable agriculture.

"We are very pleased to launch this ambitious project, working alongside ADM and Illinois state partners as InnovaFeed expands to provide sustainable solutions to meet the fast growing demand for insect feed in the US and worldwide," said Clement Ray, CEO and co-founder of InnovaFeed. "Around

the world, InnovaFeed is contributing to the emergence of sustainable food systems by developing a pioneering and sustainable industry. Our new operations in Illinois, a global leader and destination for agriculture, will allow us to take the next steps to innovate and grow our business."

"At a time when the demand for animal feed protein is steadily increasing, insect farming stands out as a true solution for the future," said Chris Cuddy, ADM senior vice president and president of the company's Carbohydrate Solutions business. "We're excited to work with InnovaFeed on this ambitious project, which further expands our participation in the growing market for animal food and feed that comes from responsible, sustainable sources. It's a great demonstration of how ADM is expanding its value chain by offering opportunities for collaboration to leading, innovative startups. It's yet another example of how we're constantly identifying new ways to create value from corn, oilseeds and more. And of course, we're extremely proud that we can help bring this new, job-creating project to Decatur, the home of our North American headquarters."

Insect feed has become an increasingly popular protein ingredient for the agriculture and aquaculture industries, as demand for animal feed has now reached an all-time high and consumers look for food that is sustainably and responsibly grown. InnovaFeed already operates two insect production facilities in France, including what is today the world's largest. The Decatur facility represents InnovaFeed's first international project.

Construction is targeted to begin in 2021, pending necessary permitting and approvals. Construction and production will come in two phases. When both are complete, the plant would have a target annual production capacity of 60,000 metric tons of animal feed protein derived from Hermetia Illucens, a type of fly with exceptional nutritional qualities; the plant will also have the capability to produce 20,000 metric tons every year of oils for poultry and swine rations, and 400,000 metric tons of fertilizer.

Industrial Sustainability News

The plant will be built using an innovative model of industrial collaboration that InnovaFeed has already demonstrated in other facilities enabling the French Biotech company to produce the insect protein with the lowest carbon footprint on the market. The plant will be co-located with ADM's Decatur corn complex, with complementary infrastructure that will allow ADM to directly provide corn by-products to supply InnovaFeed's innovative insect rearing process, as well as waste heat and steam. This collaborative operational model will enable the InnovaFeed facility to reduce CO_2 emissions by 80 percent versus standalone production.

Learn more at www.adm.com and at www.innovafeed.com

Smarties Switches to Recyclable Paper Packaging

Nestlé announced (January 26, 2021) that its popular *Smarties* brand is now using recyclable paper packaging for its confectionery products worldwide. This represents a transition of 90% of the *Smarties* range, as 10% was previously already packed in recyclable paper packaging. *Smarties* is the first global confectionery brand to switch to recyclable paper packaging, removing approximately 250 million plastic packs sold globally every year.

Nestlé began introducing *Smarties* sharing block packed in recyclable paper in the UK last year.

Alexander von Maillot, Global Head of Confectionery at Nestlé, said: "Shifting *Smarties* packaging to recyclable paper is one of our key sustainable packaging initiatives in the confectionery category. It is a further step in realizing Nestlé's ambition to make all of its packaging recyclable or reusable by 2025 and to reduce its use of virgin plastics by one third in the same period."

The new *Smarties* paper packaging is sourced sustainably and is made of a coated paper, paper labels or carton board. Information about how to properly dispose of *Smarties* paper packaging is also included on its labels to raise consumer awareness.

Louise Barrett, Head of the Nestlé Confectionery Product Technology Centre in York, said: "Developing safe and convenient paper-based solutions for *Smarties* has required the pioneering of new materials and testing by Nestlé packaging experts at our R&D Center for confectionery in York, UK and the Swiss-based Institute of Packaging Sciences. We adapted our existing manufacturing lines to allow for the careful handling that is required for paper, while also ensuring recyclability across all new formats."

Nestlé invested significantly to upgrade its factories globally, including in Hamburg,

Image provided by Nestlé

Germany, one of the company's largest factories for confectionery products.

The transformation of the *Smarties* packaging is only one of the brands' 'SMART Initiatives', which aim to support sustainability and enhance the overall product experience.

Learn more at https://www.nestle.com/media

General Mills to Reduce Absolute Greenhouse Emissions by 30%

General Mills announced (September 21, 2020) a pledge to reduce absolute greenhouse gas emissions by 30% across its full value chain – from farm to fork to landfill – over the next 10 years[1]. The company also committed to a long-term goal to achieve net zero emission levels by 2050. The absolute greenhouse gas commitment was calculated using methodologies approved by the Science Based Target Initiative (SBTi) that model a level of emission reductions that science suggests is necessary to sustain the health of the planet. General Mills was the first company to publish a goal approved by the SBTi in 2015.

"We're proud to be making this ambitious goal which will take strong leadership and collaboration to drive holistic change," said Jeff Harmening, chairman and CEO of General Mills. "From farmers and suppliers, to where we make our food, to packaging producers and shippers, to retailers, and finally how we get it to our consumers' tables, each step in our value chain has a critical role to play – that's how we'll tackle this to ensure we are doing more and taking bolder actions."

2030 framework and focus

Each step in the company's value chain has unique challenges and opportunities. General Mills has four key ambitions guiding its work to accelerate planetary health, healthy living ecosystems, and thriving farmers and communities over the next 10 years, including:

- **Reduce GHG emissions** across the full value chain by 30% by 2030 and net zero emissions by 2050 in alignment with the new SBTi 1.5˚C guidance;
- **Advance regenerative agriculture** across the company's sourcing footprint on 1 million acres by 2030 and activating programs across the ingredient categories with the largest GHG footprint;

1 General Mills' 2030 climate target is based on fiscal years from 2020 through 2030.

Industrial Sustainability News

- **Reduce food loss and waste** by 50% in the company's operations; and
- **Advance respect for human rights** in the company's value chain in accordance with the United Nations Guiding Principles on Business and Human Rights.

These ambitions all contain bold 2030 targets, existing commitments and strategic partnerships to enable the company to prioritize and create work streams, develop governance policy, and solidify a data governance strategy, systems and processes to track and report progress publicly.

"Realigning our commitment to a more aggressive target is consistent with how we have approached our business for over 150 years and lived one of our core values – to do the right thing all the time," said Mary Jane Melendez, chief sustainability and social impact officer at General Mills. "While our greatest impact is outside our four walls – in agriculture, ingredients and packaging – we know we have a role to play in helping to restore planetary health."

Accountability within our operations

The company's focus on reducing greenhouse gas emissions formally began within its direct operations in 2005. Between 2005 and 2015, General Mills reduced its manufacturing GHG emission rate by 23% and its absolute emissions by 11% while net sales rose 57%. The company accomplished this by using energy more efficiently across its owned facilities and by converting to less greenhouse gas-intensive forms of energy. Key projects include consolidation of operations, improvements to common systems like compressed air, lighting and steam/hot water, and application of renewable energy certificates (RECS) from its wind power agreements.

Food waste within the company's owned operations also contribute to the overall footprint. General Mills is committed to reduce food loss and waste by 50% in the company's operations. Worldwide, at the end of 2019, 12 General Mills production facilities (24% of the global total) met it's zero-waste-to-landfill criteria where nothing was sent to landfill or incineration without energy recovery.

Lower-impact packaging

General Mills continually innovates to reduce the environmental impact of packaging through better design – by decreasing materials use, switching to lower impact materials (including renewable and recyclable) and improving truckload packing efficiencies. The company has a target to source 100% of its fiber packaging by the end of 2020 from recycled material or from virgin wood fiber regions that do not contribute to deforestation, and through 2019, had achieved 99.5%. And in early 2019, General Mills announced an ambition that 100% of its packaging be recyclable or reusable by 2030.

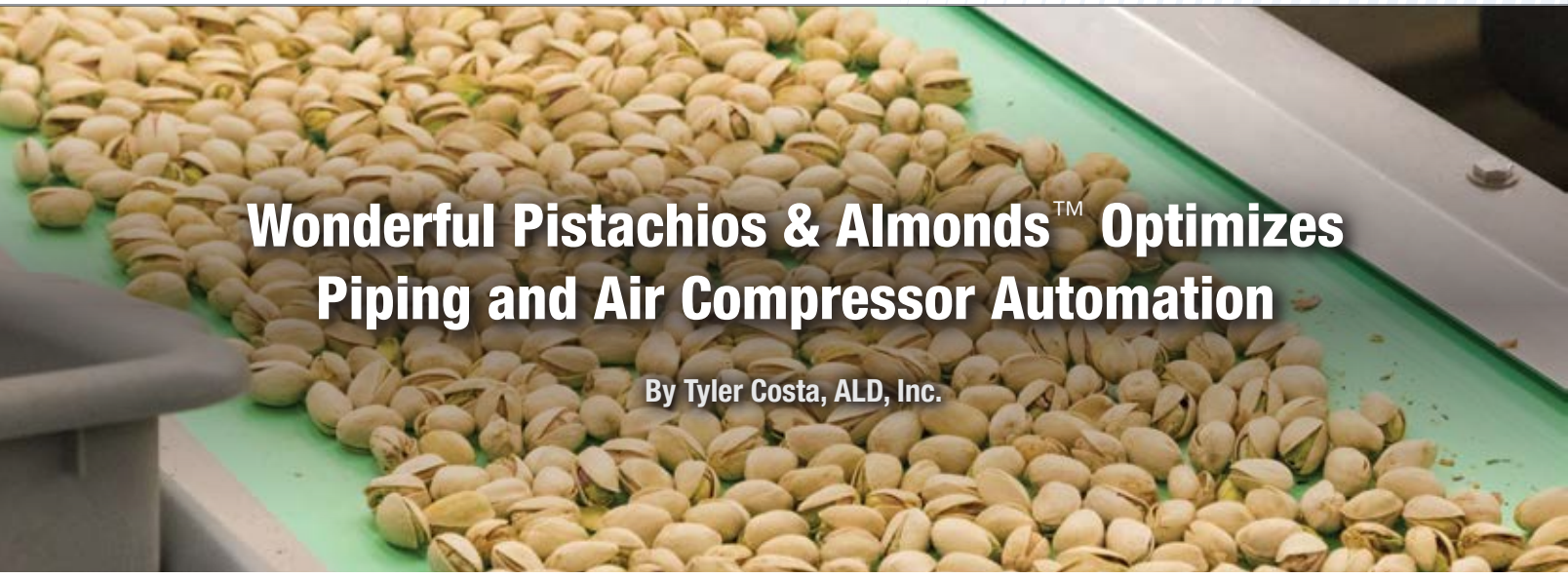
Leaning into climate action

General Mills recently signed on to the Business Ambition for 1.5°C, a global movement of leading companies aligning their business with the most ambitious of the Paris Agreement, to limit global temperature rise to 1.5°C above pre-industrial levels and reach net-zero by 2050 for the best chance of avoiding the worst impacts of climate change. As of September 15, 2020, more than 282 visionary corporate leaders have signed the commitment to take action.

"The science is clear: in order to limit the catastrophic impacts of climate change, we must ensure warming does not exceed 1.5°C," said Paul Simpson, CEO of CDP, one of the SBTi partners. "The ambition is high but it's achievable – and science-based targets give companies a roadmap for getting there. Corporations worldwide have an unprecedented opportunity to be at the very forefront of the transition to a net-zero economy – and there is no time to lose."

In each of the following years, 2017, 2018 and 2019, General Mills was recognized as a global leader in corporate sustainability by environmental impact non-profit CDP, achieving a place on the "A List" for climate change. The company's transparent actions to cut emissions, assess and mitigate climate risks and contribute to the low-carbon economy were based on the data it submitted through CDP's annual climate change questionnaires. "While our success depends on our actions, we cannot get there on our own," added Melendez. "We believe every company, government and individual has a role to play."

For more information on General Mills' commitments, progress and work underway, visit the company's 2020 Global Responsibility Report or https://www.generalmills.com



Wonderful Pistachios & Almonds™ Optimizes Piping and Air Compressor Automation

By Tyler Costa, ALD, Inc.

The Wonderful Pistachios and Almonds campus in Lost Hills, California is a manufacturing facility that processes and packages pistachios and almonds for the consumer market. Food processing requires extensive use of compressed air to control multiple applications ranging from actuators, valves, optical sorters, packaging equipment and plant maintenance operations. The campus has its peak season during harvest in late August/early September, but processing and packaging operations take place year-round.

The compressed air system consists of eleven (11) lubricated rotary screw air compressors operating five independent compressed air systems throughout the 4 million square foot campus due to reasons such as physical distance and different perceived production pressure requirements. The compressors range from 250 HP down to 50 HP and run on their own individual pressure control switches, making efficient control extremely difficult, especially when there are multiple physically remote air compressor stations. Even though many of the individual air compressors have variable displacement technology, without a central automation system controlling all the air compressors based on a central pressure band, the facility always ends up operating more air compressors than necessary to protect the plant from low pressure events. All of the site air compressors were well maintained and ranged in age from 3 to 18 years, with the majority of the air compressors in the 3 to 5-year range.

The Compressed Air System Audit

The Wonderful engineering team reached out to ALD, Inc. in an attempt to solve some of the pressure issues plaguing certain production areas and to see if there were any utility incentives available for compressed air system optimization. An audit of the compressed air systems at the Wonderful campus was initiated to determine compressed air system performance during normal operations, provide recommendations for the system, identify energy savings opportunities, evaluate distribution systems and demand applications for optimal performance, while utilizing potential utility incentive money through ALD's Industrial Compressed Air System Efficiency (ICASE) Program.

The compressed air system audit consisted of setting data loggers to monitor air compressor power and system pressure in various locations throughout the campus air system. The complete compressed air system can be broken down into five (5) independent subsidiary systems: Building P1, 18-20/ Building 23,24,25 / Building 47, A1 / Building 48-52 and Huller 2. Throughout these five air compressor systems, Wonderful operated nine out of the eleven site air compressors, with many of these compressors running highly modulated. The average weekday demand was approximately 2,640 CFM being generated

COMPRESSOR DATA

Plant Air System		Model	HP	Rated CFM	Rated Pressure	Rated KW	Mfg.	Type	Control Type	Motor Efficiency	Power Factor	Service Factor	RPM	Voltage	Fan KW	Motor FLA
Comp #	Location															
1	P1	EBM99M	75	365	125	69	Gardner Denver	Rotary Screw	Load/Unload	95%	0.85	1.15	1475	460	0.0	96
2	P1	EBM99M	75	365	125	69	Gardner Denver	Rotary Screw	Load/Unload	95%	0.85	1.15	1475	460	0.0	96
3	BLDG 18	EBM99K	75	365	125	69	Gardner Denver	Rotary Screw	Modulation	94%	0.83	1.15	1775	460	2.3	96
4	BLDG 18	EBM99K	75	365	125	69	Gardner Denver	Rotary Screw	Modulation	94%	0.83	1.15	1775	460	2.3	96
5	B47 AC1	EBU99C	200	1,000	100	171	Gardner Denver	Rotary Screw	Variable Capacity	96%	0.88	1.15	1785	460	3.7	222
6	B47 AC2	EBQ99M	125	530	125	90	Gardner Denver	Rotary Screw	Variable Capacity	95%	0.87	1.15	1785	460	2.2	141
7	B47 AC3	EBQ99M	125	530	125	90	Gardner Denver	Rotary Screw	Variable Capacity	95%	0.87	1.15	1785	460	2.2	141
8	B25 AC1	EAU99T	250	1,089	125	232	Gardner Denver	Rotary Screw	Variable Capacity	95%	0.88	1.15	1785	460	7.5	275
9	B23 AC1	EAQ99Q	125	530	125	90	Gardner Denver	Rotary Screw	Variable Capacity	95%	0.85	1.15	1775	460	2.3	156
10	B24 AC1	EAM99D	75	305	125	69	Gardner Denver	Rotary Screw	Variable Capacity	95%	0.85	1.15	1780	460	2.3	189
11	H2 AC1	EAH99D	50	200	125	37	Gardner Denver	Rotary Screw	Variable Capacity	95%	0.82	1.15	1175	460	2.3	60

Pertinent information from all system air compressors

by 642 kW of online air compressors. On weekends the demand dropped slightly to 2,114 CFM being generated by 555 kW of online air compressors. System pressures ranged from 123 PSI to 93 PSI throughout the campus.

Each building had an adequately sized looped header system that ran in an interstitial attic area with drops down to the production equipment, so pressure drop within each building was not an issue. After running flow calculations based on different demand scenarios for each building, it was decided that a 3" header would be the correct size to flow the most worst-case scenarios without over-engineering the system. It would take a total of approximately 2,500' of piping to connect these five independent compressed air systems and all of the piping work would have to be done while normal operations took place. In order to keep material and installation costs down, while providing high quality piping materials to reduce flow any flow restrictions, it was decided to use a 90mm marine grade aluminum piping system with Victaulic connections. The new header would be easy to install and highly modular for future expansion.

Efficient Control for Eleven Air Compressors

The next challenge was designing a system to efficiently control all eleven air compressors that were each spread over 1,000 feet apart from each other. To further complicate the control scheme, there were pressure flow control (PFC) valves on two of the compressor stations, which would cause control issues now that the systems were all tied together. Instead of recommending large rotary screw or centrifugal compressors to replace a majority of the existing compressors, ALD recommended a robust automation platform that has had a high level of success with campus type layouts like Wonderful. This automation platform would also be eligible for incentive money through ALD's ICASE program.

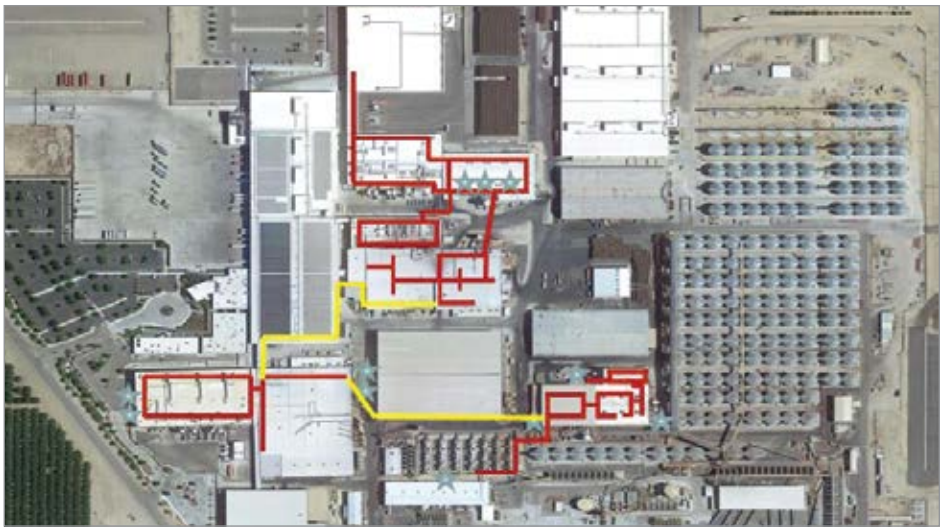
The Wonderful engineering team had a strict Allen Bradley specification for their PLC's and other hardware, so ALD teamed up with iZ Systems and their counterpart Case Controls to design a custom engineered automation platform to control all site air compressors for Wonderful. The standard iZ code can interface to and control as many compressors, of any brand or technology at multiple system pressures as required, without the

Wonderful Pistachios & Almonds™ Optimizes Piping and Air Compressor Automation

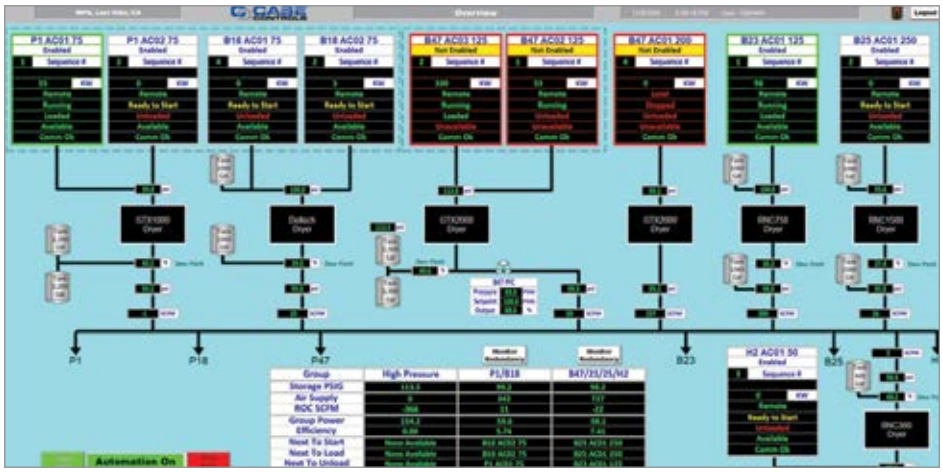
necessity of any custom programming which can lead to untested and unreliable code. iZ interfaces exist for almost every compressor brand, type, and control vintages including centrifugal, reciprocating, vanes, lubricated and non-lubricated rotary screws, all with electropneumatic, microprocessor, PLC, Modbus, and/or serial communication.

iZ's wireless cell modem provides security enabled access without impacting the client's IT department. Technical support and program upgrades, or modifications, can be accomplished without a site visit. This access allows ALD and iZ's full contingent of experienced compressed air staff to provide ongoing consultation and support for each installed system consistent with our goal of maintaining the gains in efficiency achieved at each facility. The cell modem also provides remote monitoring for corporate or plant personnel via password protected, pre-configured screens without impacting the plant's network security.

The automation platform also includes a robust data acquisition system allowing any combination of data to be instantly viewed as real time or historical trends to allow complete analysis of the performance of an individual compressor or the entire system. Every data point is available on one simple screen which is intuitively scaled and zoomed with click and drag capability. For example, compressor power can be compared to its delivered flow and the rate of change in system pressure as it loads to confirm its performance. WPA would now be able to monitor key compressed air system metrics such as compressor kW, discharge and plant pressures, air purification system pressure differentials, system flow and dew point. Additional instrumentation is easily accepted to provide real time monitoring of these parameters as desired. The platform is expandable to monitor and control any other facility systems including cooling water, chilled water, steam generation, etc.



Layout of WPA's existing header system (red) and the proposed header system (yellow). The stars designate compressor locations.



Overview screenshot of the newly installed automation platform showing half the number of online air compressors than were monitored in the baseline.

When air compressors are located in multiple locations in a facility, many times it makes sense to set up what is called a "split system". This is where you have a trim station with compressor(s) located upstream of a large storage tank and a pressure flow control valve. The trim compressors discharge and store air at a higher pressure than the plant pressure. Usually, a pressure differential of 5-10 psid is kept in the tank, called control storage, and the PFC valve will modulate to control the expansion of air down to the lower plant pressure. The rest of the compressors will discharge directly into the plant header at the lower pressure and will run fully loaded or off. This also results in energy savings from discharging at a pressure that is lower than the compressor rating. An upgraded PFC valve was installed downstream of the two 125 HP compressors on the B47 pad, making this the trim station for the system. With the size of this air system, it costs the plant approximately $3,900 per PSI increase on an annual basis. Pressure reduction is key to energy savings. The other PFC valve that was located on the P1 air compressor pad was

removed so that the two 75 HP compressors on this pad would discharge directly into the lower header pressure.

Annual Energy Savings of 53%

After the new piping had been installed and the automation platform commissioned, ALD performed an analysis on the post-installation data and was able to show a 53% energy reduction in online air compressor power. The automation platform keeps the compressors from running in modulation and also keeps multiple compressors from running part loaded at one time. After these changes were made, Wonderful was able to run on 4-5 compressors during their peak weekday production instead of nine compressors. This also allowed them to have redundancy in the air system and to allow preventative maintenance to occur during the week instead of on weekends, saving additional labor costs. The annual energy savings ended up being 2,729,310 kWh with a peak demand reduction of 312.6 kW. This translates into $382,103 in annual every savings for Wonderful, who also received an incentive of $106,075 from the local utility company. BP

About the Author

Tyler Costa is VP of Operations for ALD, Inc. who has performed hundreds of compressed air system audits across the country from industries ranging from refineries and forges to food processing and microchip manufacturers.

About ALD, Inc.

ALD, Inc. is the largest independent compressed air and vacuum auditing and professional services company on the West Coast. We specialize in compressed air system assessments and design and have the capability to manage turnkey project implementations with guaranteed energy savings. ALD is also a major supplier for robust industrial automation platforms, ultrasonic leak detection equipment/ services and many other energy efficient demand side compressed air parts and equipment. ALD administers the Industrial Compressed Air System Efficiency (ICASE) Program in northern and central California and is also a certified third part implementor for many utility companies across the U.S. www.airleakdetection.net

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How to Size and Maintain Oil Free Compressed Air Systems

By Nav Sharma, Sullair

Sullair centrifugal compressor installation at an automotive manufacturer.

➤ With each passing year, there is growing demand for higher-quality compressed air in the chemical, food and beverage, pharmaceutical, automotive, medical, semiconductor and packaging industries, among others.

When users consider adding an oil free air compressor to their facility, there are several factors that should go into the decision to ensure it is the right equipment for the user's operation. Some considerations and factors can include why to choose oil free to begin with; how to properly select and size the compressor; how to adjust sizing for different cooling water conditions or different ambient temperatures; and what it will take to maintain the compressor throughout its lifespan. To lay a foundation, it is important to first understand why oil free air is important, how compressed air is used and what options are on the market.

Why is oil free important to begin with?

Many industries and applications require clean, dry compressed air – and the best quality of air – to reduce the risk of contamination on compressed air, on the end product and other items throughout the production process.

Even the slightest amount of oil as a contaminant can have damaging effects on these industries – think contaminating end products like food or drinks, damaging production equipment, causing downtime, or damaging your brand's reputation due to the low quality of the end product and/or product rejections.

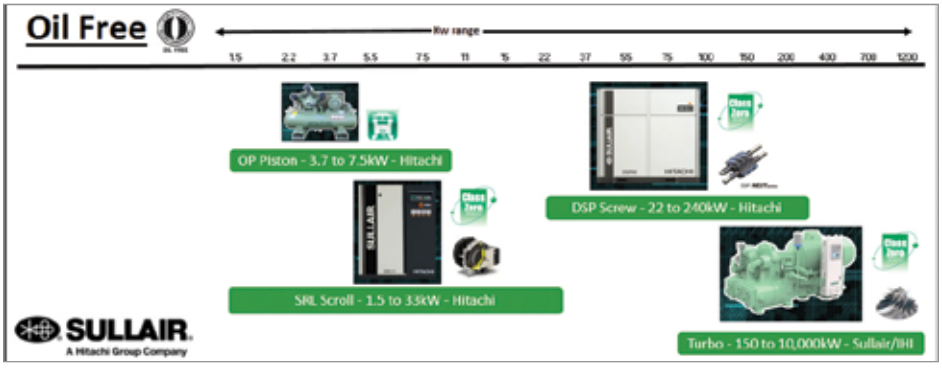

Chart showing which oil free compressor options are available per kW range.

Uses of oil free compressed air

Oil free compressed air is most often used in three applications at facilities:

1. For process applications – when we say process applications, we mean oxygen content. This is important for pharmaceutical companies, in combustion and with other processes that consume oxygen.

2. To control equipment – starting and stopping equipment in facilities is often driven by compressed air

3. To power machinery and equipment in the facility

Oil free air compressor options

There is a range of oil free air compressors available on the market from 1.5 psi to 160 psi (pressure rating), and from 10 cfm to more than 5000 cfm (flow). Oil free air compressor options include scroll, single-stage rotary screw, two-stage rotary screw and centrifugal.

How to size oil free air compressors

Properly sizing an oil free air compressor will determine if your facility will have enough air to power your production equipment. By taking careful consideration and proper planning upfront, you'll end up with a more effective compressed air system that helps minimize interruptions and downtime.

Choosing the right equipment and determining how the air will be used are important considerations when determining the size of the oil free compressor. If you choose an air compressor too large for your application, you'll consume more energy than needed. If you choose an air compressor that is too small for your application, it will not deliver the air supply needed for your production. Not only can this impact your production itself, but it will likely result in a need to purchase another compressor to meet the demand, which emphasizes the need to get it right at the start.

How do you go about selecting and sizing oil free air compressors? It involves a few steps:

1. **Match compressor type to the required pressure**
   How much air (CFM) do you need? While it sounds simple, it can cause issues in installations if it's not done right. Cubic feet per minute (CFM) is how much airflow a compressor can produce, and there are many variables that can affect the performance of the compressor you buy. Understand the CFM demand of your facility during peak times and find a compressor that will deliver the required CFM in your operating environment.

Altitude, room temperature, and humidity – all variables – can significantly derate the capacity of your compressor. Take these into account when making your equipment decisions. If you buy a compressor that is too big, you are wasting money and several maintenance issues can develop over time. If you buy too small, you won't be able to operate the machines or tools you need to keep your operation humming and the compressors can also develop maintenance issues over time.

How to Size and Maintain Oil Free Compressed Air Systems

2. **Determine air quality and what "oil free" means**
   The International Organization for Standardization (ISO) 8573-1 Air Quality Classes outlines the contaminants allowed by class. Oil free applications require Quality Class 1 at minimum but preferably Class 0. Class 0 air is more stringent than Class 1 (0.01 mg/m³ of oil as contaminant), as agreed upon between the manufacturer and the user.

A food processing plant depends on twin 150 hp Sullair DA-13 oil free air compressors.

1 Daily/3-Monthly Schedule (for 8,000 hours/year or less operation)

Part or Item	Action	Service Interval		Remarks
		Daily	3-Monthly	
LCD Indications	Check	▯		Record data in the OPERATION RECORD LOGBOOK
Oil Level	Check	▯		Add as required.
Aftercooler - Condensate	Drain	▯		
Intercooler - Condensate	Drain	△		
Control Air Pipe - Condensate Drain	Drain	△		
Main motor grease	Greasing		△	

3 Annual Schedule (for 8,000 hours/year or less operation)

Part or Item	Action	Service Interval	Remarks
Oil	Replace	○	
Joints, Bolts, Nuts	Retighten/Check	△	
Oil Strainer (primary)	Clean	△	
Oil Filter (secondary)	Clean	○	
Air Intake Filter	Replace	○	
Valve Sheet - Blow off Valve	Replace	●	Also clean one month after a start up operation.
Seal Gasket - Suction Throttle Valve	Replace	●	Replace as required.
Relays & Electric Devices	Check/Clean	▲	
Aftercooler	Check/Clean	▲	Replace as required.
Intercooler	Check/Clean	▲	
Oil Cooler	Check/Clean	▲	
Hi-Precooler	Check/Clean	▲	
3-Way Solenoid Valve & Capacity Control Sytem	Check	▲	Replace as required.
Air Relief Valve	Check/Clean	▲	
Protective Device	Check	▲	Change any operating parts in need of replacement.
Motor	Check/Clean	▲	Measure the insulation for any resistance.

Maintenance Schedules for Dry Screw Air Compressors

While Class 1 may be technically acceptable, it comes with risks. Class 1 requires inline filtration to eliminate oil content coming from the compression process. The filtration then depends on two variables directly affecting the performance of the filtration process: compressed air pressure and compressed air temperature/ambient temperature.

3. **How much are you using the compressors?**
   Do you run an operation with one shift? Two shifts? Three shifts? This is an important consideration to determine whether you'll need one compressor or multiple compressors, as well as how much backup air.

Maintaining oil free air compressors

Once you've properly sized an air compressor and it has been installed, the work isn't over. To help ensure smooth operations at your facility, and to avoid interruptions and unexpected downtime, it is critical to maintain oil free air compressors. Oil free air compressors require less maintenance but require more care.

Preventative maintenance is crucial, and some of the key components are the most important to inspect and/or clean according to schedule. Most newer oil free compressors can show upcoming maintenance reminders on the controller display based on operating hours and calendar. This makes it easier for end users to plan, schedule downtime, and order needed parts and kits. Maintenance schedules are different, depending on whether you operate less than 4,000 or 8,000 hours per year.

Scroll compressors require maintenance every 2,500 hours. Scroll heads should be

maintained every 10,000 hours or 4 years for 122 psi and 5,000 hours or 2 years for 145 psi machines.

Other than daily checks, centrifugal compressors require six monthly and annual preventive maintenance checks to operate at optimum working conditions and avoid any unforeseen downtime.

Many manufacturers and distributors offer service and maintenance plan options to help ensure your oil free air compressor will operate day after day and to its full life expectancy. As anyone who runs an operation knows, downtime is costly.

Service and maintenance plans ensure maintenance is taken care of, genuine parts are used, and factory-trained technicians repair the machines. Working with a service and maintenance plan helps:

1. Avoid downtime – Performing maintenance as scheduled helps the compressor run smoothly and more efficiently, thereby decreasing bouts of downtime

2. Avoiding costly emergency repairs – Timely and proactive maintenance helps increase profits though increased productivity. If repairs are needed, it's covered under the plan, keeping maintenance budgets in check.

3. Ensure energy savings – When regular maintenance is performed, technicians can identify when a machine is overexerted or underproducing. This is often a first indicator of a part needing replacement or cleaning. When you identify the issue early, energy savings can be realized.

Having a service and maintenance plan is one option to help you avoid unplanned expenses and maintain a well-functioning operation.

Overhaul frequency

Overhauling dry screw oil free machines consists of inspecting and replacing the air end, fan inverter and bearings every 6 years or 48,000 hours.

On scroll compressors, scroll heads need to be overhauled every 20,000 hours, or 8 years of service, for 122 psi and 15,000 hours, or 6 years of service, for 145 psi.

Centrifugal compressors have a simpler design, hence fewer moving parts, but also require an overhaul every 6 years or 48,000 hours of service. This involves dismantling, inspecting for damage and wear and repairing/re-coating of impellers to extend the life of compressor.

How to adjust sizing for different cooling water conditions or different ambient temperatures

Should I go with air-cooled or water-cooled?

When selecting an oil free rotary screw air compressor, there are two cooling configurations to choose from: air-cooled or water-cooled. Air compressors create a lot of heat during their normal operation – up to 90% total electrical energy consumed. The heat primarily comes from the motor, air end and cooling circuit. Users need to choose between

How to Size and Maintain Oil Free Compressed Air Systems

an air-cooled or water-cooled compressor, and this decision is based upon the size, location and utilities available to the air compressor.

The reason a customer opts for air-cooled versus water-cooled is often based on their environment, costs of water cooling, if water is available and space considerations.

Air-cooled compressors require adequate amounts of cooling air for the inlet and enough space for discharge. Without enough space, customers may encounter temperature regulation issues which can cause nuisance shutdowns or equipment failures. Ductwork to the inlet and from the discharge typically gets cool air into the compressor package and the discharged hot air can be removed from the plant. In the wintertime, this heat can be directed into the plant to help heat the factory – offering additional savings and improve energy efficiency of the manufacturing facility.

If you have a confined space you're working with, water-cooled compressors may be a better choice. If the customer's environment is caustic or extremely dirty, a water-cooled solution may be the best fit. There are many different designs of cooling towers and each has its advantages and disadvantages. Users need to consider the initial cost of the tower plus the energy required and maintenance that goes along with cooling tower designs. Users can also use other sources of cooling water like public supply water, self-supplied well water, river, ocean or lake water. A major consideration when using a natural water supply is the cleanup of the water once it passes through the compressor. Chilled water is also a consideration if the customer has this type of equipment, but often this is avoided due to the high costs associated with chilled water systems.

If opting for water-cooled, the water can be used for other hot water applications, where you reclaim the heat. Water-cooled air compressors allow for most of the heat from compressors to be reclaimed.

Depending on your geography – say you're in a colder climate – if you use cooling water,

Sullair DSP Series oil free rotary screw compressor installation at a pharmaceutical manufacturing plant.

you could then use that water for various applications, such as in the boiler room or for other manufacturing applications. In times where every penny is important in an operating environment, this is an additional way to realize savings.

What about different ambient conditions?

Based on ambient conditions, you need to oversize the air compressor to compensate for higher cooling requirements and high temperature shutdowns. The most common oil free ambient condition is 40°C. Some compressors are smart and can reduce output by 3 to 9% and continue to operate above rated ambient temperatures. Reduced output is better than no output when the air requirements can be distributed to other compressors in the facility or backup compressors.

How to set up compressed air purification systems (including heat of compression dryers) after the air compressor

While oil free compressors eliminate oil that would otherwise need to be removed from compressed air if you used an oil flooded compressor, oil free air compressors do not have the ability to reduce many of the other contaminants typically present. This includes water (moisture).

To ensure processes and end applications are not affected by water (moisture), it is necessary to remove or reduce them to an acceptable level. This is where heat of compression comes into play, to ensure air that is clean and dry, up to -70°F dewpoint. Some of the regenerative or desiccant dryers will need to accommodate for 15-20% of additional capacity to allow for purge air to recharge the desiccants in the dryer. Through proper dryer selection, this purge air wastage can be saved.

Conclusion

There are many considerations when selecting on oil free rotary screw air compressor. It is always best to consult your local compressed air expert to determine what best suits your facility. They will better understand the needs and recommend a reliable and a long-term oil free air system solution. BP

About the Author

Navendu (Nav) Sharma is the Senior Global Oil Free Product Manager for Sullair. He joined Sullair in 2014 and previously served as a senior product manager for portable air compressors. Throughout his career, Nav has also served in quality, product development, and program management roles within the manufacturing industry. Nav may be reached at navendu.sharma@sullair.com.

About Sullair

Sullair, founded in Michigan City, Indiana, in 1965, is a leading global provider of compressed air solutions. The company was one of the first to execute rotary screw technology in air compressors, and its machines are known throughout the world for their reliability, durability and performance. Sullair became a Hitachi Group Company in July 2017. For more information, visit www.sullair.com/oilfree.

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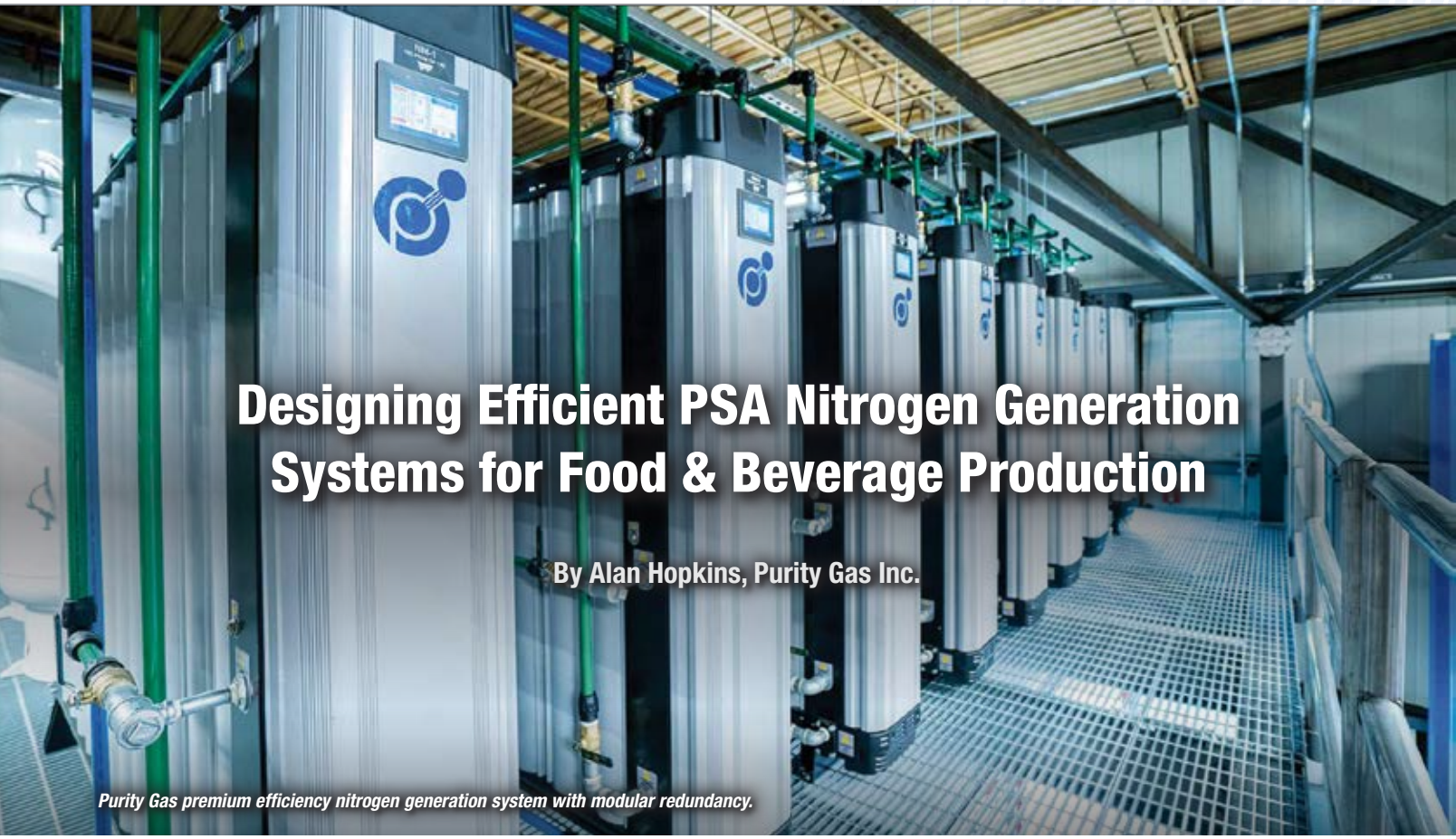


Designing Efficient PSA Nitrogen Generation Systems for Food & Beverage Production

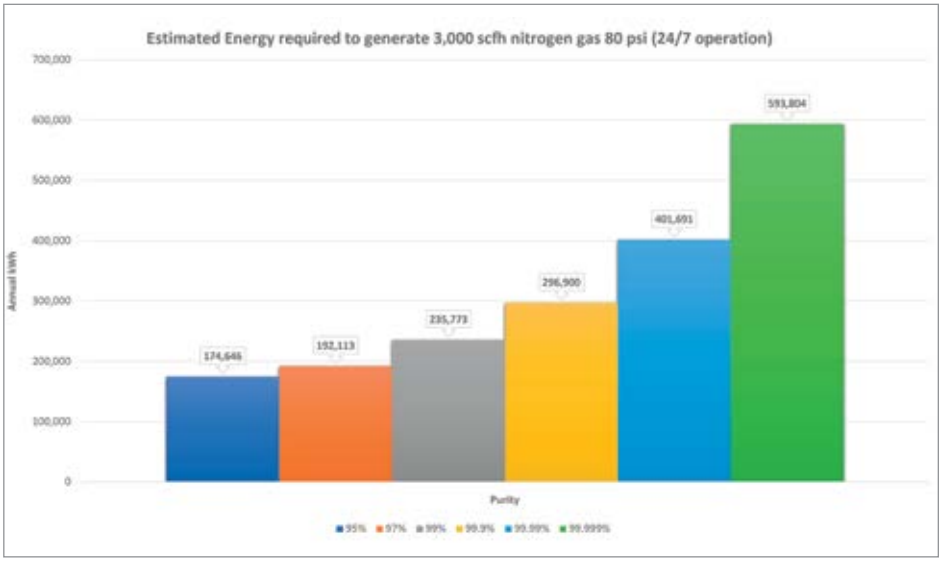
By Alan Hopkins, Purity Gas Inc.

Purity Gas premium efficiency nitrogen generation system with modular redundancy.

This article is for you if your company is purchasing nitrogen gas at 99.999% purity and you're not sure why. While there are many applications which do require nitrogen gas concentrated to 99.999%, they are significantly outweighed by the applications that don't. Rather than relying on a delivery of bulk liquid or pressurized cylinders, many nitrogen users are choosing to produce a custom supply of nitrogen within their facility, and they are doing it at a fraction of the cost. Over the past decade we've seen a mass industry shift from delivered nitrogen supply, to nitrogen generation.

With nitrogen being the most plentiful air gas at 78%, the process of separating nitrogen from air is very efficient, relative to the extraction of the other air gasses which only account for 22%, most of which is oxygen. The ability to tailor the nitrogen purity, pressure and flow rate to a specific industry or application is what leads to substantial savings over traditional supply.

The reality (and also the problem) is that no matter how inefficient a system is designed, nitrogen generation will typically be less expensive than purchasing the gas from a third party. This inevitably introduces wasteful and bloated nitrogen generation systems into the market. This article will focus on the key considerations of nitrogen gas generation system design.



As nitrogen purity increases, so does the requirement for input compressed air and energy. Using the national (Canada) average electricity rate of 12 cents per kWh, the annual electricity cost to produce nitrogen at 95% purity will be approximately $20,957 vs. $71,256 when produced at 99.999%.

Why is Nitrogen Generation in High Demand?

Most of our projects are fueled by end users who are motivated to reduce costs and their carbon footprint. When using nitrogen in traditional supply form (liquid or cylinder), the gas is produced at an air separation plant using an electrically intensive process called fractional distillation. The fractional distillation of liquefied air is a process in which air has to be cooled beyond -200°C and then re-heated to extract the different elements based on their boiling points. This process requires large amounts of energy and can only be done on a large scale to be economically viable.

Once the nitrogen has been 'produced', it is decanted into large transport trucks and dispatched from the air separation plant, eventually landing at its final destination where it is stored and consumed by the end user. The nitrogen is analyzed at the air separation plant and registers at an exceptionally high purity, typically 99.998+%.

The alternative solution to delivered supply is nitrogen generation. Nitrogen gas generation is the efficient approach to supplying manufacturing processes with the gas they require. Nitrogen is extracted and concentrated from a supply of compressed air using carbon molecular sieve, or hollow fiber membrane tubes. The purity of the nitrogen is determined by the contact time between the compressed air and chosen separation medium; longer contact results in higher purity. Therefore, higher purity nitrogen requires more input air flow and costs more to generate.

Each application and process using nitrogen will have a maximum allowable tolerance for oxygen. A 'low purity' application such as fire suppression may only require 95+% purity, while a high purity application such as selective soldering will typically require 99.995+%. Food and beverage production falls in the middle, with most applications ranging from 98% to 99.5% (or 2% to 0.50% remaining oxygen content). The cost to generate nitrogen at 95% requires significantly less energy and equipment to produce the same volume at 99.999%. Purity selection is a critical component of efficient system design.

If the process receives no additional benefit past a certain purity, the overpurifying result is waste. An over consuming nitrogen generation system will use much more compressed air and equipment than required. Unfortunately, a blind eye is turned to the wasted capital and overconsumption of energy because it's still cheaper than purchasing nitrogen from a third party. Many years of compressed air system optimization and energy reduction can be lost in the blink of an eye with a hungry nitrogen gas generation system.

Nitrogen System Assessment Sets the Baseline to Measure the Opportunity

When designing a nitrogen gas generation system, the ultimate goal is to produce an optimum supply of nitrogen, at the lowest possible price; capital and operating expenses inclusive. In this case, 'optimum' means engineering a system producing enough nitrogen to satisfy the peak demand, at the appropriate pressure, with the highest tolerable amount of remaining oxygen.

Designing Efficient PSA Nitrogen Generation Systems for Food & Beverage Production

It is critical to understand the nuances of the existing nitrogen supply and how it is used, before designing a new system. Collecting flow, pressure and purity data from the existing supply can help create a baseline for measurable improvement. We are firm believers in the adage *"you can't manage what you can't measure"*. When possible, the nitrogen flow and pressure requirements can be captured using calibrated flow meters and pressure transducers (downstream of the evaporator if using liquid supply).

If a process uses a very large volume of nitrogen intermittently, nitrogen generation may not be the best choice, as the system will need to be large enough to satisfy the peak demand of the plant, but only for a short period of time. Nitrogen generators quickly pay for themselves when they are in operation, not sitting idle. Facilities and processes with consistent flow demands and multiple shifts, typically produce the strongest business cases.

Collecting purity data at the point of use can help reset the expectation that a certificate of analysis from the air separation plant provides. When purchasing nitrogen in bulk liquid or cylinder form, the purity is analyzed at the air separation plant prior to transport, storage, evaporation and process use. Many of our clients are surprised by the purity measured at the point use, or within their finished product after a series of losses. As a part of our detailed nitrogen assessment, we suggest collecting purity data at the point of use with a calibrated oxygen analyzer which measures the remaining oxygen content in PPM or %. We are often instructed that the plant needs 99.999% to support a process, simply because of what the incumbent certificate of analysis reads. More often than not, we will record substantial purity losses throughout the distribution network of pipe and at the point of use, which objectively changes the baseline for purity needs.

Collecting purity data, at the point of use, can help determine the nitrogen purity specification. Nitrogen generators will produce nitrogen gas at a specified purity, displaying the remaining oxygen on the HMI in real time. When gas is not required, the generator will enter energy saving mode preserving valuable compressed air.

rated outlet flow (1)	nitrogen purity at the outlet (maximum oxygen content)*											
	99.999% (10 ppm)	99.995% (50 ppm)	99.99% (100 ppm)	99.975% (250 ppm)	99.95% (500 ppm)	99.9% (0.10%)	99.5% (0.50%)	99% (1%)	98% (2%)	97% (3%)	96% (4%)	95% (5%)
scfh	32	60	71	88	106	127	184	205	258	293	335	364

As purity increases, the outlet flow rate of the nitrogen generator decreases. A system can become significantly oversized if 'worst case' purity is assumed (99.999%) and additional equipment may be required to meet the target flow rate.

Craft Brewery Carbon Emissions Case

Many companies are striving to contribute to global sustainability initiatives and reduce their carbon footprint, Purity Gas included. When purchasing nitrogen in bulk liquid or pressurized cylinders, it's important to learn where the nitrogen was produced (location of the air separation plant) and how far it was transported to the final destination. The origin of production will typically be indicated on the certificate of analysis. In addition to the greenhouse gasses (ghg) emitted by the electricity intensive fractional distillation process, transportation to the final destination will also need to be considered. The United States Environmental Protection Agency publishes a standard formula for calculating the approximate ghg emitted as a result of freight, via a typical transport truck: Distance x Weight x Emissions Factor. The average transport truck emits 161.8 grams of CO_2 per ton-mile as per the EPA. Depending on how your region produces electricity, the delta between emissions associated with transport and the electricity required for nitrogen generation can help determine the environmental gains available through conversion.

A craft brewery in remote, northern Quebec was seeking cost reduction and environmental sustainability opportunities for their business. The brewery was using one bulk pack of

nitrogen every two weeks and wanted to learn how the conversion to self generated nitrogen supply would support their environmental goals.

- Using the EPA calculations for freight emissions, we multiplied the distance traveled (120 miles) x weight (1.26 tons) x emissions factor (161.8 grams per mile-ton). Therefore, each bulk pack delivered to site was responsible for approximately 24,464 grams of CO_2 emissions. Multiplied by 26 deliveries per year, the brewery's carbon footprint related to bulk pack deliveries was 636,064 grams of CO_2, per year.

- We then calculated the carbon emission associated with nitrogen generation. According to the National Energy Board of Canada, Quebec (most is hydro power) has the lowest CO_2 per kWh emissions in Canada at only 1.2 grams of CO_2 per kWh. The proposed nitrogen generation system would consume 4,480 kWh annually (mostly from compressed air), for a total impact of 5,376 grams of CO_2.

- By implementing a high efficiency nitrogen generation system, the brewery was able to net an annual carbon footprint reduction of 630,688 grams of CO_2; a 99% reduction over the carbon emissions associated with delivered nitrogen bulk packs.

Designing the Optimum Nitrogen Generation System

The efficiency of a system is defined by its compressed air to nitrogen ratio; how many units of compressed air are required to produce a single unit of nitrogen. 95% pure nitrogen may only require two units or compressed air to produce one unit of nitrogen, while 99.999% pure nitrogen may require close to seven units of compressed to produce the same volume. It's very important to highlight that nitrogen generators do not produce better, or worse nitrogen; it's just less expensive because it offers a custom purity solution, by application. Typically, the lower the purity, the greater opportunity becomes for savings. A nitrogen system operating at 95% purity can produce 7.5x more nitrogen than that of a system running at 99.999% purity.

Using baseline purity data from a nitrogen system assessment, one can begin to work backwards to the optimum purity. The purity requirement can often be instructed by a quality assurance department, as internal testing may have already been completed. However, if purity is unknown, we often suggest using certified nitrogen & oxygen mixes in a controlled environment to determine the point of diminishing return, instead of assuming a worst case scenario (99.999%). Over assuming the purity will substantially increase the capital and operating costs of the system. There comes a point in each application where an increase in nitrogen purity does not provide additional benefit to the process or result, but will absolutely cost more to generate. When it comes to purity, it is critical to identify the point of diminishing return.

The efficiency of a nitrogen gas generation system can be refined by optimizing ancillary equipment, operating set points and the

Designing Efficient PSA Nitrogen Generation Systems for Food & Beverage Production

applying appropriate technology. While this article is not intended to specify compressed air systems, considerations should be made to use supporting technology which is cost effective to own and operate. The nitrogen generator contains very few mechanical components and is largely passive in its operation, relative to the complexity and mechanical involvement of an air compressor. This typically makes the air compressor the most vulnerable point in the system. The electricity cost to run the air compressor, along with system maintenance is what determines the price of nitrogen gas produced by the system. Regardless of the technology, it is imperative to understand the maintenance costs during the evaluation stage.

Example – Some nitrogen generators will use a zirconium oxide oxygen sensor to measure purity, while others will use an electrochemical oxygen sensor with a galvanic cell. The zirconium sensor is more expensive, but is also maintenance and calibration free, with a service life of 5 to 10+ years. The galvanic cell **will** deplete in the presence of oxygen and requires costly quarterly calibration, and annual replacement.

Maintenance costs play a significant role when determining the cost to produce a unit of nitrogen. When evaluating technology options, complete transparency and upfront disclosure of all operating costs are mandatory in order to make an educated decision.

When selecting a nitrogen generator, one has the choice between pressure swing adsorption (PSA) and membrane technology. PSA nitrogen generators use carbon molecular sieve (CMS) and an adsorption process to remove unwanted gas molecules, and can typically deliver purity up to 99.999%. Membrane generators use hollow fiber membrane tubes and selective permeation to remove unwanted gas molecules, and can typically deliver purity up to 99.9%. The selection of which technology to apply is entirely dependent on the application, environment and purity requirements. Whether using PSA or membrane equipment, we suggest using technology that can grow with increasing production demands, without the original installation becoming obsolete.

As stated earlier in this section, the efficiency of a system is defined by its compressed air to nitrogen ratio. The practical reality of

Nitrogen Generation Efficiency Audit - 99.5% Purity

PURITY

Date	N2 System Output Fow (scfm)	N2 System Output Pressure (psi)	Before Air:N2	After Air:N2
Day 1	135.6	95.5	5.8	2.87
Day 2	216.7	94.5	6.1	2.86
Day 3	281.4	92.8	4.8	2.86
Day 4	256.7	91.5	5.1	2.86
Day 5	251.3	91.6	7.1	2.85
Day 6	269.9	90.7	5.0	2.86
Day 7	249.8	92.8	5.1	2.86
Average:	237.3	92.8	5.6	2.86

Summary of results after implementing a control strategy to manage compressed air usage within the system – averaged by day
Data collected every 15 seconds

An existing nitrogen generation system was using antiquated technology and lacked controls discipline. The existing system was retrofitted with energy saving equipment and a new control strategy. This resulted in stabilizing the compressed air to nitrogen ratio and significantly reduced the operating cost of the system.

manufacturing is that there will likely be periods of variable demand and the full capacity of the system will not be required When designing a nitrogen generation system, it is imperative to meet the maximum demand, while being able to meet the average demand efficiently. A modular technology selection with an appropriate control strategy will allow the system to scale down its gas production duties and isolate the unneeded modules during low demand periods, constantly managing the compressed air to nitrogen ratio. As production increases, the system will scale up by awakening modules from an economy energy saving mode, ensuring that peak demand is satisfied. This control strategy creates an environment where modules will only operate when they are required, avoiding the unnecessary loss of valuable compressed air and stabilizing the measure of efficiency: compressed air to nitrogen ratio.

Next Steps to Self-Sufficiency

A nitrogen generation system with thoughtful and diligent design can be a great way for nitrogen users to reduce costs, carbon emissions and contribute to their financial and operational goals. However, it's not a catch-all solution all for every application. We always suggest beginning with a condensed preliminary assessment before too much time, energy and capital is wasted; it's all about efficiency. There are often times when we quickly instruct our clients to not make any changes to their existing supply, even before arriving at the audit or detailed assessment stage. Sometimes the business case doesn't support the investment in a system. A qualified solutions team will be able to model a detailed capital cost recovery report and pinpoint the savings to the penny. If a viable solution is available, a fully informed discovery and evaluation can quickly lead to self-sufficiency and pulling the plug on a never-ending supply of liquid nitrogen. BP

About the Author

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About Purity Gas Inc.

Purity Gas is a industry leader in high efficiency nitrogen gas generation design and implementation. Our mission is to engineer and deliver world class solutions empowering nitrogen users to produce their own endless supply of nitrogen gas, while contributing to their economic, safety and sustainability initiatives. For more information visit www.puritygas.ca

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Meat Processor Improves Uptime, Saves Costs with Compressed Air System Upgrade

By Mike Grennier, Compressed Air Best Practices® Magazine

➤ For decades, a major meat processor and packaging operation in Northern England did what many growing companies do when more compressed air is needed to meet demand: added another air compressor and then another air compressor and so on. Yet the company decided the strategy of adding equipment had run its course, especially given a positive outlook for continued growth and the need to resolve nagging issues with system downtime and compressed air quality.

The decision to start from scratch led to a compressed air system makeover, which included the replacement of small fixed-speed rotary screw air compressors scattered throughout the plant with a centralized compressed air system that not only eliminated problems encountered but also improved uptime, saved costs, and ensured ample capacity to accommodate future growth.

Plant Outgrows Piecemeal System

The meat processing and packaging plant is one of the company's numerous operations spread throughout the United Kingdom and Ireland. Started in 1975 as a consortium of farmers, the company has since built a reputation as a leading supplier of premium and fresh sliced cooked meats for food retailers and food service companies throughout Europe with annual revenues in excess of $2 billion.

By upgrading its compressed air system, a leading meat processor in Northern England improved production uptime and ensured the delivery of high-quality compressed air for years to come.

Compressed air at the expansive processing and packaging facility is the main source of production power and is used for a diverse range of applications, from controlling valves on cooking equipment to powering pneumatics on automated conveying systems and thermoforming packaging lines.

Since the plant began operation, it steadily added production capacity and expanded to keep pace with demand for its products. All the while, decision-makers took a conservative approach to the compressed air system by installing various brands of new air compressors and auxiliary equipment when and where needed throughout the facility.

The compressed air system eventually grew to include 10 rotary screw air compressors, which ranged from 10 to 20 horsepower each, and delivered up to 460 scfm of compressed air to production and packaging lines. The original system also included eight refrigerated dryers and an equal number of wet receivers, some of which were paired with two air compressors – depending on the production process and air quality needs involved.

Over time the aging piecemeal compressed air system began to falter and became increasingly difficult to maintain. Additionally, the addition of two thermoforming lines at the plant drove the decision to explore a more reliable and cost-effective strategy for supplying the facility with compressed air for both immediate- and long-term needs.

Reliability a Top Priority

The addition of the thermoforming lines shed light on the plant's vulnerability to serious and unacceptable problem since it clearly demonstrated how the facility outgrew the existing compressed air system. It also placed even more emphasis on the need to put issues of inefficiency and serviceability behind it.

A major issue was the inability of the system to deliver enough compressed air needed for production during periods of peak demand. As such, some production areas struggled to maintain productivity since a sufficient supply of air was not always available. The addition of the thermoforming lines would only worsen the problem. It also wasn't unusual for any one of the air compressors to require service, creating the need to bring in rental air compressors to maintain production until work was completed on the unit being serviced.

Equally troublesome were near-weekly production shutdowns as a result of problems with the quality of air delivered by the compressed air system. The problem occurred when water made its way past the dryers into the compressed air pipeline supplying production areas, and as a result, caused frequent failure of control valves on equipment located throughout the plant.

Air treatment issues, combined with the complexity of maintaining aging equipment and reliability, drove the need to upgrade the compressed air system, which included a mix of air compressors from various manufacturers.

Problematic Compressed Air Configuration

To more strategically address the issues, decision-makers analyzed the plant's compressed air use to gain an accurate picture of demand. The team also vetted a number of compressed air service companies to gain ideas for resolving the issues and equipping the plant

Meat Processor Improves Uptime, Saves Costs with Compressed Air System Upgrade

with a system capable of providing high quality air to the operation for years to come.

The team ultimately chose to partner with BOGE Compressors U.K. (https://uk.boge.com/en) to design and install a new centralized system ideally suited for the plant. BOGE UK, based in Huddersfield, England, is a subsidiary of BOGE KOMPRESSOREN Otto Boge GmbH & Co. KG, based in Bielefeld, Germany.

A key issue to address, said BOGE U.K. Project Manager Neil Gibson, was the configuration of the existing compressed air system.

"The plant had a single galvanized piping system with 10 air compressors linked to it, which created areas of pressure drop typically at points of use at the end of the distribution line," Gibson said, adding the physical location of some air compressors and dryers also needed to be addressed.

"Some of them were located in the roof void of the plant between the ceiling joists and the roof with production ovens located beneath them," he said. "The temperature in the space was tremendously high, especially during the summer months. In addition, there wasn't enough air circulation in the space to cool the air compressors. The dryers were not getting air down to the proper pressure dew point, which let condensate into the piping system."

Condensate, as well as particulates, entering the piping system caused pneumatically controlled valves on production equipment to malfunction, which led to production shutdowns. With the need to improve uptime and develop a more effective approach to compressed air, decision-makers decided the best option was to start with a clean slate.

"The service costs for the compressed air system were spiraling out of control and the decision to keep buying another small air compressor and dryer and install it somewhere where they had pressure drop was no longer an option, especially with continued growth," Gibson said. "The company wanted somebody to come up with the right solution."

Centralized Compressed Air System

Working closely with the plant, BOGE U.K. determined the best option was to replace the existing air compressors and related equipment with an efficient centralized compressed air system and a new piping network able to reliably deliver high-quality compressed air throughout all areas of the plant with capacity to spare.

Housed in a centralized air compressor room on the ground floor, the system includes two, fixed-speed BOGE S-3 air compressors and a Variable Speed Drive (VSD) S-3 air compressor. Each fixed-speed 75-horsepower (hp) air compressor is rated to deliver 309 scfm at 115 psig. The 75-hp VSD unit is rated to deliver 340 scfm at 115 psig. Compressed air travels from air compressors to 793-gallon wet receiver tank and through a pre-filter and into a 918-scfm-rated BOGE Fridge Desiccant Adsorption Dryer (FRDA) tandem dryer.

The unique tandem dryer uses a combined refrigeration and adsorption drying process to deliver a pressure dew point of -40°F (-40°C). The dryer operates by passing compressed air through a standard pre-filter, which protects the cooling circuit and efficiently removes most of the water vapor. This is followed by adsorption drying and additional filters for oil aerosols and particle separation. The moisture contained in the air at this stage is reduced to the target pressure dew point before the clean, dry compressed air is passed to the air-air heat exchanger. The air is then heated again and delivered to an after-filter before entering the newly designed pipeline network. The dryer and air filtration system together are designed to achieve moisture removal, particulates and oil to ISO 8573-1: 2010 Air Quality Purity Class 4, Class 2 and Class 2, respectively.

Ring Main Key to New Piping Network

Designing "the right solution" included replacement of the galvanized piping system with a new, BOGE EasiFit, 2.5-inch-diameter aluminum distribution piping system.

The approach involved the installation of a ring main (or looped piping system) encircling the

Meat Processor Improves Uptime, Saves Costs with Compressed Air System Upgrade

The meat processor's upgraded compressed air system features three BOGE S-3 air compressors located on the ground floor of the operation.

The newly installed centralized compressed air system gives the meat processing operation 40% additional capacity to accommodate future growth.

production plant. Installed in the roof void, the system incorporates branch pipe connections for serving compressed air points of use. The new piping network, said Gibson, allows for more uniform compressed air supply.

"By creating a ring you allow the system to consistently provide equal distribution of compressed air, which lessens the potential for pressure drop at any point in the system," he said. "The use of lightweight aluminum piping with push-fit connections also helped with the installation, especially since it the roof void can be hard to access and using galvanized steel would've made things difficult. Drops can also be quickly added where needed as the plant makes changes and continues to expand."

Production Uptime Improves

Since the new compressed air system began operation, the meat processing and packaging plant has significantly improved production uptime and eliminated costs for rental air compressors.

Today, the plant normally operates one fixed-speed air compressor at near 100% capacity as a baseload unit, while the VSD air compressor picks up the additional workload when needed. Each fixed-speed machine is rotated on a weekly basis, allowing for system redundancy and ensuring consistent wear on both units. Additionally all three air compressors are equipped with BOGE focus control 2.0, which automatically sequences the machines and delivers the appropriate volume of air based on based end-user demand.

Looking ahead, the centralized system also gives the plant 40% additional capacity to fulfill the plant's need for compressed air to accommodate continued growth. Importantly, Gibson said, decision-makers at the plant are able to focus on the business of production and supplying the market with quality meat products.

"After the engineering manager at the plant saw how the new system performed, he said 'the system just runs' and he's glad because he doesn't have to think about it. The main thing for us is that the plant is pleased with what we've done," Gibson said. BP

For more information on BOGE America, Inc. visit https://us.boge.com/en-us. All photos courtesy of BOGE U.K.

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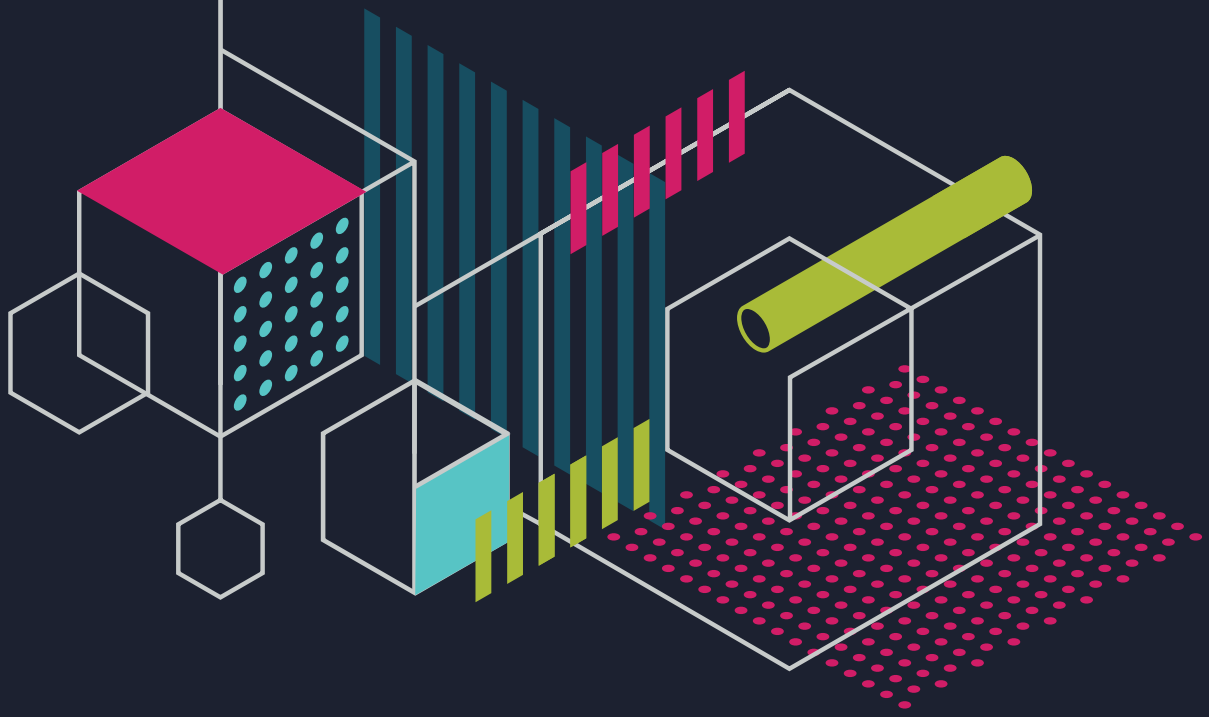

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Are My Pulse Jet Dust Collectors Wasting Compressed Air?

By Kevin Cardwell, Airdusco Engineering and Design Services

Pulse jet dust collectors are common air/material separators in the food industry serving as dust collectors, bin vents, and pneumatic conveying filter/receivers. The biggest complaint I've heard from plant managers and plant engineers about these is that "these collectors don't make us any money". While that is true, they can COST a plant a significant amount of money if they aren't maintained. Wasted compressed air is one of the worst offenders, as it not only costs the plant in energy costs associated with creating and conditioning the air, but also in premature bag failure from improper cleaning, production downtime, and inefficient dust collection leading to increased housekeeping requirements, and other many issues.

Compressed Air Manifold Cracks and Separations.

A clean air plenum with pulse tubes blown out of their couplings. Author's Note: I apologize for the picture quality. The clean air plenum was very dusty, and the airborne dust created by opening the door was reflected in the camera flash.

How can you tell if your pulse jet units are wasting your compressed air? To understand some of the issues that can cause wasted compressed air, we need to first look at how the units operate. Then we'll look at simple ways of discovering, fixing, and preventing the issues that cause the compressed air to be wasted.

Basic Operation of Pulse Jet Dust Collectors

The unit takes in dust-laden air and exhaust clean air. The dust collects on the outside shell of the filters. Pulse jet units use compressed air to clean the dust off of the filters. Air volume and pressure requirements will vary. The cleaning cycle starts when the timer board or controller fires the solenoid valve. When this happens, the solenoid actuates the diaphragm valve, which opens and pushes air into the pulse tube. The air is directed into the inside top of the filters and "walks" its way down the filters, causing the dust to loosen and fall off the outside of the filters. This cleaning keeps the system operating within the designed parameters.

Over the last thirty years or so, I have seen thousands of installed pulse jet units. A vast majority of them had issues that wasted compressed air in some way. These issues fall into two general categories: Maintenance Issues and Operational Issues.

Maintenance Issues

Faulty Diaphragm Valves – Worn-out springs or cracked, brittle diaphragms lead to air leaking into the cleaning tube, but not at the correct pressure to clean the filters. Depending on whether the pilot or main spring and diaphragm are damaged, the leak can be continuous, wasting hundreds of cubic feet of compressed air per hour.

The easiest way to diagnose these issues is to listen to the collector. Is the pulse a sharply defined "pop" sound, or more of a "shhhh" sound. Anything other than a "pop" indicates

Are My Pulse Jet Dust Collectors Wasting Compressed Air?

that you have issues inside a diaphragm valve. To determine the correct one without waiting for the system to pulse again or disassembling the valve, you can manually pulse the filter. Most solenoid valves that actuate the diaphragm valves have an opening on the bottom that you can stick a paperclip into and manually pulse the valve. Make sure to let the manifold recover pressure before moving to the next solenoid.

Leaks – There are numerous ways a pulse jet cleaning system can leak. The most obvious are holes in the manifold; disconnected, cracked, or broken compressed air lines; loose, cracked, or broken flex connections; and loose pipe unions or compression couplings on the pulse pipes. A less obvious leak would be disconnected pulse pipes (either left off after a filter change or blown off during operation).

Visual evidence of leaks between a diaphragm valve and the compressed air header.

A misaligned pulse tube blew a hole in this bag filter in less than a month.

Exterior leaks can be found in a number of ways. Listening to the collector while it is in operation and during a shutdown. You can usually hear air leaks. This might not pinpoint the leak, but it can give you a reason to investigate more closely. There are several portable detectors available that listen for and map leaks from a distance. You can often see the results of leaks.

Other maintenance issues that can lead to wasting compressed air include low air pressure, water in the compressed air, and incorrectly aligned pulse tubes. Even if you have a compressed air dryer in your air compressor room, you can have water in your air outside at the collector. Cleaning with wet air can prematurely impinge the filters. The very act of cleaning the filters is a waste of compressed air if you are blinding them instead of cleaning them. Incorrectly aligned pulse tubes also do not clean the filters (again, wasting the air), and can actually blow holes in the filter media leading to further problems.

These issues are a little more difficult to discover. Telltale signs of water in your compressed air line or header include filter differential pressure increasing more rapidly than expected and/or not decreasing when the filters are being cleaned and also moisture freezing in the compressed air lines or header. You can verify this by draining the header and checking the filters for signs of moisture. Signs of incorrectly aligned pulse tubes include filter differential pressure increasing more rapidly than expected and/or not decreasing when the filters are being cleaned, a sudden drop to near zero differential pressure (also a sign of a hole in a filter or filters). Verification of

this requires inspecting the pulse tubes in the clean air plenum. Low air pressure is wasting air by not efficiently cleaning the filters while still using large quantities of air to have little to no impact. Pressure requirements vary by manufacturer, model, and size of pulse jet dust collectors, but a general rule for this is 80-100 PSIG of clean, dry compressed air.

Preventing Maintenance Issues

One way to prevent some of these issues is to install a water trap with an automatic dump in the compressed air line just prior to the compressed air manifold on each pulse jet dust collector. This not only prevent the issues discussed previously, but also eliminates the need to heat the compressed air lines on the dust collectors to prevent the lines from freezing in winter.

A preventive maintenance program should include daily (or once per shift) checks of filter differential pressure on each pulse jet unit, looking and listening to each collector while online to check the pulsing sound and frequency, and checking each filter cleaning manifold compressed air pressure before and after pulses, along with weekly, monthly, and longer-term PM checks. An efficient and effective way to accomplish this is to make one person on each shift responsible for the dust collectors. After a very short time, they will be familiar with the differential pressure trends and the sounds the collector makes when it's operating properly and when it has issues. When we do maintenance training, we recommend that the designated person come from a utility-type position. This position gives the selected person a bump in pay as well as a path for growth in the facility by making them a part of the maintenance division.

Operational Issues

Long or Short Pulses – As with the pressure and volume requirements, different manufacturers recommend different pulse times. When we troubleshoot issues with the cleaning system on pulse jet collectors, we recommend 300–500 milliseconds. This is enough time to allow a solid "pop" of air, without an additional "Shhhh" with it. Any air that is used after the initial pop is wasted, as the reduced pressure available after the initial "pop" does not increase the cleaning. Shorter pulses may not allow enough air to clean the filters all the way to the bottom, causing premature filter impingement. As previously stated, inefficient cleaning is a waste of compressed air. Pulse time can be set on the timer board or controller.

Pulsing Too Frequently – We are often asked, "What is the correct delay between pulses?" Our answer is always "Long enough for the manifold to recover to the correct pressure." It seems simple, but we frequently see a combination of pulsing too long and too frequently. If the compressed air manifold does not refill back to the right pressure, the result is an ever decreasing manifold pressure and inefficient cleaning, which is (again) a waste of compressed air. Pulse delay time can be set on the timer board or controller.

Pulsing Sequence – This one may seem counterintuitive, but pulsing the filters in row order is a waste of air. For example, you have a pulse jet collector that has 10 rows of filters. Your pulsing sequence starts at row 1, then rows 2, 3, etc. After row 1 has been cleaned, the static pressure required to pull air through this row of filters is less than the other rows. Air will always take the path of least resistance.

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When you pulse row 2, the dust is carried back to row 1 by the air being filtered, which basically negates some of the cleaning you just did on row 1. The sequence continues. Inefficient cleaning of the filters is the result and is a waste of compressed air (a repetitive theme in this article).

Pulsing by row order can be detected by listening to the collectors while they are cleaning. To change the order, re-land the wires on the timer board. We recommend moving at least two or three rows away if possible. For instance, in a filter with 10 Rows, our recommended sequence would be 1, 4, 7, 10, 2, 5, 8, 3, 6, 9, repeating.

Pulsing Continuously vs Pulsing On-Demand – The majority of pulse jet filters start their cleaning cycles when the filter in placed online, and these pulses continue until the filter is shut down. This is necessary for some materials, and all that is required is a timer board, smart controller, or a sequencing loop in a PLC. For damp, sticky, or hygroscopic materials, this may be required; however, if your material does not require continuous pulsing, pulsing on demand is an option. Most filter media manufacturers consider that a filter with a "cake" of material makes the filtration more efficient. If the filter is continuously pulsing, this is not possible because the "cake" of material is always being removed.

Pulsing continuously can waste air by cleaning the filters when they don't need it. It can also cause premature filter failure. To change to pulsing on-demand, you will need a differential pressure gauge that can be set at two different pressures (a high differential pressure to start the cleaning sequence, and a low differential pressure to stop the cleaning) and have relays capable of starting and stopping power to the timer board, or switching discrete inputs to a smart timer or PLC. We typically recommend using 4" w.c. as the starting point for pulsing and 3" w.c. as the stopping point. The actual pressure can vary based on the application, but a 1" w.c. range is always recommended.

It is impossible to cover every possible way that compressed air can be wasted in and around pulse jet dust collectors in this article, but I hope this has given you some additional tools to use to save time and money in your facility. BP

About the Author

Kevin Cardwell, CFEI, CFPS is the Operations Manager for Airdusco Engineering and Design Services, LLC. In over 23 years at Airdusco, and 30 total years in pneumatic conveying and dust collection, he has designed and started-up hundreds of systems, and has diagnosed and solved system and equipment issues in hundreds more. He can be reached at 901-362-6610 x 3104 or kcardwell@airdusco.com.

About Airdusco

Airdusco Engineering & Design Services, LLC is a specialty engineering and consulting firm based in Memphis TN with focus and expertise in the following areas: Combustible Dust Consultation & Dust Hazards Analysis, Audits of Existing Dust Collection Systems, Engineering and Design Packages and Technical Support & Field Services. www.airduscoeds.com

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COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

Sullair 1600H Portable Air Compressor

Sullair, an industry leader in innovative compressed air solutions since 1965, introduced its next generation 1600H Tier 4 Final portable air compressor. Redesigned with a focus on enhanced usability, the compressor is built with reliability, durability and performance in mind – the three pillars driving the quality of all Sullair compressors since the company's founding. "Sullair customers are accustomed to compressors that are reliable and durable," said Rus Warner, Vice President of Rental and Infrastructure Sales and Service for the Americas at Sullair. "On the performance side, we continue to incorporate innovative features to make the day-to-day operation of the compressors even better, especially relating to runtime and serviceability." The new 1600H compressor is available in three Tier 4 Final emissions compliant, diesel engines: Caterpillar C15, Perkins 2506J and Cummins QSX15.

Sullair, www.sullair.com

CAGI Updated Chapter in Handbook

The Compressed Air & Gas Institute (CAGI) is pleased to announce that an updated version of Chapter 4-Compressed Air System Design of the Compressed Air and Gas Handbook is now available for download from the CAGI website. Chapter 4 is a comprehensive review of how to properly design, install, operate, and maintain a compressed air system to ensure it is an efficient source of power. This chapter focuses on the roles that key system parameters play in achieving the ultimate goal of a well-designed compressed air system. The eight-chapter Compressed Air and Gas Handbook is undergoing an extensive revision to bring its content up to current levels of technology and application regarding compressed air. Chapter 4 joins Chapters 1, 2, 3, and 5 as being revised and they replace the Chapters of the sixth edition of the Handbook that are currently posted on the CAGI website.

Compressed Air and Gas Institute, www.cagi.org

Atlas Copco AIRkeeper Remote Monitoring System

Remote monitoring and control for the G-range of compressors is now available with Atlas Copco's newest mobile app, AIRkeeper. Designed for G-ranges between 10-30 horsepower, users can control the compressor's operating parameters anytime, anywhere using a Bluetooth connection from either a smartphone or tablet. The fully programmable AIRkeeper offers several features, including remote starting and stopping, adjusting the pressure band and even a leakage detection program to ensure the compressed air system is working optimally. Importantly, the real-time monitoring systems notifies the user immediately if the compressor needs attention. The app also stores all booklets and instruction guides needed for the compressor. "AIRkeeper was designed specifically with the end-user in mind to provide easy, secure access to pivotal information," said Trey Ragsdale, vice president of industrial air for Atlas Copco Compressors in the U.S.

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

Rogers Machinery New Brand Name

Rogers Machinery Company, Inc. is proud to announce that we are changing the brand name of our Kobelco KNW Series OilFree rotary screw air compressors to Rogers KNW Series. Our compressors will remain powered by Kobelco's OilFree rotary screw technology, reaffirming our strong 36-year relationship with Kobelco and its subsidiary Kobelco Compressor Manufacturing Indiana. "The new logo is an update to the same great quality product we've been providing, while more clearly representing Rogers Machinery's lead in design, packaging, testing, technical and aftermarket support", said Lane Hawkinson, Director of Global Sales at Rogers Machinery. "The global marketplace depends on the Rogers KNW Series OilFree compressors for reliability, energy efficiency and aftermarket support. This all continues with the new identity," said Andrew Ragen, CEO and President of Rogers Machinery.

Rogers Machinery Company, Inc., www.rogersmachinery.com

COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

Ingersoll Rand 1-15 HP Oil-Less Air Compressor

Ingersoll Rand, a global leader in compressed air and gas systems and services, has introduced the 1-15 HP Oil-Less Reciprocating Air Compressor. The compressor helps hospitals, laboratories, breweries, food and beverage facilities, and water and waste management plants meet requirements for reliable oil-free air and continuous duty cycles. "For customers who need 100% oil-free air, the Ingersoll Rand Oil-less Reciprocating Air Compressor is a robust option in a familiar reciprocating format that customers find approachable," said Derek Davis, Product Manager at Ingersoll Rand Industrial Technologies and Services. The oil-less reciprocating compressor design has a completely dry crankcase to achieve its 100% oil-less specification. In lieu of oil for lubrication, sealed greased bearings yield up to 10,000 hours of oil-less operation. For applications that require oil-free air, the oil-less reciprocating compressor offers an affordable, powerful solution.

Ingersoll Rand Inc., www.IRCO.com

FS-Elliott R2000 Control Panel

FS-Elliott, a leading manufacturer of oil-free, centrifugal air compressors, has announced the launch of the R2000 Control Panel. The R2000 features all the options of the existing R1000 model but includes numerous new or upgraded features expanding the capability to control the compressor. One of the most exciting features of the panel is the Energy Advisor. This feature allows plants to monitor and manage energy usage via the control panel. Designed with the focus on energy efficiency and enhanced user accessibility, the R2000 is an easy to use, innovative, and feature rich configuration, created using years of experience with centrifugal compressors. With a broad range of standard and optional features, including increased analog and digital I/O Points, the control panel can also meet the retrofit needs of the legacy FS-Elliott products, while allowing users to ensure that their system is operating at peak efficiency.

FS-Elliott, www.fs-elliott.com

Yannick Koch Named BEKO Managing Director

Yannick Koch joined the management team of the manufacturer specializing in compressed air and compressed gas technology on January 1, 2021. The eldest son of company founder Berthold Koch will work in a team with his colleague Norbert Strack to drive forward the digital transformation in the product portfolio of the family-owned company. The previous Managing Director Manfred Lehner is retiring after almost 30 years of meritorious service to BEKO TECHNOLOGIES. As the new Managing Director, Yannick Koch is responsible for Sales, Service, Product Management, Marketing and Human Resources. Co-Managing Director Norbert Strack will now take over Finance and IT in addition to his responsibilities for Research and Development, Production, Supply Chain and Quality. Together they will push the focus on customer orientation, quality and innovation within the corporate strategy and increasingly target the markets in Asia, Central and South America.

BEKO Technologies, www.beko-technologies.us

Enmet ProAir 2200 Compressed Airline Monitor

Contamination from compressed air is a major source of concern for the thousands of factories operating in many segments of the food and beverage industry. ENMET's ProAir 2200 compressed airline monitor is designed for monitoring process air quality during manufacturing processes that use compressed air. The ProAir 2200 can continuously monitor up to four gases that may be present in compressed air including carbon monoxide, oxygen, dew point, carbon dioxide, VOCs, trace hydrocarbons and many other gases associated with process compressed air usage.

Enmet, www.enmet.com

COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

VPInstruments Introduces VPFlowScope In-Line 3/8 Inch

VPInstruments, manufacturer and worldwide supplier of measurement and monitoring equipment for compressed air and gas, is proud to introduce the innovative VPFlowScope In-line 3/8 inch for smaller diameters. Obtain all the data you need to optimize your oxygen and/or compressed air consumption. With the pioneering smaller diameters, the VPFlowScope In-line 3/8 inch is the perfect solution to measure low flows of compressed air and oxygen at the point of use. The VPFlowScope In-line 3/8 inch can measure flow, total flow, and temperature simultaneously. Its Modbus and analog outputs enable you to interface with VPVision or other energy monitoring systems.

Installation is simple, and its size is compact. Moreover, the VPFlowScope In-line 3/8-inch features 2-line TFT display with real-time information and configuration keys, which enhance user visual insight at first blush.

VPInstruments, www.vpinstruments.com

FLIR Vibration and Temperature Monitoring Kit

Often before industrial machinery start showing issues that require immediate maintenance, pending problems can be detected through minute vibration changes. Therefore, the first component of effective condition monitoring is a combined remote vibration and temperature sensing monitoring solution. Manufacturing facilities from paper mills, to food and beverage processors to the oil and gas industry benefit from 24/7 remote condition monitoring of critical infrastructure and machinery. By combining the power of FLIR's vibration and temperature detection, industries now have a complete solution kit that maximizes production output, improves worker safety, and reduces operational costs. Vibration detection not only provides early warning to help eliminate maintenance surprises before they happen, but it also empowers staff to prioritize and streamline its maintenance schedule to maximize efficiency while reducing down-time.

FLIR Systems, Inc., www.flir.com

Exair Intellistat Ion Air Gun

EXAIR's patented Intellistat Ion Air Gun is a handheld and lightweight solution to static elimination in clean processes or sensitive assembly work such as scientific and electronic test facilities, laboratories, and clean rooms. The Intellistat was designed to consume minimal compressed air while simultaneously delivering precise blow-off, and exceptional static decay rates capable of reducing 1000 volts to less than 100 in less than a second at up to 24" away. This Intellistat is activated with a comfortable, ergonomic short throw trigger which requires minimal effort. Constructed with a low voltage transformer converting 120V to 24V, it was designed to ensure user safety, in addition to using an EXAIR engineered air nozzle to maximize efficiency and meet OSHA requirements for sound level and dead-end pressure.

Exair, www.exair.com

SPX FLOW Appoints Sonya Roberts to Board of Directors

SPX FLOW, Inc., a leading provider of process solutions, has appointed Sonya McCullum Roberts as an additional independent director. "Ms. Roberts brings an attractive combination of P&L ownership, business marketing, customer focus and leadership experience to SPX FLOW," said Anne Altman, Board of Directors Member and Chair of the Nominating & Governance Committee. "Her strong knowledge of the food and industrial markets, along with her track record of driving strategic investments to fuel growth, align well with SPX FLOW's strategy." Ms. Roberts is the President and Group Leader for the Salt business at Cargill Incorporated, where she has held several leadership positions for the past 12 years. Prior to joining Cargill, she spent 19 years at ConocoPhillips. She holds a bachelor's degree in Business Administration from the University of North Texas.

SPX FLOW, Inc., www.spxflow.com

COMPRESSED AIR INDUSTRY & TECHNOLOGY NEWS

Pattons 75 Years in Business

Pattons, a leading distributor of industrial compressed air systems and services and a subsidiary of ELGi Equipments Limited, announced they are celebrating 75 years in business. Pattons is a trusted name for the supply and service of air compressors, with multi-brand parts and service supporting thousands of satisfied customers. The company recently held a grand opening and ribbon cutting ceremony for their new main office location in Charlotte, NC. "The celebration of our 75th anniversary is a testament of our ability to endure regardless of economic and market conditions. It is truly an incredible milestone for the organization. Pattons longevity has been accomplished through the dedication of employees who exemplify a continued commitment to improve compressed air solutions and provide value for our customers," said David Puck, President, ELGi North America.

Pattons, www.pattonsinc.com

Festo Valve Manifold with Integrated Safety

Festo introduces to a unique pneumatic valve manifold that enables up to Performance Level-d Category 3 safety through an integrated serial bus backplane for pneumatics. The "C-Bus" plug-and-play integration simplifies, speeds up, and lowers component costs when installing pneumatic safety circuits, which are specifically for safe exhausting and preventive start-up. The new VTSA-F-CB valve manifold offers serial communication that enables up to three safety-shutdown-groups per manifold. The VTSA-F-CB is compatible with combinations of pilot air control valves, soft-start exhaust valves, proportional valves, and vacuum generators. "The VTSA-F valve manifold platform, a long-standing product in automotive applications, now offers with its C-Bus variant the ability to control downstream valves and devices via an integrated C-Bus backplane," said Frank Latino, Festo Product Manager.

Festo, www.festo.us

Lupamat New Generation Premium Series

Lupamat Compressor introduced the new generation premium series. The Premium series stands out with maximum performance and ultra-quiet features in difficult conditions. The new generation premium series, produced by developing the Industry 4.0 infrastructure, has been developed for different operating conditions as well as remote control, data analysis, and fault feedback support. Another advantage of the new design is its low rpm operation, long maintenance intervals and warranty period. The maximum rpm is 1700-2000. The Premium series, which stands out with its ease of maintenance and short service times, has provided a significant advantage in energy savings to users. There are two oil injected screw models in the series. The direct drive has a range of 22-315kw and the direct drive with variable speed has a range of 11-450kw.

Lupamat Compressor, www.lupamat.com

Ashcroft 1147 Low Differential Pressure Gauge

The new Ashcroft 1147 differential pressure gauge delivers a high quality, cost effective measurement solution for tank level, filtration and flow monitoring. Available in 4 ½" and 6" diameter dials, the 1147 introduces a 270° dial arc for increased resolution. It also features an upgraded movement that ensures smoother pointer motion when subjected to shock and vibration. This gauge is available in low DP ranges from 30 to 2000 in. H_2O and manages liquid or gas pressures up to 1000 psi. Options include additional body materials and various mounting capabilities along with a switch feature for control of a pressure alarm or shutdown. The case is designed to allow easy removal of the gauge window for cleaning.

Ashcroft Inc., www.ashcroft.com

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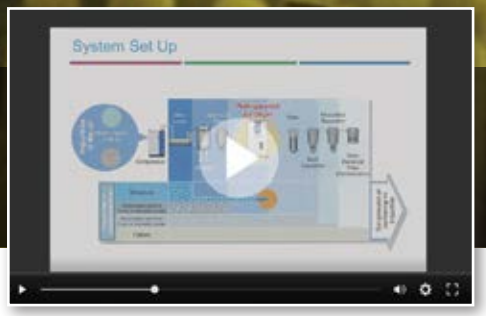

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