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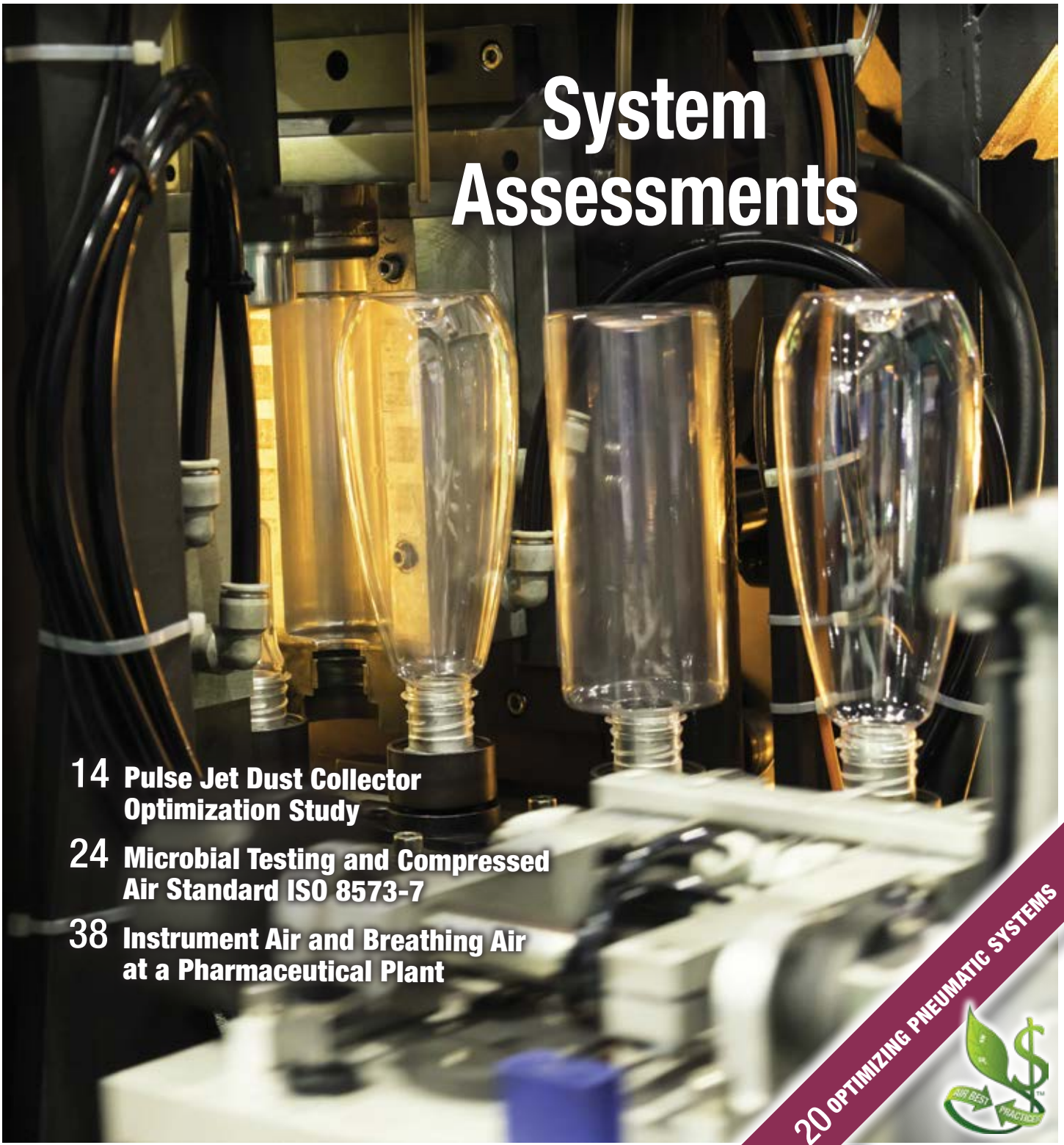

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FROM THE EDITOR | System Assessments

The content in this issue reminded me, that after 26 years in this business, I have a lot yet to learn about compressed air systems. Russell Morine, from The Baker Group in Iowa, left my knowledge quickly in the dust (ha!) with his knowledge of pulse jet dust collection systems. Dust collectors are one of the larger users of compressed air in many industries. His article provides an example of the system assessments he performed at a flour-based frozen foods manufacturer to significantly reduce their compressed air consumption. A compressed air guru once told me true improvements are "effortful." This is a perfect example.

When visiting a food processing show, earlier this year in Portland, I was pleased to meet Bill Nevills from Valin Corporation. He is a Certified Fluid Power Specialist advising OEM's and factories on how to optimize pneumatic circuits. He's observed significant advances in pneumatic technology over the past ten years. I hope you enjoy his article reviewing proper pneumatic component selection and sizing.

"Microbial Testing and Compressed Air Standard ISO 8573-7" is the title of the article provided to us by Maria Sandoval, a Microbiologist at Trace Analytics. I really enjoyed digging into terms like "colony counts" and petri plates when reading and trying to take my compressed air purity knowledge to the next level – a level required by many users of compressed air. I do believe more plants should be verifying/testing their compressed air quality.

Open blowing, often used for drying or cleaning products, is a very common inappropriate use of compressed air. Hank van Ormer provides us with his third article, covering "Mistakes in Compressed Air System Design," where he outlines efficient options to solve this system issue often seen on production lines.

A pharmaceutical plant has two compressed air systems experiencing problems with production efficiency, issues with dryers and high energy costs. Ron Marshall sends us another interesting system assessment story where production was stabilized and energy costs of the two systems were reduced 46 and 64 percent respectively.

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

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

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

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INDUSTRY NEWS

Cummins-Wagner Appointed Sullair Distributor

Sullair, an industry leader in innovative compressed air solutions since 1965, is pleased to announce Cummins-Wagner Co., Inc. has been appointed an authorized distributor for Sullair Commercial and Industrial Products in the Eastern US. As an authorized distributor, Cummins-Wagner will provide full customer sales and support for Sullair equipment, parts, service and warranty.

"Cummins-Wagner is a solid addition to our distributor network in the U.S. Mid-Atlantic region," according to Brian Tylisz, Vice President Commercial and Industrial Sales, Sullair. "Their company culture and growth mindset are very much aligned with our own business, and we couldn't be more pleased to have them onboard. Cummins-Wagner's longevity, deep knowledge of their local markets, and commitment to service all speak to the integrity of the business and to their strength as a partner."

Cummins-Wagner Co. will carry the full line of Sullair oil flooded compressors from 5 to 600 hp, plus the complete line of oil free and centrifugal compressors up to 30,000 hp. Cummins-Wagner will also sell, install and support the full Sullair air treatment and aftermarket line, including compressed air dryers/filters/drains, industrial vacuum systems, flow controllers and Sullair Genuine Parts.

"We are excited about our partnership with Sullair," says Doug Ardinger, President of Cummins-Wagner. "Their commitment to the customer, distributor, quality and product development is well known in the industry. It makes them a perfect fit with our business philosophy of being the leading solutions provider for compressed air applications. We look forward to growing and improving our sales, service and packaging capabilities with the Sullair product line."

Cummins-Wagner Co. is a 100% Employee Owned Company that specializes in the sales, service and packaging of compressed air products. They are headquartered in Annapolis Junction, Maryland with branch offices in Salisbury, Maryland; Ashland, Virginia; and Elizabethtown and West Chester, Pennsylvania. For more information about Cummins-Wagner Co. visit www.cummins-wagner.com.

About Sullair

Since 1965, Sullair has developed and manufactured air compressors with proven reliability and wear-free durability. Sullair is globally recognized as a leading manufacturer of air compressors for use in manufacturing, oil and gas operations, food processing, construction and more. The Sullair compressor line includes oil flooded as well as oil free compressors, including rotary screw, scroll, and centrifugal options. Sullair also offers a complete line of construction air tools, compressed air treatment equipment and vacuum systems. Customers around the world keep their compressors running optimally with a full line of aftermarket parts, fluids and services. Sullair has manufacturing capabilities in Michigan City, Indiana; and Shenzhen and Suzhou, China; as well as a JV (IHI-Sullair) based in Suzhou. For more information, visit www.sullair.com. Sullair is A Hitachi Group Company.

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nano-purification solutions joins forces with AKG Thermal Systems

nano-purification solutions, Charlotte, NC has joined forces with AKG Thermal Systems as their national channel partner for the compressed air distribution channel for North America.

"We have focused on expanding our compressed air cooling market share and we believe nano is the best partner to help us achieve our goals. Through our partnership with nano, we believe we have the best opportunity to leverage our compressed air cooling technologies in the compressed air distribution channel," said AKG Vice President, Gary Chestnut.

"The relationship with AKG is a natural fit for nano and our sales team, expanding our extensive range of compressed air treatment products to our distribution network. The quality of the AKG product and their commitment to customer service aligns with our Experience. Customer. Service focus at nano. We are excited to have the opportunity to align ourselves with AKG and provide future growth for both companies," said nano Director of Distribution, Nick Herrig.

AKG Thermal Systems is a division of AKG North America located in Mebane, NC. AKG Thermal Systems is a leading supplier for standard catalog cooling products for the industrial and portable compressed air markets. AKG Thermal Systems offers a wide variety of brazed air-cooled aluminum coolers for oil, air and water/glycol mixtures.

For more information visit www.n-psi.com

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INDUSTRY NEWS

EPA Announces 2017 ENERGY STAR® Certified Manufacturing Plants

The U.S. Environmental Protection Agency (EPA) announced that 93 manufacturing plants earned ENERGY STAR certification for their superior energy performance in 2017. Together, these plants reduced their energy bills by almost $340 million, saved more than 60 trillion British thermal units (TBtu) of energy, and achieved broad emissions reductions, including 4 million metric tons of greenhouse gas emissions. The energy savings is enough to meet the annual energy needs of almost 360,000 American households.

"Earning ENERGY STAR certification is a real mark of excellence, highlighting companies that are leaders in cutting energy costs and reducing waste," said EPA Assistant Administrator for Air and Radiation Bill Wehrum. "This program is in direct line with the administration's priorities to support American manufacturing— greater efficiency fosters industrial development, greater competitiveness, a strong economy, and a healthy environment."

The ENERGY STAR industrial program provides industry-specific energy benchmarking tools and other resources for 17 different types of manufacturing plants. These resources allow an industrial plant to compare its energy performance to others in the same industry and therefore establish meaningful energy performance goals. Plants from the automotive, baking, cement, corn refining, food processing, glass manufacturing, pharmaceutical manufacturing, and petroleum refining sectors are among those that qualified in 2017.

Manufacturing plants earning ENERGY STAR certification for the first time in 2017

- American Cement Company: Sumterville, Fla. (cement manufacturing)
- Bimbo Bakeries USA: Auburn, N.Y. (commercial bread & roll baking)
- Bimbo Bakeries USA: Dubuque, Iowa (commercial bread & roll baking)
- Bimbo Bakeries USA: Fergus Falls, Minn. (commercial bread & roll baking)
- Bimbo Bakeries USA: La Crosse, Wisc. (commercial bread & roll baking)
- Bimbo Bakeries USA: Sioux Falls, S.D. (commercial bread & roll baking)
- CalPortland: Oro Grande, Calif. (cement manufacturing)
- Dave's Killer Bread: Milwaukie, Ore. (commercial bread & roll baking)
- Flower Baking Company: Tyler, Texas (commercial bread & roll baking)
- General Motors: Kansas City, Kans. (automobile assembly)
- Klosterman Baking Company: Cincinnati, Ohio (commercial bread & roll baking)
- Lehigh Texas Cement Company: Buda, Texas (cement manufacturing)
- Phillips 66 Company: Old Ocean, Texas (petroleum refining)
- Tate & Lyle: Loudon, Tenn. (corn refining)
- Treehouse Foods: Princeton, Ky. (cookie & cracker baking)

About the ENERGY STAR Industrial Program

Since 2006, the ENERGY STAR Industrial Program has annually certified manufacturing

plants for reaching the top 25 percent of energy performance in their industries nationwide. Over 190 plants have achieved this distinction since 2006. For more information, see: www.energystar.gov/plants. For specific plant profiles, see: www.energystar.gov/buildinglist. To learn more about how ENERGY STAR and industry work together, see: www.energystar.gov/industry

About ENERGY STAR

ENERGY STAR® is the government-backed symbol for energy efficiency, providing simple, credible, and unbiased information that consumers and businesses rely on to make well-informed decisions. Thousands of industrial, commercial, utility, state, and local organizations—including more than 40 percent of the Fortune 500®—rely on their partnership with the U.S. Environmental Protection Agency (EPA) to deliver cost-saving energy efficiency solutions. Together, since 1992, ENERGY STAR and its partners have helped save American families and businesses $430 billion on their energy costs—while also achieving broad emissions reductions—all through voluntary action. More background information about ENERGY STAR can be found at energystar.gov/about and energystar.gov/numbers.

Atlas Copco Donates Brewing Equipment to Colorado State University's Fermentation Science and Technology Program

Atlas Copco, a leading provider of sustainable productivity solutions, recently donated new brewing equipment to support Colorado State University's (CSU) Fermentation Science and Technology Degree Program. The oil-free air compressors, nitrogen generator, receiving tanks, electronic water drains and air filters will be used to keep the University's campus brewery running efficiently and support research that requires specific anaerobic environments.

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INDUSTRY NEWS

"Supporting education and developing future leaders has long been a commitment at Atlas Copco," said Craig O'Neil, account manager for western region of the U.S. at Atlas Copco. "Our recent donation gives CSU students access to the state-of-art equipment to ensure they can produce the highest quality beer possible."

Colorado State University celebrated the grand opening of the Lory Student Center on April 9, 2018, at the school's on-campus Raskeller Brewery. The brewery opened last year on the lower level of the student union and serves beers produced by the CSU Fermentation Science and Technology program.

"Atlas Copco's generous donation allows our program advisors the opportunity to demonstrate exactly how brewing technology operates," said Jeff Callaway, associate director of fermentation science and technology at Colorado State University. "Having the equipment in our campus brewery and classroom also allows our students to gain a better understanding of different compressor types and how they work to support brewing applications."

For more information about CSU's fermentation program, please visit http://www.fshn.chhs.colostate.edu/students/undergraduate/fermentation-science/.

Atlas Copco is a world-leading provider of sustainable productivity solutions. The Group serves customers with innovative compressors, vacuum solutions and air treatment systems, construction and mining equipment, power tools and assembly systems. Atlas Copco develops products and services focused on productivity, energy efficiency, safety and ergonomics. The company was founded in 1873, is based in Stockholm, Sweden, and has a global reach spanning more than 180 countries. In 2016, Atlas Copco had revenues of BSEK 101 (BEUR 11) and about 45,000 employees.

Festo Announces New $90 Million Investment Expanding Manufacturing in Mason, Ohio

Festo Also Announces Leadership Transition, Welcoming Dr. Nikolas Gebhard as Chief Operating Officer and Vice President of Product Supply for North America

The City of Mason and Festo, a German-based global corporation specializing in advanced automation technology for more than 40 industries, today announced the company will expand its existing state-of-the-art Regional Service and Manufacturing Center in Mason by approximately 350,000 square feet, nearly tripling the company's capacity in logistics, production and industrial training solutions offered through its Festo Didactic Learning Center, which serves manufacturing companies and colleges throughout the Tristate. Construction will be conducted in two phases and is expected to be completed by 2024. The company also plans to add 350 jobs in the fields of engineering, mechatronics, purchasing and material management, as well as production and logistics operations, over the next five years.

Festo, which maintains United States and North American regional headquarters in New York, first announced its move to Mason in 2013, opening doors in 2015 to a $50 million, 150,000 square-foot facility located along the I-71 Innovation Corridor. Festo's leadership team credits the strong foundation established with city, regional and state officials, as well as the opportunities the regional ecosystem provides in terms of talent, connectivity and innovation in Industry 4.0/Industrial Internet of Things (IIoT), as the impetus to locate and expand here. This new investment is a next step in maximizing the 47-acre campus acquired by Festo to meet growing demands in the North American market.

INDUSTRY NEWS

"Strong market growth in the U.S. and other North American countries requires us to expand our capacity in logistics and production to ensure product and service excellence for our customers," said Oliver Ring, Festo's global senior vice president of supply chain and logistics. "We are pleased and proud to announce this substantial expansion here in Mason, where our team feels welcome and at home. We look forward to a long future of collaboration and success with our customers and partners."

"As we continue to grow in the U.S. and North America, this strategic investment in production, logistics and supply chain excellence will enable us to better supply our customers long term," said Carlos Miranda, chief executive officer of Festo, North America.

"Digitalization trends around Industry 4.0 (IIoT) are driving fast-paced changes in the automation industry," said Rich Huss, president and chief executive officer, Festo U.S. "To keep up with and meet our customers' high expectations, this investment will allow us to increase local production and strengthen our regional supply chain long term."

"While this may seem like a traditional economic development announcement on the surface, this investment represents far more," said City of Mason Mayor Victor Kidd. "Our four-year friendship with Festo runs deep. Through its incredible generosity to our community and schools, Festo has redefined what it means to be a partner, helping to inspire curiosity in STEM education in our youngest residents."

The City of Mason, REDI Cincinnati and JobsOhio are collaborating to create an incentive package for Festo. The expansion is contingent upon the approval of those incentives at the local level and from JobsOhio, which will be made public after review from the appropriate approval bodies.

"Festo's expansion is an example of how talent, collaboration and commitment to innovation can help a global advanced manufacturing leader thrive in Ohio," said JobsOhio Director for Advanced Manufacturing Glenn Richardson. "Festo has been a fantastic partner in Mason, investing in cutting-edge technology, creative training solutions and hundreds of new jobs for Ohioans."

"Festo has a passion for transforming the way people work with their innovative technology solutions," said Kimm Coyner, vice president of business development and project management at REDI Cincinnati. "Their increased investment in our region helps advance our leadership in IIoT. We are proud of our partnership, which has focused on strengthening our talent, including sponsorship of the City of Mason's Innovation Week."

Local Leadership at Festo Transitioning

Festo also will mark a leadership transition at its Mason campus. Yannick Schilly, the chief operating officer and vice president of product supply for North America who successfully relocated and established Festo's Regional Service and Manufacturing Center in Mason, will step down. Dr. Nikolas Gebhard was announced as Schilly's successor earlier today during the company's Town Hall Meeting. Gebhard has served since 2012 in various positions at Festo in engineering and with the supply chain division. Schilly will stay on through June to ensure a smooth transition.

"After four successful years, I have decided to establish my own business venture here," said Schilly. "Mason has become the perfect home to my Festo family, as well as my own family."

"Having worked in Italy and Germany, I am excited about this investment and my new professional and personal challenge here in the U.S.," said Gebhard. "After several months of close collaboration with the local Festo team in Mason, I now look forward to taking the Mason campus to the next level and to fostering the wonderful partnerships Festo has forged here. My family and I look forward to joining this community, which has already embraced our Festo family."

Festo and City of Mason Provide Model for Strong Public-Private-Partnership

Under Schilly's leadership, Festo has worked closely with the City of Mason to foster a strong public-private-partnership that supports community education and talent development; inspires students of all ages to take an interest in science, technology, engineering and mathematics fields; and brings economic benefits to the technology ecosystem already present in the city and region. Festo served as a founding partner in launching the City of Mason Innovation Week

in 2015 with its Bionic Learning Network, which illustrates how principles from nature provide inspiration and creative solutions to technical and industrial applications. Last year, Festo showcased its Mobile Mechatronics Lab, featuring the latest advancements in energy-efficient automation technology.

About Festo

Festo is a leading worldwide supplier of intelligent automation solutions including pneumatic and electromechanical systems, components and controls for process control and factory automation. Festo's products and services are available in 176 countries. With approximately 20,000 employees in more than 250 branch offices in 61 countries worldwide, Festo's sales exceeded $3.5 billion last year. Actual figures for 2017 will be released in late April. Each year, Festo invests approximately 8 percent of its revenue in research and development. For more information, visit www.festo.com.

About Festo Didactic

Festo Didactic is the world-leading equipment and solution provider for technical education. The company designs and implements learning laboratories, educational equipment and programs that train people to perform in highly dynamic and complex industrial environments. Festo Didactic's Learning Center in Mason, Ohio, serves manufacturing companies and colleges in Ohio, Kentucky and Indiana, offering a wide range of industrial solutions training and qualifications related to Industry 4.0 (IIoT). The company worked together with Sinclair Community College to create an accredited two-year Mechatronics Apprenticeship Program to help employers develop skills that are missing in the workforce today by combining theoretical education, hands-on training and on-the-job training. For more information, visit www.festo-didactic.com.

An outdoor model pulse jet dust collector with a cyclone separator for heavy dust removal

A Pulse Jet Dust Collector OPTIMIZATION STUDY

By Russell Morine, Compressed Air Systems Evaluation Specialist, The Baker Group

A flour based frozen foods manufacturer orders a compressed air efficiency audit. The audit establishes the cost of compressed air at $0.27/1000 cubic feet. The study finds the 116 pulse jet dust collectors represent the greatest opportunity for compressed air demand reduction and energy cost savings. A dust collector optimization study/service is suggested and the customer agrees to proceed. In this facility, pulse jet dust collectors are used to filter dust from raw materials entering the plant, for conveying and mixing of ingredients, and for the final packaged finished products leaving the plant.

The Compressed Air Energy Cost of the Pulse Jet Dust Collection Systems

A pulse jet dust collector is a suction and filtration system. As dust-laden air is drawn into the system, filter media will collect dust, while clean air is discharged from the collector. Compressed air is applied in reverse pulse to clean the filter media. For most applications, the optimum filter differential is 3"- 4" H_2O. Dust collectors operating with lower differentials may be over-cleaning the filters and wasting compressed air.

The first objective of the study was to inspect every dust collector recording the operating set points and condition of each dust collector. The second objective of the study was to adjust timers to conserve compressed air wherever possible. The third objective of the study was to provide training to help better manage and maintain dust collectors in the future. Again, dust collectors represent the plants greatest opportunity for compressed air demand reductions and energy cost savings.

Most of the dust collectors are serving intermittent applications. They are cycling too long and too frequently and are operating

The AVS Filter is a typical silo-top filter (dust collector) that may or may not have a suction fan. Typically used when moving raw materials in or out of a silo.

> "The average weekend air demands have dropped from 800 scfm to 485 scfm. Based on the established compressed air cost of 27¢/1000 cubic feet, the initial timer adjustments will lower the compressed air costs from $187,920 to $113,441 per year."
>
> — Russell Morine, Compressed Air Systems Evaluation Specialist, The Baker Group

with low differential pressure. Based on the current timer settings, the dust collectors will account for maximum compressed capacity of 3,255 standard cubic feet per minute (scfm) of compressed air flow. The dust collectors are operating at fifty percent (1,600 scfm) average duty cycle during weekday production, and 25% (800 scfm) average duty cycle on weekends. Based on the established compressed air cost of 27¢/1000 cubic feet, dust collectors will have annual compressed air cost of $187,920.

Dust Collector Timers, Air Pressure Gauges and Pulse Valve Diaphragms

With the help of a maintenance mechanic familiar with dust collectors, we started the five-day study. Timers were adjusted on 57 dust collectors that were cycling too long and too frequently, or leaking compressed air. These dust collectors were also operating with low differential pressure. The 57 timer adjustments reduced the maximum compressed air demand from 3,255 scfm to 1,935 scfm. Based on the projected duty cycles, the average weekday air demands have dropped from 1,600 scfm to 965 scfm. The average weekend air demands have dropped from 800 scfm to 485 scfm. Based on the established compressed air cost of 27¢/1000 cubic feet, the initial timer adjustments will lower the compressed air costs from $187,920 to $113,441 per year.

Eight of the 116 dust collectors are out of service. A good number of the 51 untouched dust collectors are wasting compressed air and need attention prior to timer adjustments. Most of the 57 adjusted dust collectors still account for excess air consumption, and will require further adjustments. The attached dust collector spreadsheet provides a list of conditions that must be addressed prior to more timer adjustments.

At least 38 dust collectors are operating with the original pulse valve diaphragms. Most

A PULSE JET DUST COLLECTOR OPTIMIZATION STUDY

About The Baker Group

Baker Group is recognized as one of the Midwest's most successful full-service specialty contractors. With over 650 employees, multi-million dollar revenues, and Baker Group's name on many of the area's marquis projects, BJ Baker III and his company have certainly come a long way from their roots as a small plumbing contractor.

The Baker Group headquarters in Des Moines, Iowa.

Founded in 1963 Baker Group provides mechanical, sheet metal, electrical, compressed air, building automation, process automation, security systems, fire alarm systems, parking/revenue controls and 24/7/365 service. Committed to client satisfaction, Baker Group has grown organically by identifying systems and services that their clients need, and striving to deliver the best services possible - earning a reputation for providing unparalleled service and the highest quality craftsmanship. For more information visit www.TheBakerGroup.com

pulse valve diaphragms manufactures claim a two million cycle life, which typically occurs within 3 to 5 years. Old and worn pulse valve diaphragms and springs will fail to provide consistent pulse cycling and filter cleaning. Old and worn pulse valve diaphragms and springs are one of the most common causes for excess timer cycling. Timer adjustments should only be made when the dust collector pulse valve diaphragms are in good condition and making consistent pulse cycling.

Every dust collector air manifold should be fitted with an air pressure gauge. The pressure gauge will allow you to observe pulse cycling and check for equal pressure surge during each pulse cycle. Inconsistent pressure surge is the first indicator of faulty pulse valve diaphragms or solenoid issues. Every dust collector listed with original diaphragms is a candidate for a complete set of new diaphragms and springs. By my count there are 38 dust collectors with 240 original pulse valve diaphragms. Pulse valve diaphragm kits

A 20 year-old dust collector with original pulse valve diaphragms. Notice diaphragm tab is painted same color at unit.

Magnehelic gauge installed with inline filter on clean air port.

will cost approximately $50.00 to $60.00 each to purchase and install. The projected cost for 240 diaphragm kits and in-house labor is estimated at $15,000.00.

Maintaining a 3" to 4" H_2O Filter Differential

Every dust collector should be fitted with a Dwyer Magnehelic differential pressure gauge. The Magnehelic gauge will tell you if you are wasting compressed air, and will give you an indication of the filter condition. There are 36 dust collectors that have no Magnehelic gauge. There are 23 Reimelt dust collectors that have no Magnehelic gauge. The Reimelt dust collectors have no differential pressure ports, and apparently Reimelt sees no value in knowing or displaying the filter differential

TABLE: DUST COLLECTOR 3/4" PULSE VALVE COMPRESSED AIR DEMANDS

PULSE DURATION	AIR @ 100 PSI	AIR @ 80 PSI	AIR @ 60 PSI
50 Milliseconds	2.1 CF	1.9 CF	1.5 CF
100 Milliseconds	2.3 CF	2.1 CF	1.7 CF
150 Milliseconds	2.5 CF	2.3 CF	1.85 CF
200 Milliseconds	2.8 CF	2.6 CF	2 CF
300 Milliseconds	3.3 CF	3.1 CF	2.5 CF
400 Milliseconds	4 CF	3.7 CF	2.9 CF
500 Milliseconds	4.6 CF	4.2 CF	3.4 CF

The LST System is a typical pulse jet dust collector for waste product.

A PULSE JET DUST COLLECTOR OPTIMIZATION STUDY

EXAMPLE OF DUST COLLECTOR OPTIMIZATION STUDY SPREADSHEET

LOCATION	# PULSE VALVES	TIMER	CURRENT MAGNEHELIC H20 GAUGE	INITIAL PULSE DURATION	INITIAL PULSE CYCLES	INITIAL SCFM	ADJUSTED CYCLES	CURRENT SCFM	COMMENTS
A	6	NCC	Plugged	200	8/min	22.4		22.4	Timer out of reach, original PV diaphragms
B	8	NCC	Plugged	100	21/min	48.3	5/min	10.5	No fan, original PV diaphragms
C	8	NCC	Plugged	100	16/min	36.8	6/min	12.6	No fan, original PV diaphragms
D	8	NCC	<3"	50	4/min	8.4		8.4	Original PV diaphragms
E	8	NCC	0"	100	12/min	27.6	4/min	9.2	Original PV diaphragms
F	6	NCC	0"	100	12/min	27.6	4/min	9.2	Original PV diaphragms, no fan
G	5	NCC	<1"	250	14/min	42	6/min	18	1 bad pulse valve (repaired)
H	10	NCC	<1"	450 >300	10/min	43	6/min	18	Leaking PV connector hose
I	3	NCC	?	100	10/min	23		23	Dust in Magnehelic gauge (replace)
J	4	NCC	?	200	12/min	33.6	6/min	16.8	No Magnehelic gauge
K	5	NCC	No	300 >200	12/min	200		33.6	Open pulse valve leak (fixed) - No Magnehelic
L	5	NCC	No	200	12/min	33.6	6/min	16.8	Bad timer - no Magnehelic gauge
M	7	NCC	<1"	100	24/min	55.2	8/min	18.4	Plugged tube

PULSE DURATION	100 PSI	80 PSI
50 Millisecond	2.1 CF	1.9 CF
100 Millisecond	2.3 CF	2.1 CF
150 Millisecond	2.5 CF	2.3 CF
200 Millisecond	2.8 CF	2.6 CF
300 Millisecond	3.3 CF	3.1 CF
400 Millisecond	4 CF	3.7 CF
500 Millisecond	4.6 CF	4.2 CF

pressure. Installing differential pressure ports and Magnehelic gauges on Reimelt dust collectors will require hot work and isolation of dust collectors.

There are 25 dust collectors with plugged tubes, plugged filters, Magnehelic gauges containing dust or Magnehelic gauges installed backwards. I would suggest replacing these Magnehelic gauges. There are also 13 dust collectors missing Magnehelic gauges (not including the Reimelts). Any dust collector fitted with an in-line filter to protect the Magnehelic gauge must be periodically taken apart and cleaned. Any Magnehelic gauge found to contain dust should be fitted with a new in-line filter. Any Magnehelic gauge installed backwards should be discarded and replaced.

The Magnehelic gauges will cost approximately $120.00 to purchase and install. The projected cost to purchase and install 38 Dwyer Magnehelic gauges, with miscellaneous materials and in-house labor is $5,000.00. The 0" to 15" H_2O differential Magnehelic gauge is best suited for these applications. When you install the Magnehelic gauge, it is critical to minimize the tube connections that may leak. You will never have accurate differential if a tube fittings are leaking.

3" to 4" H_2O filter differential is considered optimum for most applications. Maintaining 3" to 4" H_2O filter differential will provide an adequate cake of dust and prove to have fewer particle emissions. In order to target 3" to 4" H_2O filter differential, I find you need to gradually adjust timers when possible to reach that point. Maintaining 3" to 4" H_2O filter differential will conserve compressed air and minimize filter wear and tear. Sugar and Dextrose are two materials that may require more frequent filter cleaning and lower differential pressure. It was mentioned that different filter media may used for these materials.

Adjusting Dust Collector Timers

Nearly all filter cleaning occurs within the first 100 milliseconds of the pulse cycle. This is providing that pulse valve diaphragms are in good condition. Dust collector timers were found set for as low as 100 milliseconds and as high as 1 seconds. There are currently 72 dust collectors with timers set for longer than 100 millisecond pulse duration. When you start to replace pulse valve diaphragms you may be able to perform additional duration adjustments.

The Reimelt dust collectors are PLC controlled and were all set for 1 second pulse duration and six cycles per minute. These were all reset for 250 millisecond pulse duration. Again, these units have no Magnehelic differential pressure gauges and no ports to measure differential pressure. These appear to be the newest dust collectors and most likely could be adjusted for shorter pulse duration.

Dust Collector Compressed Air Demands

Most of the dust collectors are non-regulated and operating with 90-100 PSI line pressure

air. Dust collectors fitted with shorter filters can and should be regulated. It does not take 90-100 PSI air to clean 36" or shorter filters. Regulating air pressure from 100 PSI to 80 PSI, may provide even greater savings. A 100 millisecond pulse cycle accounts for 2.3 CF at 100 PSI, and 2.1 CF at 80 PSI. If the dust collector is eventually set for 4 cycles per minute, the annual compressed air cost difference between 100 PSI and 80 PSI is about $47.82. In order to minimize pressure drop during each pulse cycle, I suggest high capacity 1" pressure regulators. The purchase and install high capacity 1" pressure regulators will typically cost about $200.00 each.

Dust collector air demands can be determined by calculating the number of pulse cycles by the values on this chart. You can also calculate your savings with these values. All timer adjustments during this study have been recorded on the attached spreadsheet. I would suggest you continue to use the document and keep record of all changes, including differential pressure.

Summary

Here is the summary of the 5-day dust collector optimization study performed.

1. Timer adjustments during this five-day study has reduced the maximum air demands from 3,255 scfm to 1,935 scfm. Projected average dust collector air demands have been reduced from 1600 scfm to 965 scfm. If your air compressors are as well controlled as claimed and capable of responding to the demand reductions, the potential annual energy cost savings are approximately $74,479.00, and will begin within just a week.

2. Proposed service and repairs will allow the plant to continue to adjust timers and conserve even more compressed air. Based on the number of dust collectors that still need timer adjustments, I project that maximum air demands for dust collectors is approximately 1,000 scfm, and average weekday demands may only require 500 scfm.

3. If these projections are correct, the annual compressed air cost for all dust collectors should be less than $60,000.00. The potential annual compressed air cost savings are close to $128,000.00. The potential compressed air cost savings will warrant allowing extra man-hours to service and maintain the dust collectors.

4. The projected cost to replace pulse valve diaphragms and Magnehelic gauges is $17,000.00. These improvements will allow the plant to continue the timer adjustments and achieve maximum compressed air cost savings.

5. The dust collector spreadsheet should be used to document every improvement and every timer adjustment. You can expand the spreadsheet to include sock & filter service, and well as a parts list other maintenance items. BP

For more information please contact Russell Morine, Compressed Air Systems Evaluation Specialist, The Baker Group, tel: 855.262.4000, email: mariner@thebakergroup.com, www.TheBakerGroup.com

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Optimizing Today's Pneumatic Systems

By Bill Nevills, Certified Fluid Power Specialist, Valin Corporation

In the last ten years, the design of pneumatic systems has changed dramatically, mainly due to developments in the technologies that create them. Pneumatic manufacturers' online tools for sizing components have evolved, the fieldbus systems are ever-changing, component designs are constantly improving, and network devices such as the Industrial Internet of Things (IIoT) have reshaped the industry. All these advances play a large role in optimizing the efficiency of pneumatic systems, but the age-old practice of routine maintenance must not be overlooked. This article will focus on proper air compressor sizing, proper pneumatic component sizing and predictable preventative maintenance.

The heart of any compressed air system is the air compressor itself and the related components such as the receiver tank, aftercooler and dryer. A qualified air compressor vendor should be consulted for the specific type of components required based on environment, duty cycle, pressure and required cubic feet per minute (cfm)

"Proper component design and sizing is very important in order for the system to perform as intended and as efficiently as possible."

— Bill Nevills, Certified Fluid Power Specialist, Valin Corporation

and safety factors for future expansion. Each of these factors will be considered when a system analysis is performed. If a particular machine function requires a higher pressure than the rest of the required function, a storage receiver tank and air amplifier can be an efficient way to provide the added pressure to that leg of the system versus increasing the pressure of the air compressor.

Proper component design and sizing is very important in order for the system to perform as intended and as efficiently as possible. To that end, never have there been more tools available for the sizing of components due largely to many manufacturers' online sizing tools that allow for maximum system efficiency. In terms of optimizing overall system efficiency the most common components of yesterday are true today. Regulators, Pressure and Flow Controls, Filtration and properly-installed piping systems can each offer major efficiency and extended life benefits.

Industrial Regulators

Industrial Regulators are typically found in two construction types, the first being sandwich style. In this design, the regulator is positioned between the subbase or manifold and the valve body. This layout is convenient but not the most efficient because the body size is mandated by the width of the valve. This can reduce the overall flow from that valve section by as much as 50 percent, requiring the valve be oversized in order to get the desired flow needed to satisfy the work to be done. A more efficient regulator would be the inline style, which has a reverse flow check that allows it to be placed between the valve and actuator for dual pressure function. Dual pressure is a simple but overlooked method to increase efficiency since many actuator cycles only have one power stroke (load in one direction). By adding a regulator to the non-power stroke, pressure can be reduced to meet that need, therefore saving energy and improving performance.

Electro-Pneumatic Pressure Control

Electro-Pneumatic Pressure Controls are offered in different design types and can be integrated into the machine logic to change pressure based on a voltage or current command signal. This type of regulator can be placed near an actuator in hard to get to locations and still provide efficient operation. Designers can also build a "pressure recipe" if known pressure adjustments are required, or interface with a machine controller. These applications can vary greatly and include some of the options listed below:

- Press Rolls (which can require different forces depending on the product/application)
- Spot Welders (these also require different forces depending on the metal gage)
- Solder Paste Dispensing
- Medical Dispensing
- Robotic Paint Spraying
- Cylinder Speed Control
- RPM Motor/Turbine Control (extremely precise speed control can be realized when adding a speed sensor as a feedback)
- Dancer Rolls (such as paper or fabric)
- Counter Balance Control
- Brake Force Control

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OPTIMIZING TODAY'S PNEUMATIC SYSTEMS

Flow Controls

Flow Controls limit the actuator speed, conserving the flow generated by the compressor. The two common styles used are inline and right angle. Both are available in "Meter In" or "Meter Out", the latter being the better option due to the compressibility of air. The right-angle style is designed to pipe directly into the actuator port where the best results can be obtained. Additionally, there is a safety element to flow controls being installed at the actuator that, should a hose or tube be severed, makes the actuator move at the desired speed versus a non-controlled, run-away effect that could possibly cause equipment damage or bodily injury.

Filtration

Filtration extends the life of system components, and industrial components range in micron size from 5µm to 40µm for standard valves and actuators. The degree of the filtration required in a system is published by the component manufacturer. Some more critical applications such as instrumentation, pharmaceutical, food & beverage and air logic may require .001µm, meaning a pre-filter and coalescing filter are necessary.

Selecting the correct filtration for a particular leg of a pneumatic system is just as important as selecting the correct valving and actuators. In addition, the contamination indicator used on filters should be considered carefully in order to meet the degree of system importance. Filter indicators include a simple low-cost pressure gauge, red/green visual indicator gauge, electric indicators and pressure switches. Knowing when to replace a filter element is important because changing too soon would not be taking full advantage of the element life and can be costly, especially in terms of the coalescing element. Alternatively, waiting too long can have an adverse effect on system function.

The visual-type indicators require an effort to view them and the "out of sight, out of mind" rule may come into play. However, the electric and pressure switch-type indicators will be harder to ignore since they can provide any number of indication alarms.

Preventative Maintenance Components

Preventative Maintenance Components, such as a smart pneumatic module (SPM), take the next step in optimizing the complete pneumatic system. It keeps it at a peak performance level and significantly reduces costly down time by utilizing the IIoT to monitor system performance. The SPM can alert the appropriate personnel that a

Electro-Pneumatic Pressure Control

particular component is approaching the end of its life expectancy – something that can be accomplished without taking up valuable machine controller memory.

Properly-Designed Piping Systems

Properly-Designed Piping Systems can also provide efficiency by reducing the number of sharp angles. The turbulence of one 90-degree bend can cause a pressure drop of 3-5 PSI. Another factor to consider is moisture. Moisture is a by-product of a compressed air system and causes rust in some types of piping. The rust that forms in piping systems can cause contamination and premature failure in components. In addition, the rust scale that forms on the inside of a pipe can cause additional air flow turbulence, which is a direct reflection of pressure drop. Using aluminum piping will avoid the rust issue. Drip leg drains can also offer a way to rid water at specific points in the piping system. Drop legs off of header pipes should be taken off the top rather than the bottom where moisture can accumulate.

Understanding the overall system of potential energy, control of that energy, proper maintenance of the system including removal of water, moisture and impurities and designing the pneumatic control circuits for optimum efficiency is always the ultimate goal. After considering all the factors above, trying to lay out current and future objectives of the system is the key element in reaching that goal. BP

About the Author

Bill Nevills is a Certified Fluid Power Specialist at Valin Corporation, a leading technical solutions provider for the technology, energy, life sciences, natural resources and transportation industries. Valin offers personalized order management, on-site field support, comprehensive training and applied expert engineering services utilizing automation, fluid management, precision measurement, process heating, filtration and fluid power products. Valin also has solutions for managing the compressed air system mentioned in this article. For more information, please visit www.valin.com

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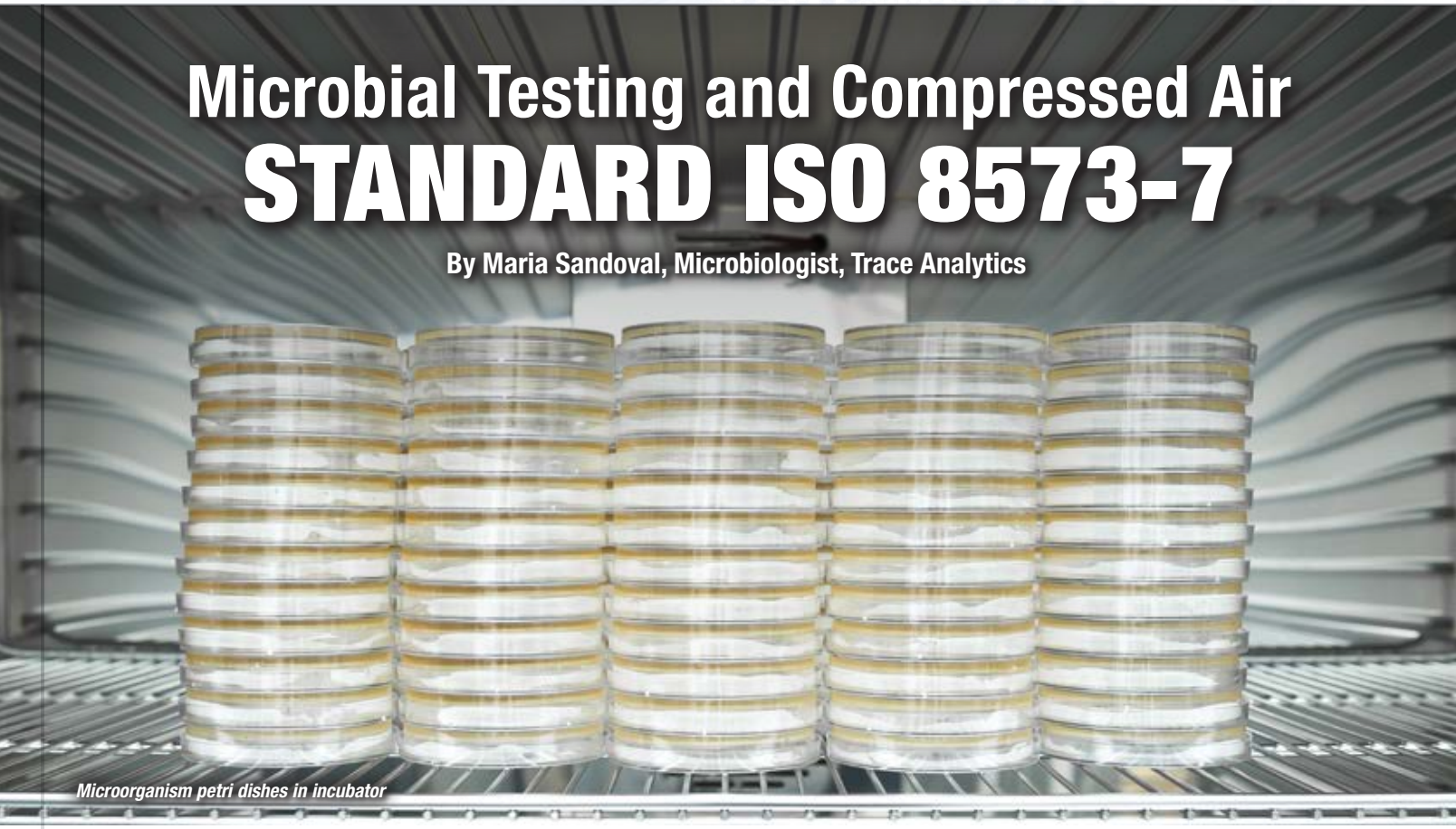
Microbial Testing and Compressed Air
STANDARD ISO 8573-7

By Maria Sandoval, Microbiologist, Trace Analytics



Microorganism petri dishes in incubator

➤ Introduction

Compressed air is an often underestimated but crucial utility, the quality of which must be monitored periodically to fulfill national and international standards. The International Organization for Standardization (ISO) publishes world-class standards for products, services and systems, to ensure quality, safety and efficiency.[1] ISO 8573 is an available standard addressing compressed air quality. It consists of nine parts that address purity classes, specifications, and procedures. ISO 8573-7:2003, the most current version, can be utilized across all industries' compressed air microbial monitoring plans. It contains both informative and normative procedures but lacks any tested compressed air microbial specifications regarding colony enumeration limits for microbial plate counts. Specifications do exist for the required blind samples. This article will focus on ISO8573-7 normative test methods and analysis for viable microbiological contaminants and how it can be fundamentally utilized in compressed air microbial monitoring plans.

Choosing a method that fits your needs.

Analyzing micro burden data at point of use outlets throughout compressed air pipeline systems at a given time, acts as a window of observation into the control of the facility. Maintaining control means proper preventative maintenance, microbial monitoring scheduling and risk assessment must be appropriate for the industry being monitored. Many accreditation bodies can aid in the understanding of microbial limits

> "Compressed air is an often underestimated but crucial utility, the quality of which must be monitored periodically to fulfill national and international standards."
>
> — Maria Sandoval, Microbiologist, Trace Analytics

and specifications, critical to specific industry needs. Once the compressed air microbial monitoring plan is approved, a sampling procedure that provides the company with the results suitable to its limits and specifications needs to be established. This requires the use of a procedure that accurately measures and samples a specific volume of air for microbial burden analysis inside the tested compressed air system.

Searching on the internet today, one can find a plethora of options, ranging from small, sleek portable samplers to robust pieces of equipment like the SAS Pinocchio Super II sampler. It is imperative when choosing the piece of equipment for testing that the technician and monitoring supervisor read the original equipment manufacturer (OEM) manual to establish what the limits and restrictions are for that product. For instance, while the portable samplers are lightweight and easily transportable, the OEM recommendations may state.[2] "Due to the air flow pattern inside the unit, it is not recommended that CFUs get counted. Rather, the results should be viewed qualitatively." As it stands, this instrument, though ideal for qualitative binary results, does not provide useful information for total plate counts mandated by ISO 8573-7 or any monitoring plan requiring validated colony forming unit enumeration.

Some microbial air impact samplers, like the SAS Pinocchio Super II, are designed to diffuse the air flow from a regulated point of use outlet, and then measure the flow rate to

About the Author

Maria Sandoval has over 15 years of experience in Microbiology and Molecular Biology. Her field work includes analyzing extremophiles isolated from the depths of Lake Baikal in Russia to the 50km exclusion zone of Chernobyl. Additionally, she's worked alongside the CDC with DSHS analyzing and diagnosing patient microflora. Her tenure with the Lawrence Berkeley National Laboratory, Department of State Health Services and the University of Texas MD Anderson Cancer Center has made her a leading expert in microbial testing. As Trace Analytics' Microbiologist, she is responsible for microbial testing and procedural development.

Trace Analytics is an A2LA accredited laboratory specializing in compressed air and gas testing for food and beverage manufacturing facilities. Using ISO 8573 sampling and analytical methods, their laboratory tests for particles (0.5-5 microns), water, oil aerosol, oil vapor, and microbial contaminants found in compressed air. For over 29 years, they've upheld the highest industry standards of health and safety, delivering uncompromising quality worldwide in accordance with ISO, SQF, BRC, and FDA requirements. Visit www.AirCheckLab.com

Maria Sandoval, Microbiologist, Trace Analytics

MICROBIAL TESTING AND COMPRESSED AIR STANDARD ISO 8573-7

Table 1. Correction Table:

TRACE Analytics LLC

Adjust colony counts from a 219-hole impactor using a standard 55mm contact plates and 90mm petri plates.

COLONIES	MPN	COLONIES	MPN	COLONIES	MPN	COLONIES	MPN	COLONIES	MPN	COLONIES	MPN
r	Pr	r	Pr	r	Pr	r	Pr	r	Pr	r	Pr
1	1	41	45	81	101	121	175	161	289	201	542
2	2	42	46	82	102	122	178	162	293	202	554
3	3	43	48	83	104	123	180	163	297	203	554
4	4	44	49	84	106	124	182	164	301	204	580
5	5	45	50	85	107	125	185	165	305	205	595
6	6	46	51	86	109	126	187	166	309	206	611
7	7	47	53	87	110	127	189	167	313	207	627
8	8	48	54	88	112	128	192	168	317	208	646
9	9	49	55	89	114	129	194	169	322	209	666
10	10	50	57	90	116	130	196	170	326	210	687
11	11	51	58	91	117	131	199	171	331	211	712
12	12	52	59	92	119	132	201	172	335	212	739
13	13	53	60	93	121	133	204	173	340	213	770
14	14	54	62	94	122	134	206	174	344	214	807
15	15	55	63	95	124	135	209	175	349	215	851
16	17	56	64	96	126	136	212	176	354	216	905
17	18	57	66	97	128	137	214	177	359	217	978
18	19	58	67	98	130	138	217	178	365	218	1088
19	20	59	69	99	131	139	220	179	370	219	1307
20	21	60	70	100	133	140	222	180	375		
21	22	61	71	101	135	141	225	181	381		
22	23	62	73	102	137	142	228	182	387		
23	24	63	74	103	139	143	231	183	393		
24	25	64	76	104	141	144	234	184	399		
25	26	65	77	105	142	145	237	185	405		
26	27	66	78	106	144	146	240	186	412		
27	29	67	80	107	146	147	243	187	418		
28	30	68	81	108	148	148	246	188	425		
29	31	69	83	109	150	149	249	189	432		
30	32	70	84	110	152	150	252	190	439		
31	33	71	86	111	154	151	255	191	447		
32	34	72	87	112	156	152	258	192	455		
33	36	73	88	113	158	153	261	193	463		
34	37	74	90	114	160	154	265	194	471		
35	38	75	92	115	162	155	268	195	480		
36	39	76	93	116	165	156	271	196	489		
37	40	77	95	117	167	157	275	197	499		
38	42	78	96	118	169	158	278	198	508		
39	43	79	98	119	170	159	282	199	519		
40	44	80	99	120	173	160	286	200	530		

r= colony forming units counted Pr= probably count MPN= Most Probable Number

achieve the recommended rate by the OEM. This allows the end user to only monitor the time required to meet the desired total sample air volume; in most cases, 1000 liters. When using impact samplers, various sampling heads exist to disperse the air onto the recipient agar plate. Slit samplers and sieve samplers are the most prevalent.

The most common question about sieve samplers is whether to include the corrections adjustment for the post analysis reporting. If a sieve sampler is used, note the correction table (Table 1) from SAS 180 Microbial Air Samplers, which is extrapolated from the Macher article referenced below.[3,4] Since the SAS Pinocchio Super II uses the same sieve head as the SAS 180 environmental air sampler head, the adjustment can be used. The correction is made to the final colony forming unit count that corresponds to the number of holes inside the sampling head relative to the plate size. The correction adjustment can be utilized on behalf of all perforated sampling heads with 219-hole, 401-hole, or 487-hole impactor for the statistical possibility of multiple particles passing through the same hole on to the agarose surface. If the facility's microbial limitations are under the need for the corrections adjustment, then the point is moot.

ISO 8573-7 requires two blinds and a sterility blank.

ISO 8573-7 dictates that two types of controls exist that "shall be" free from contamination. The first type of control plates is called blinds, these blinds (before and after) are to confirm that no outside or unwanted contamination from external variables (sampling technicians and the environment) have entered the air sampler or agarose surface. It should be noted that lack of aseptic technique can cause an entire sampling point to fail, resulting in unplanned costs and retesting. The blind is taken with the same movements as a compressed air sample, but no air is to enter the funnel head or impact the agarose. Two blinds are taken, one before the point of use and one after. The second type of control plate required, is a negative control, or sterility blank.

There is no name in the ISO standard for this control plate, however, there is a description as follows: "Using the same means of transport, "geographically" trace a Petri dish the entire distance from the manufacturer who filled the Petri dishes with agar, to the place of sampling and the laboratory, in order that it can be inspected for unintended after-contamination. The dish shall not subsequently show growth." This plate's sole purpose is to travel the length of its existence, unopened, from cradle to grave, until its final analysis in

Table 2. Calculations for Sampling Times:
Examples for common sampling times

TRACE Analytics

Calculation:	AIR VOLUME NEEDED *(liters)* / FLOW RATE *(liters per minute)*	=	SAMPLING TIME, *minutes*
EXAMPLE: PINOCCHIO SUPER II *Recommended/OEM validated*	1000 L / 100 LPM	=	10 minutes
EXAMPLE 2:	1000 L / 80 LPM	=	12.5 minutes

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the testing lab. Both controls must be <1 CFU/plate to be considered a "pass" from an ISO 8573-7 stand point. These are the only viable microbial specifications and limitations in ISO 8573-7:2003.

Taking a compressed air sample is easy!

Most impact air samplers are made to use a sterile tube to sample the outlet air into the inlet port of the unit for analysis. For simplicity reasons this article will focus on the use of a Pinocchio Super II sampler. The compressed air is then passed through a manifold that measures the air through the calibrated flowmeter, and pressure gauge. Per the OEM the compressed air must measure to an appropriate rate (in this case 100LPM) with pressure under 3 Bar. Once the flow rate has been established, the air valve to the pressure gauge and flowmeter is closed. Since no adjustments were made at the inlet valve, the valve to the sampling funnel head can now be completely opened for measurement.

See Table 2 for calculations of measurement times relative to air flow rate. When the appropriate time has lapsed to sample 1000 liters, the inlet valve is closed, the plate is removed aseptically, labeled, and shipped to the testing lab for analysis. When sampling media is placed on the clips for testing, all efforts should be made to avoid secondary contamination. It only takes one breath, sneeze, loose gloved finger to make an entire point of use sample worthless. Paying attention to aseptic technique is imperative to taking a true compressed air microbial sample.

Why is aseptic technique so important?

Aseptic technique is a term that refers to movements, actions, attire and attitude when working in a scientific or environmental sampling capacity. Testing compressed air may not seem like the proverbial environmental sample, but it is. Taking a small sample of the microbial profile of a

point of use environment and growing it up in a laboratory takes skill and awareness. Aseptic technique functions to prevent contamination of media and reagents by microorganisms. The first action is to always wear the minimum appropriate personal protective equipment, PPE (Table 3): fitted gloves, eye protection, clean lab coat, and hair net. Before handling any media, gloves should be rubbed down or sprayed with greater than or equal to 70% Isopropanol Alcohol or Ethanol. Not doing this important step will almost certainly result in contaminated blinds and samples. When in doubt, change your gloves or wipe them down with alcohol. The simplest and most economical way to reduce contamination is to work on a cleaned, disinfected work area.

Food industries who sample on sorting floors are subjected to a lot of dust. Cleaning and disinfecting the area that the microbial air sampler sits upon should be routine and thorough. Afterwards, open the contact plate or petri dish for sampling, the lid should always be placed down, as to not catch any floating microbial vectors like dust inside the lid. These are all points of contamination that are easily avoidable. Most plates are sent with sterile bags to send back to the testing lab. Feel free to place the lid face down inside the sterile bag provided, making sure gloves are clean.

Sampling technicians should make sure to never open multiple petri dishes at a time. Sealing the petri dishes is the next best mode of avoiding contamination. If a locking mechanism exists on the plate, make certain to lock it once the sample is taken. Always parafilm or tape the plate, this protects the lid from falling off during transit, and keeps moisture in the plate. Good personal hygiene acts to not only protect the sampling technician from environmental contaminants, but also protects the samples from contamination like shed skin, dirt and dust from street clothes.

Table 3. Personal Protective Equipment (PPE)

TRACE Analytics LLC

Aseptic technique is required when sampling for microorganisms in compressed air.

Alcohol	≥70% Isopropyl Alcohol wipes or spray
Eyewear	Goggles or lab glasses required
Mask	Face mask to prevent transfer of bacteria
Gloves	Wear clean gloves and do not touch face or hair
Lab Coat	Ensure lab coat is clean

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Brett Rasmussen
Senior Energy Engineer, Nissan North America

Doug Barndt
Manager Demand Side Energy & Sustainability, Ball Beverage Packaging

MICROBIAL TESTING AND COMPRESSED AIR STANDARD ISO 8573-7

Understanding the results of an ISO 8573-7 report.

Once the final microbial report has been issued, certain criteria must be met to adhere to ISO 8573-7. Mentioned above, the before and after blinds, must be reported as <1 CFU/plate. The distinction between CFU/plate and CFU/m^3 is made when no volume of air is tested and when 1000L of air is tested, respectively. The sterility blank must also be free of contamination and reported as <1 CFU/plate. The compressed air sample should fall inside of the facility's monitoring plan limits and specifications. Remember to always keep in mind of the measurement of uncertainty that ISO 17025 labs report.

Laboratory measurements always involve uncertainty, which must be considered when analytical results are used as a part of a basis for making decisions like pass/fail. Some monitoring plans require that the actual sample number fall within the limitations of the measurement of uncertainty. Usually it is the responsibility of the facility, not the lab to determine a pass/fail status.

The only analysis required by ISO 8573-7 is colony forming unit enumeration. However, if a facility requires microbial identification, Gram staining is done for bacterial colonies. Gram staining classifies most bacterial colonies into two groups; Gram positive or Gram negative. Additional information is noted on shape and morphology upon Gram staining. Most pathogenic organisms can begin to be identified from this simple strain. For instance, if the air sample was contaminated with Gram positive cocci bacteria, there is no need to test for Listeria since Listeria is a Gram positive, non-spore forming rod. It should be noted however, that these samples, while informative, are a snap shot of the level of control in the facilities compressed air system. Continual monitoring and quarterly or at minimum biannual testing is recommended.

Summary

- ISO 8573-7:2003 is the leading standard for testing compressed air.
- ISO 8573-7 requires before and after blinds, one sterility blank and absolutely no contamination on them.
- ISO 8573-7 requires a validated impact air sampler for colony forming unit enumeration, read the OEM manual before renting or purchasing to confirm.
- Aseptic technique is required, it will save you money if you learn it, and cost you money if you don't.
- ISO 8573-7 only requires colony forming unit enumeration.
- Gram stain differentiation is an easy way to begin the process of pathogenic identification.

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1. All about International Organization for Standardization. https://www.iso.org/about-us.html
2. Compressed Air Microbial Testing Unit Detection Kit [Manual]. (07/2015)
3. SAS 180 Air Sampler [Manual]. (03/2007)
4. Macher, J. (1989). Positive-Hole Correction of Multiple-Jet Impactors for Collecting Viable Microorganisms. American Industrial Hygiene Association Journal, 5(11), 561-568.

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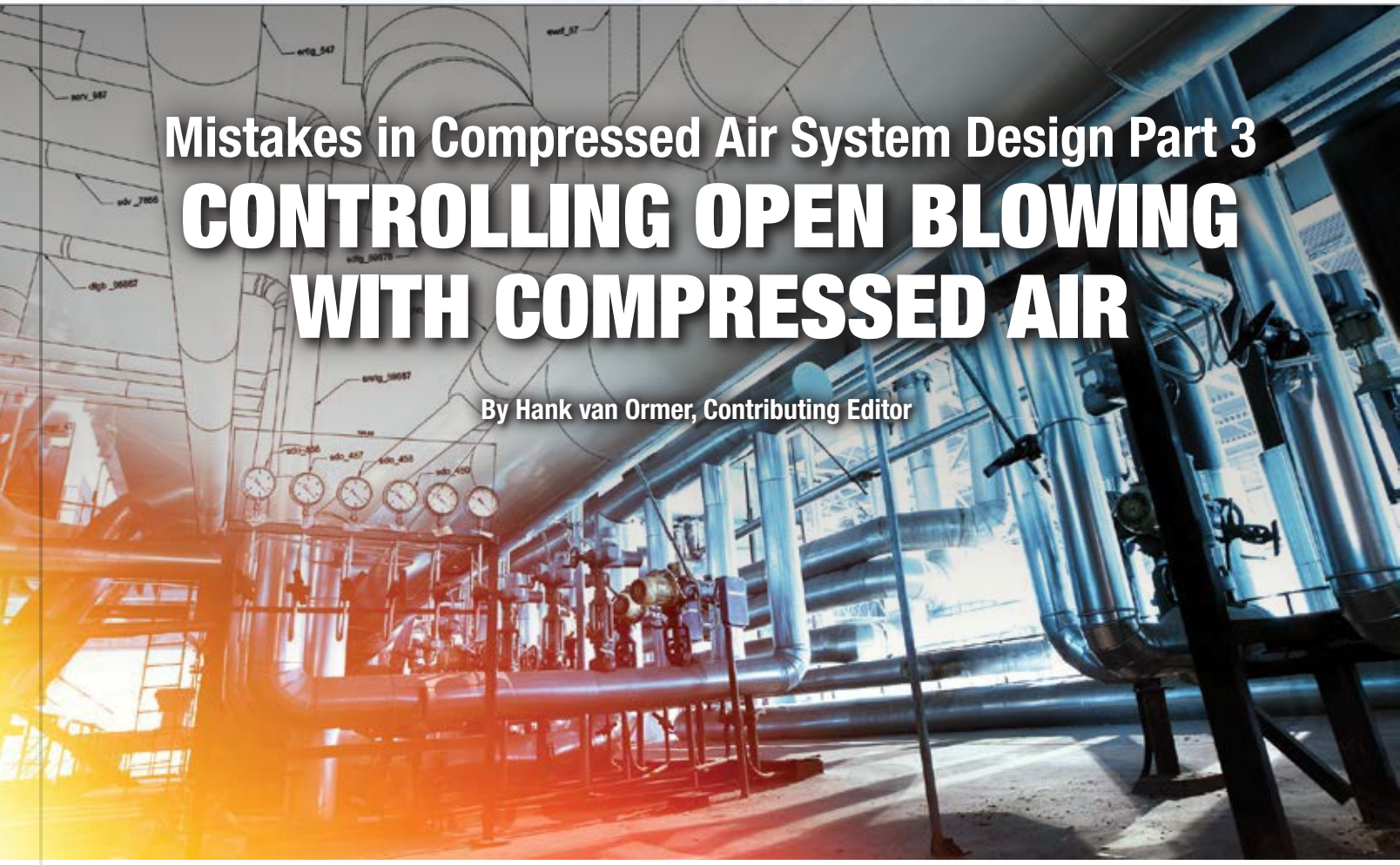

Mistakes in Compressed Air System Design Part 3

CONTROLLING OPEN BLOWING WITH COMPRESSED AIR

By Hank van Ormer, Contributing Editor

The previous two articles in this series covered some very common issues in the Compressed Air Generation or "Supply Side" with regard to misapplying some capacity controls and installing different types of air compressors with piping and/ or orientation. These can preclude any reduction in compressed air demand on the production side from effectively translating lower air usage into a commensurate level input energy.

From this point on we will look at some of the common missed opportunities for compressed air reduction in most production facilities. The topic of this article is open blowing with compressed air.

"Blowing Off" Products in Production Lines

Many industries use a great deal of compressed air in "blowing off" the product. It is used to removed cleaning agents and water, to move product along the line, to remove rejected pieces, etc. It is also used for various cooling applications such as camera lens in hot areas; mold cooling; etc. The compressed air used in these operations varies from open tube or pipe blowing; to non- amplifying control dispersion nozzles; to venture-driven amplifying nozzles. Almost without exception, any straight compressed air blow off through an open pipe or tube will be very inefficient and the compressed air used can be reduced by 50% or more with better pressure and performance.

LOW PRESSURE BLOWER GENERATED BLOW-OFF AIR

Electrical Energy Cost to produce 500 cfm at 100 psig = $43,000/yr.

Electrical Energy Cost to produce 500 cfm at 50 psig = $26,000/yr.

Electrical Energy Cost to produce 500 cfm at 15 psig = $18,000/yr.

Electrical Energy Cost to produce 500 cfm at 7 psig = $8,000/yr.

Electrical Energy Cost to produce 500 cfm at 3 psig = $4,200/yr.

Use Low Pressure Air Source Whenever Feasible!

Figure 1

Regardless of application, there are several guidelines that should always be considered when compressed air is used for open blow off:

- Is there a mechanical way to do the job?
- All blow- off air should be regulated to the lowest effective pressure. Higher pressure means higher flow, which may not be needed.
- Use Venturi air amplifier nozzles whenever and wherever possible. This will usually reduce blow off air up to 50%.
- All blow off air should be controlled to shut off (automatically) when not needed for production.
- When blower air is available compare the net energy cost of each alternative.

Low Pressure Blower-Generated Air

Compressed air flow, at 25 psig or less, can often be delivered by proper blower selection. If the blower air is already available on site, it definitely should be a prime candidate. In any case always review the electric operating energy cost, initial equipment & maintenance cost, and compare to other air system/ nozzle combinations.

"Blower- generated" low-pressure air is much less costly to produce on a $/scfm basis. It is the volume of air (scfm) creating the mass or weight of the air that performs the blow off. The pressure influences the "thrust" at the end of the nozzles where it quickly dissipates. Often a "higher volume" or weight of air at a lower thrust (pressure) improves productivity and quality of the blow off over the higher thrust version. For these types of application, there are generally three types of blowers used:

- Regenerative
- Centrifugal
- Positive Displacement

There are many other types of blowers (rotary vane, liquid ring, etc.) used in industry, particularly in the smaller sizes. As in most air and gas compression equipment, larger, well- applied central units may well prove to be the most energy efficient solution when conditions dictate. Each opportunity needs a specific evaluation and possible testing to find the optimum relationship of productivity and cost.

80-100 psi Compressed Air for Open Blows

There are three basic selections to use high pressure compressed air as blow off air. They are open tubes and pipe, open jet/ dispersion control nozzles and Venturi Flow Inducer nozzles.

Air Dispersion	Inlet PSI	Tested CFM flow
	20	20
	40	22
	60	24
	80	26
	100	32

Figure 2

MISTAKES IN COMPRESSED AIR SYSTEM DESIGN PART 3

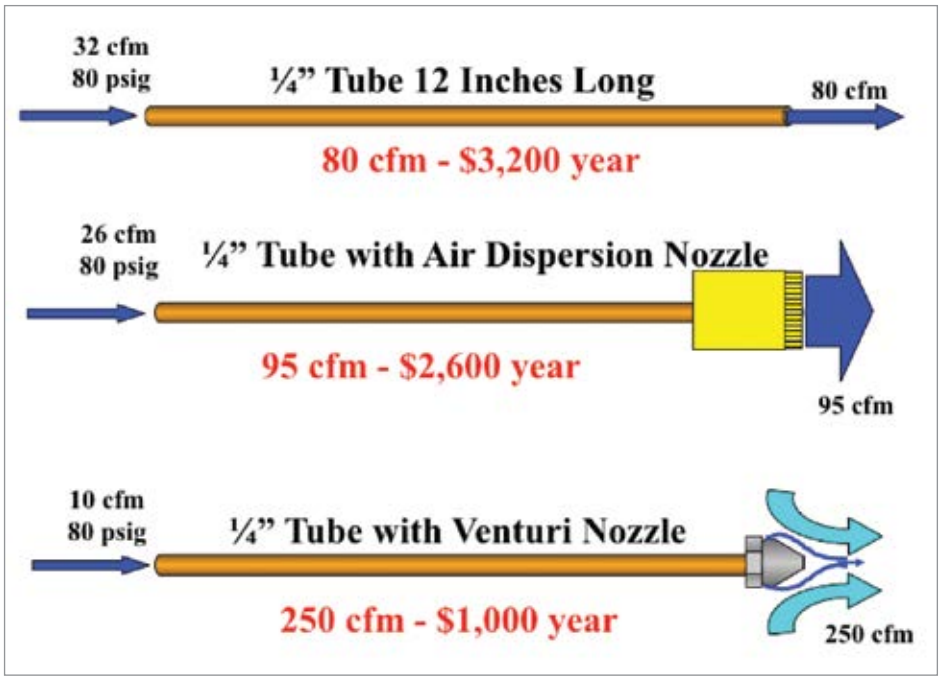

Figure 3

Open Tube and Pipe

The open pipe or tube flows compressed air to the process with very little, if any, significant amplification. Turbulent compressed air blasts straight out of the pipe or tube. It not only wastes compressed air, but often also violates OSHA noise and dead end pressure requirements. Plants with many 1/8" and ¼" open tube lines running as blow off on units will use approximately 14 and 32 cfm each, respectively, at 80 psig with 1 foot long tube. This goes up to 180 cfm with ½" open pipe.

Engineered Nozzles: Open Jet/ Dispersion and Venturi Amplifiers

There are two basic types of higher efficiency nozzles available to use in place of open tube

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or pipe; open jet/dispersion and venture amplifiers.

Open Jet Dispersion

Applying a high-quality open jet/dispersion nozzle with limited amplification will reduce this air usage significantly and it will control the air flow. We now have a predictably repeatable air flow, which when implemented correctly, will be more effective in the process delivering a stable potential optimum blow profile. Applied with properly selected regulators, the compressed air inlet pressure can be adjusted to identify the optimum flow at the lowest effective inlet pressure.

These jet type controlled dispersion nozzles come in many different configurations often designed for specific processes. Fig 2 shows a typical example of these with some tested compressed air flows at varying inlet pressure.

Venturi Amplifier Nozzles

Venturi air amplifiers require less compressed air. These air amplifiers use the venturi principle to pull in significant amounts of ambient air and mix it directly into the air stream, which amplifies the amount of air available at the point of use. Air amplifiers have amplification ratios up to 25:1. Using 10 cfm of compressed air can supply up to 250 cfm of blow-off air to the process and generate a high total flow with low compressed air consumption.

There are many configurations and styles for various applications including straight nozzles; air bars; circular design for tubing and pipe blow-off; high thrust; adjustable amplifiers; etc. In many cases, an appropriately selected and applied venture amplifier may well deliver lower net energy cost blow-off air than even blower-generated blow-off air. The capital cost and maintenance for the amplifiers is relatively low with very good installation flexibility.

How do these compare:

For a true comparison the system designer needs to collect all the appropriate performance data and perform a site specific analysis. Figure 3 shows open pipe/tube, open jet dispersion control, and venturi amplifier nozzles with some basic annualized energy cost for the consumed plant compressed air based on $.06 kWh and 8000 hours per year of operation.

It is important to point out that, in Figure 3, all flowing air streams induce some flow which in the final flow values shown are included at approximately 12 inches from the exit point and reflect a specific test. This establishes a point of reference.

1/8" Post Fixed	Inlet PSI	Tested CFM flow	Inlet PSI	Tested CFM flow	Amplification
	6	.1	60	1.2	25:1
	10	.2	80	1.8	
	20	.4	100	2.2	
	40	.6			

Figure 4: A typical Mini Venturi Amplifier

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MISTAKES IN COMPRESSED AIR SYSTEM DESIGN PART 3

Recent Developments with Mini Venturi Amplifiers

The new mini Venturi Amplifier Nozzles have opened whole new areas of opportunity. Before this product development, flows much lower than 5 to 7 scfm of plant air would accomplish little or no effective venturi induced flow. These new nozzles can now deliver up to 25 to 1 amplification at flows between .1 scfm up to 2.2 scfm. They will deliver relatively high flow for small blow –off and cooling applications with extremely low plant air use. Figure 4 shows a Typical Mini Venturi Amplifier:

Case Study at a Plastic Extrusion Plant

Mini Venturi Amplifier nozzles were applied to a cooling project at a plastic extrusion plant during a recent audit. The current cooling air flow was supplied by three open blow hoses mounted in the fixture. The measured flow of plant air was 7 scfm for an average of 2.35 scfm per hose. These flows were manually controlled by the operation – 17 operating lines were checked and these are very average numbers.

A 1/8" post-type mini venture amplifier nozzle was on each blow off line and the flows adjusted to deliver the acceptable cooling needed to hold the quality finish.

With the control valves adjusted to create the desired flow, the flow meter then read 0.4 scfm for the total of three hoses being used. This would reduce the individual hose average to 0.13 scfm. The recoverable electric energy from this test was calculated with the following results:

Number of applications	55 blows/ 17 extruders
High pressure compressed air used currently	119 cfm
Current annual energy cost for blow air	$10,730/yr
Compressed air savings with Mini Venturi Amplifier nozzles (.4x 17 = 6.8 cfm)	112 cfm
Value of air reduction (Plant air cost)	$90.17/cfm/yr
Total electrical energy cost recovery by installing venture nozzles to reduce blow by	$10,099/yr
Cost of nozzles and installation	$2,000
Reduction in compressed air use	94%

Productivity and quality improved because maintaining the critical stable flow in the lines with the current system was somewhat difficult due to compressed air system pressure fluctuations affecting the flow. This had to be corrected by various plant operators with manual controls. With the selected nozzles, the flow is always a stable .13 cfm each. With these mini nozzles, no opportunity is too small to be missed.

Summary

Blow–offs in any form are always a "missed opportunity" if not addressed. Uncontrolled it is a continuing source of leaks. Left on when not needed is a major waste. Applied at excess pressure is expensive. Applied poorly may be a negative to quality or productivity. It deserves careful attention.

There are many items and products to consider to optimize your blow off air opportunities. Most require common sense and diligence. This article has only showed a few examples to highlight what I hope will stir your interest to look deeper.

These are some take aways:

- Don't select a blow off system without considering the total operating cost in compressed air energy.
- Generally there should always be a set up with some type of automatic shut-off when open blows are not needed.
  - Tied to the production machine controls.
  - Electric eye or other device to only blow when needed and come back on when needed.
  - If there is a constant blow such as lens cooling, try and see if a "delayed pulse" of air will also work using less air.
  - Use the lowest pressure air possible.
  - Select the nozzles and air supply that perform the function at the lowest operating cost
  - Blower air should be considered as well as engineered and Venturi amplifiers.
- Almost without exception, a straight compressed air open blow through an open pipe or tube will be the most inefficient and most expensive option. BP

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

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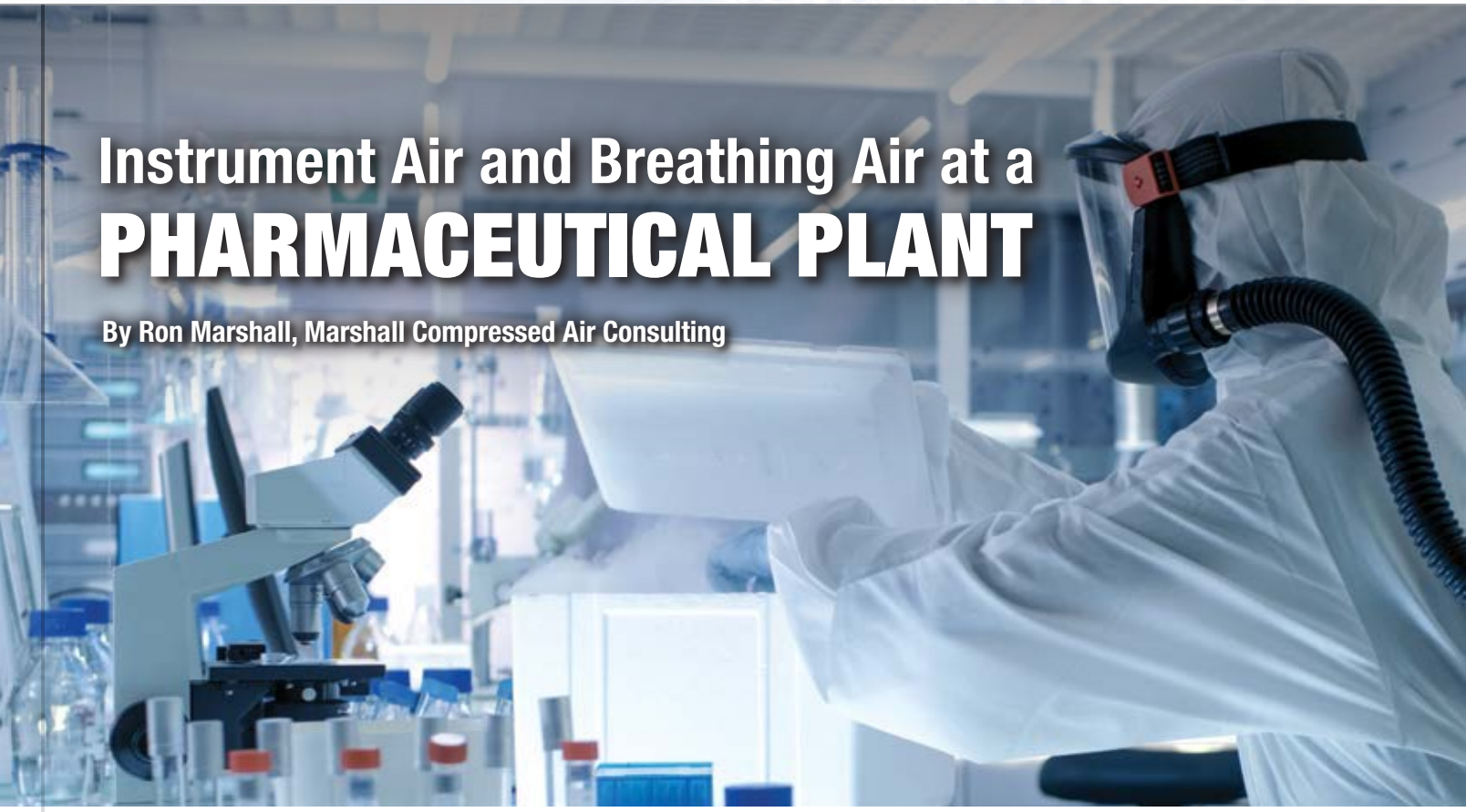

Instrument Air and Breathing Air at a PHARMACEUTICAL PLANT

By Ron Marshall, Marshall Compressed Air Consulting

➤ A pharmaceutical plant, located in Canada, has had a compressed air assessment performed on two plant systems. The studies uncovered poor compressed air production efficiency, high air dryer loss, and problems with high flow compressed air uses negatively affecting plant pressure. The plant implemented energy efficiency measures, on the two compressed air systems, saving 46 and 64 percent in energy costs respectively.

Background

The company is a large multinational pharmaceutical firm that extracts beneficial health products from animal byproducts. The Plant A compressed air supply was originally set up as two separate systems, one providing instrument air, the other breathing air for laboratory purposes. The Plant B system used a combination of both lubricated and lubricant free air compressors, sized between 15 and 60 hp, each with its own desiccant air dryer.

Initial Assessment

Supply side measurement of the Plant B system was initially done in 2004, when the plant was much busier and had higher average compressed air loading than current conditions. Figure 2 shows a snapshot of a production day, fairly constant loading, caused by dryer purge and cabinet venting, with only a short period of production mid-day. It can be seen that the 15 hp air compressor starts and runs unloaded for some unknown reason part way through the week, reducing the system efficiency. Some fluctuations causing

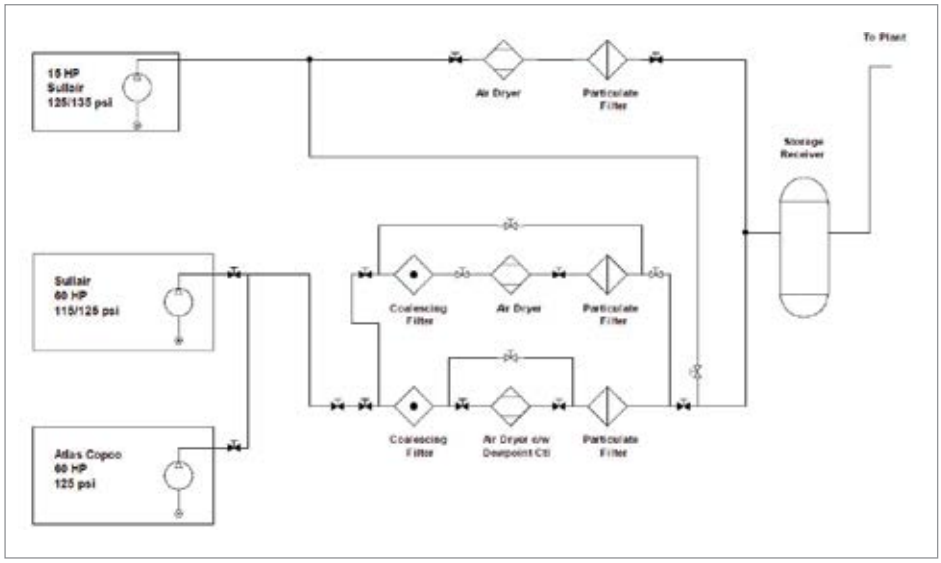

Figure 1: The as found system 1 configuration mixed lubricated and oil free (system 2 not shown)

low pressure can be seen during the day. Analysis ultimately showed the small compressor could be used to feed non-production flows rather than running the large 60 hp compressors and dryers.

End Use Pressure Problem

It can be seen in Figure 3 that the pressure profile during a production day was being greatly affected by a dominant end use which was traced to a sparging application mixing some chemicals in a storage container. This operation started as required during the production day and was set up with a pressure switch cutoff interrupting the flow of compressed air if the plant pressure fell too low. A second end use was found that used compressed air to agitate the wastewater in a pit for odor control. These end uses forced the compressor discharge levels to be much higher than required.

At the time of the assessment, based on the amp readings, the system flow was estimated at 264 cfm peak and 111 cfm average. Power consumption was estimated at 31 kW consuming about 181,000 kWh per year. System specific power was estimated at 28 kW/100 cfm (not including air dryer purge), a normal reading for an optimized system would be under 20 kW/100 cfm.

Constituents of Demand

Detailed analysis was done to estimate the compressed air uses making up the demand. Based on various special tests and flow measurements the following constituent of demand profile was created:

It can be seen the plant has a low level of leakage, which shows excellent maintenance practices, but that there are two dominant loads, cabinet purge and air dryer purge. The cabinet purge is a small amount of air that is introduced into electrical panels in areas of high solvent content. This positively pressurizes the panels to keep explosive vapors out. This is for safety, after much research it was found that this load had to remain. The air dryer load, however, was due to fixed cycle operation of two heatless desiccant air dryers. A retrofit could be done to add dew point controls onto the dryers. Further to this the sparging loads could be addressed using pumps and blowers.

The following was the annual power consumption of Plant B:

Further Monitoring

The original audit only monitored the compressed air system in Plant B of the facility. Two additional systems existed in Plant A that were initially thought by plant personnel to be running efficiently, therefore

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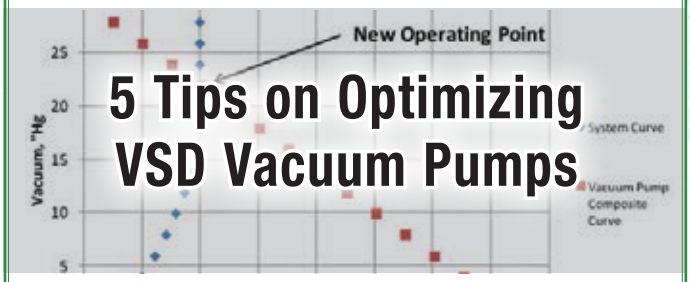

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Tim Dugan, P.E. is the President and Principal Engineer of Compression Engineering Corporation.

Our **Sponsor Speaker** is Troy Bridges, Product and Market Manager for Busch USA, whose presentation is titled "Key Tips for Using VSD on Vacuum Equipment." This presentation will explain the use of VSD to match pump capacity to the low curve of the application. He will also discuss the benefits of using VSD.

Troy Bridges is the Product and Market Manager for Busch USA.

Our second **Sponsor Speaker** is Walter See, Product Marketing Manager for the Industrial Vacuum Division of Atlas Copco, whose presentation is titled "Maximizing the Benefit and Savings of a VSD Vacuum Pump." He will discuss how to maximize the energy and cost savings of a VSD vacuum pump. His presentation will also review the optimal applications and pump technologies for VSD's along with pitfalls to avoid.

Walter See is the Product Marketing Manager for the Industrial Vacuum Division of Atlas Copco.

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INSTRUMENT AIR AND BREATHING AIR AT A PHARMACEUTICAL PLANT

no initial audit was done during the initial plant assessment (the auditor wanted to measure these but wasn't allowed). A few years after the original study all systems were revisited just before Plant B was optimized to determine if there were potential savings opportunities.

Figure 6 shows the results of the monitoring. A site breathing air system consisting of a single 40 hp modulating compressor and an oversized fixed cycle desiccant air dryer was running at very poor specific power, an unbelievable 204 kW per 100 cfm once the air dryer purge was taken into account (production specific power was 58 kW/100 going into the air dryer). Similar problems existed in an instrument air system in Building A, and the originally studied system in P B. Plant B system efficiency had actually decreased due to lower loading, a characteristic of load/unload control.

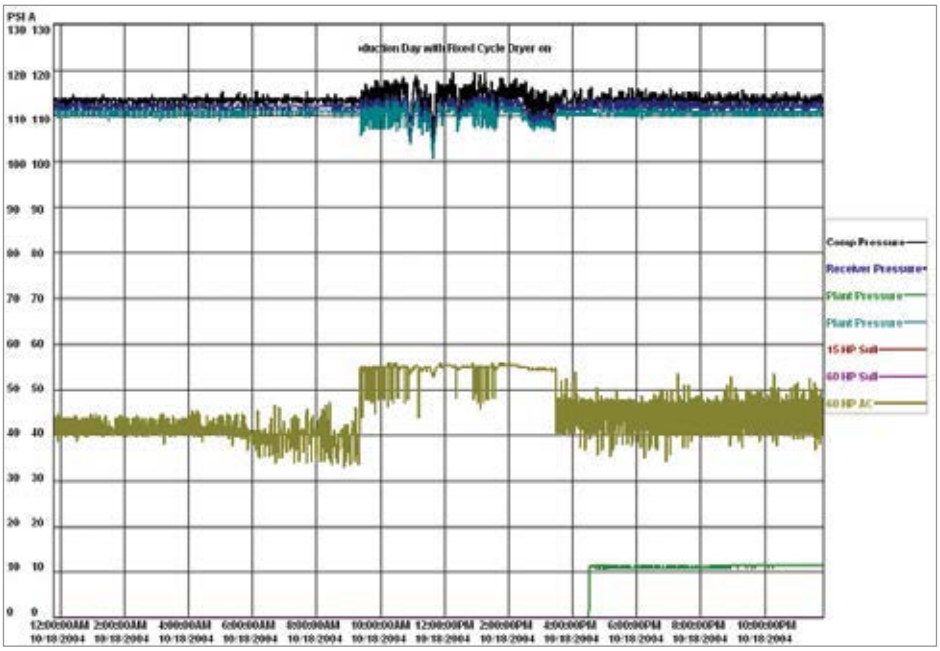

Figure 2: Sample production day with two compressors running

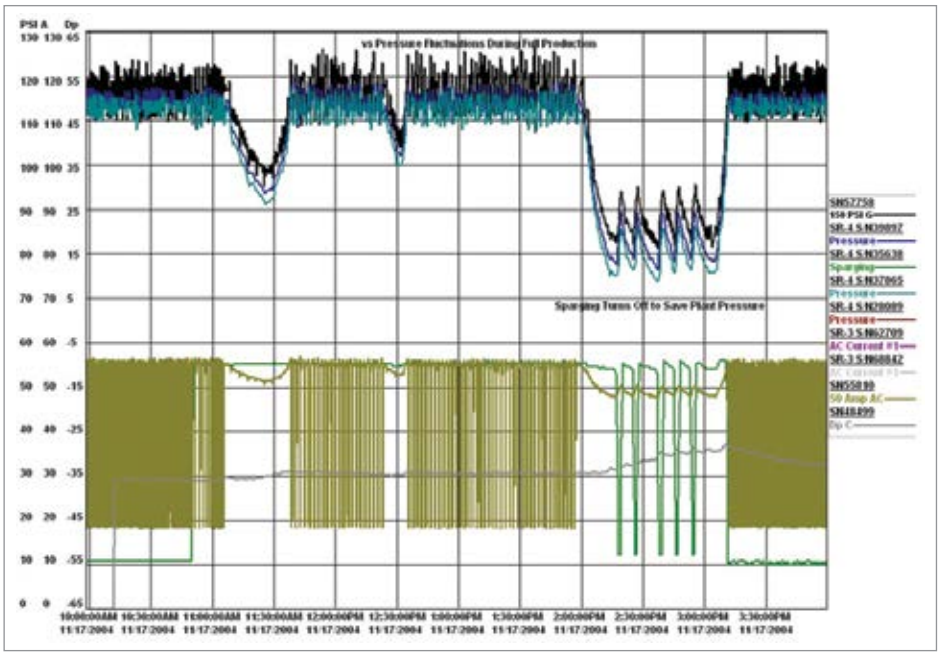

Figure 3: Shows sparging application dominating the pressure profile.

Since the breathing air system compressor was nearing the end of life, the plant decided to purchase a new VSD controlled breathing air compressor and dewpoint controlled air dryer. This changed greatly increased the compression efficiency and reduced the flow as the bulk of the compressed air flow was air dryer purge.

Improvements Completed

The plant personnel made the following improvements

- Building A instrument air and breathing air systems were combined into one well controlled VSD compressor suppled system.
- Building A desiccant air dryer was replaced by a downsized dewpoint controlled desiccant dryer for reduced purge flow.
- Building B sparging flow with compressed air was eliminated.
- Building B discharge pressure was lowered to near 100 psi.
- Building B compressor control was modified to prevent compressors from running unloaded when not required.
- Building B compressor control was changed so the small compressor and a small dew point controlled dryer runs during non-production hours.
- Building B compressor control schedule was modified so the larger compressor and a retrofitted dryer with dew point control operate during production activities.

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INSTRUMENT AIR AND BREATHING AIR AT A PHARMACEUTICAL PLANT

Constituent	Peak	Production	Non-production	Ave.	Percent
				wtd. cfm	
Production Processes	100	15	0	8	7%
Sparging	40	6	0	3	3%
Cabinet Purge	32	32	25	29	26%
Breathing Air	30	25	0	13	11%
Dryer Purge	50	50	50	50	45%
Drains	2	2	2	2	2%
Leaks	10	10	5	8	7%
Artificial Demand	0	0	0	0	0%
Total	264	140	82	111	

Figure 4: Detailed Analysis shows where air is used

Item	Hours	kW	kW	kWh
		Peak	Ave	
Production	4380	58.5	30.3	132,714
Non-production	4380	29.1	9.0	39,420
Breathing Air Dryer	4380	0	0	-
Circ Pumps and Fans	4380	2	2	8,760
Total				180,894

Figure 5: Base case power consumption

System	HP	kVa	kWh	$ Cost	Pk cfm	Ave cfm	kW/100
Bld A BA	40	32	247,300	$11,728	70	58	204
Bld A IA	15, 7.5	25	94,500	$5,800	75	36	57
Bld B	60, 15	35	158,600	$9,145	175	60	60
Total		92	500,400	$26,670	320	154	

Figure 6: Baseline energy and flow on second monitoring

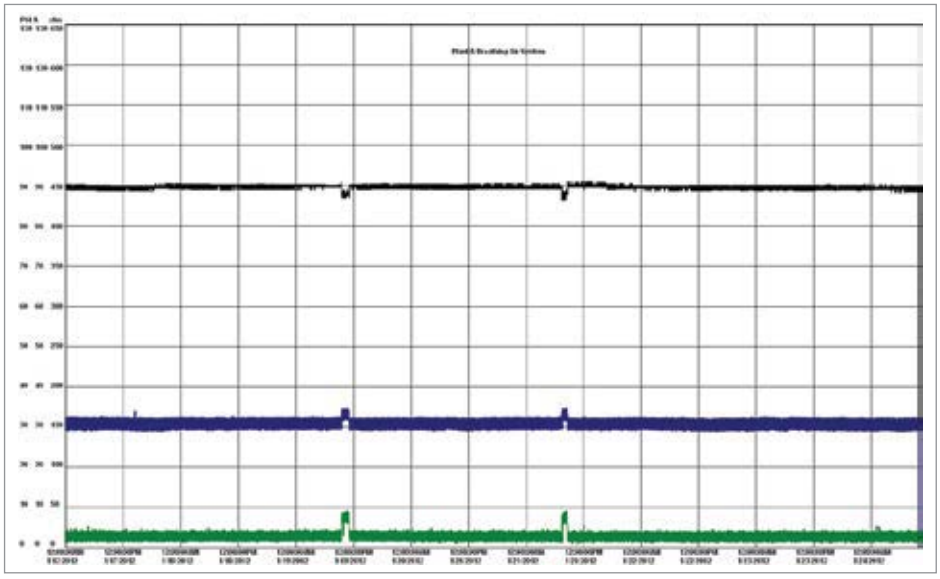

Figure 7: Even with low flow the breathing air system consumed significant power

Savings Results

Additional measurements were done to verify the savings for this project. The final outcome was as follows:

- Plant A: The energy consumption of the combined systems reduced by 215,000 kWh per year worth $12,000 per year in savings resulting in a 64 percent reduction in energy costs.
- Plant B: The changes to the system operation and air dryer purge reduced the energy consumption by 68,000 kWh worth $4,800 per year in energy savings for a 48 percent reduction.
- Based on the savings the company obtained a power utility supplied energy incentive package worth $48,000.

Conclusion

This project showed that assumptions should not be made about the efficiency of systems. Originally the systems in Plant A were not considered for optimization based on some faulty assumptions. However, once measurements were done, it was obvious to the plant personnel that more savings could be gained on that system than the original Plant B system.

The results also showed that desiccant air dryers are often the biggest end use of compressed air in the plant, and that something can be done about the purge air loss. BP

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

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Dew point is defined as the temperature a gas (e.g. air) must be cooled, at constant pressure, for water vapor to begin to condense to liquid water. In other words, when the dew point temperature has been reached, the gas is fully saturated with water vapor. Monitoring the dew point in compressed air lines is critical in medical and hospital air systems because of the possible risk for growth of microorganisms. Risks associated with letting dew point levels go unchecked in medical air/gas systems is the possible formation of bacterial growth in water droplets containing legionella germs. This can cause serious and often deadly lung infections. Also, when moisture levels are too high, water in medical air systems can shut down patient ventilators, and may cause serious physiological harm.

The MedAir 2200 is UL and CSA certified, and is capable of continuously monitoring up to four gases.

Medical air quality monitoring requirements in the NFPA 99 Standard Medical Air System Guidelines require dew point and carbon monoxide monitoring of medical air. ENMET's MedAir 2200 compressed air line monitor is designed specifically to help hospitals and medical facilities meet NFPA 99 Medical Air Systems Guidelines and OSHA monitoring requirements for Grade D breathing air. The instrument is UL and CSA certified, and is capable of continuously monitoring up to four gases including dew point, carbon monoxide, oxygen deficiency and carbon dioxide. Whether it is replacing existing medical air monitoring equipment or designing a new facility, consider including ENMET's MedAir 2200 as part of your medical air quality monitoring system to meet NFPA 99 Standards for Medical Air Systems and OSHA Grade D breathing air requirements. Contact our ENMET Sales Team today for more information, or visit www.enmet.com.

ControlAir Releases Stainless Steel Pressure Regulators and Valve Boosters

ControlAir, Inc., a leading manufacturer of precision pneumatic and electro-pneumatic controls, is pleased to share its capabilities in supporting offshore production and other corrosive environments. ControlAir's product offering of Stainless Steel pneumatic pressure regulators and volume boosters for the offshore and corrosive environments can now be found in one catalog located under 'Resources' on its website.

Common across all products in this group is a rugged construction and the use of corrosion resistant materials. With 316L Stainless Steel materials being used in the housings to ensure the best resistance to corrosive environments, ControlAir has designed these regulators and volume boosters to provide reliable operation.

Included in this group of products, the Type-350, 360, 380 and 390 regulators will operate on supply pressures up to 290 PSI (20.0 BAR) and offer flow capacity volumes up to 500 SCFM (14,150 Nl/min). These units can regulate air, inert gas along with sweet and sour gasses. The 350, 360 and 370 units are also NACE compliant to #MR-01-75 requirements. With options such as low temperature, auto-drain and up to 5 different output ranges, ControlAir has the ability to get you the right regulator for your tough environment.

ControlAir's product offering of Stainless Steel pneumatic pressure regulators and volume boosters ensure the best resistance to corrosive environments.

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The Large Flow Boosters, Type-6000 and 6600 can handle up to 150 and 250 psig supply pressure (respectively) and deliver an output pressure up to 150 psig (10.0 BAR). The Type-6600 delivers a flow capacity of up to 400 SCFM (11,320 Nl/min). Units are rated to a wide operating temperature range of -40 ˚F to 200 ˚F (-40 ˚C to 93 ˚C). Exhaust capacity is 150 scfm (4,245 Nl/min). The Type-6600 are available in 3/4" and 1" NPT porting.

About ControlAir Inc.

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

NEMA 4X Cabinet Coolers Fit In Tight Spaces

EXAIR's new Type 316 Side Mount Kits make the mounting of a NEMA 4X Cabinet Cooler possible when an electrical enclosure has limited space on the top or side. These Type 316 Side Mount Kits are corrosion resistant. The compact Cabinet Cooler is a low cost way to purge and cool electrical control panels, protecting sensitive electronics from heat, dirt and moisture.

Cabinet Coolers convert an ordinary supply of compressed air to 20 ˚F without refrigerants or CFC's. The cold air is circulated through the enclosure to eliminate high temperature malfunction. Cooling capacities up to 5,600 Btu/hr. are available. Cabinet Cooler systems include a compressed air filter to assure no moisture or dust is introduced inside the panel. Optional thermostat control minimizes compressed air use. Cabinet Coolers are UL Listed, conform to the CE general safety directive for machinery and have no moving parts to wear out.

The Side Mount Kits maintain the NEMA 4X rating of large and small electrical enclosures. Models for use on NEMA 4 and 12 enclosures are also available. Applications include cooling PLCs, microprocessors, variable frequency drives, industrial computers, and robotics. Side Mount Kits start at $220.

For more information contact EXAIR Corporation, email: techelp@exair.com, www.exair.com/78/smsidecc.htm

New Sonotec Broadband Sensors for the Sonaphone Ultrasonic Testing Device

The parabolic sensor BS30 for the SONAPHONE ultrasonic testing device can be used to detect leaks in compressed air, gas and vacuum systems as well as partial discharges over distances of up to 25 meters. The airborne sound sensor has been specially developed for the digital testing device. In addition to its range, the broadband sensor is also characterized by its directionality and its immunity to interference noise in the audible range. This allows for easy leak detection even in loud and challenging industrial environments.

The multi-function ultrasonic testing device is used in preventive maintenance for, among other things: leak detection and evaluation, tightness testing of unpressurized systems, condition monitoring of machinery, checking valves and steam traps and detection of partial discharges

"Whereas comparable testing technology only allows for processing over a narrow frequency range, our sensors make it possible to carry out a completely new analysis of the ultrasound signal in the frequency range from 20 to 100 kHz", explains Hans-Joachim Münch, Managing Director of SONOTEC Ultraschallsensorik Halle GmbH, talking about the special features of the SONAPHONE sensors.

In addition to the BS30, the ultrasound specialist also offers an airborne sound sensor and a structure-borne sound and temperature sensor

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for the SONAPHONE. Depending on the sensor, the multi-functional ultrasonic testing device can be used to detect and evaluate leaks and therefore reduce energy costs, to detect partial discharges and increase operational reliability, to detect potential weak points on bearings in good time in order to prevent any unplanned downtimes, and to assess the functioning of steam traps. "The key benefit of our SONAPHONE can be summed up in one key word: efficiency. Often, preventing just a single downtime is enough to make up for the investment costs for the device", says Hans-Joachim Münch.

Thanks to its sturdy housing, the mobile ultrasonic testing device is suitable for use in industrial applications, and the SONAPHONE can be operated intuitively like a tablet via the 5-inch display with multi-touchscreen. A user-friendly design is also paramount when it comes to the software: The different apps help the service engineer throughout the entire testing process and contain all necessary information. Test reports can be created in just a few clicks, making time-consuming and error-prone paper hardcopy recordings a thing of the past.

About SONOTEC

Founded in 1991, nowadays SONOTEC GmbH is a leading specialist in ultrasonic measurement technology solutions. With more than 150 employees, the technology company based in Halle (Saale) in the heart of Germany develops and manufactures customer-specific ultrasonic transducers and sensors as well as testing equipment and measuring technology solutions for a wide variety of industries. These range from medical technology and the chemical and pharmaceutical industries to engineering and plant construction and non-destructive testing.

Technical Data: SONAPHONE

- Frequency range: 20 to 100 kHz
- 5-point multi-touch screen
- Dimensions (WxHxD): 90 x 174 x 325 mm
- Weight: 370 g
- Auto-focus camera with 5 megapixels

Contact Rod Smith for ad rates: **rod@airbestpractices.com, Tel: 412-980-9901**

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Edgetech Instruments Introduces the AcuDew Aluminum Oxide Moisture Transmitter

The Edgetech Instruments AcuDew Moisture Transmitter is a two wire, loop powered moisture transmitter with linear 4 to 20 mA output corresponding to the measured moisture content. Its high capacitance aluminum oxide sensing element provides outstanding sensitivity, especially at low moisture content, as well as high speed of response and repeatability. The advanced electronic design of the AcuDew uses modern, high speed, high resolution hardware and software techniques for superior performance.

The AcuDew can be factory configured to provide an output corresponding to various moisture parameters including dew/frost point temperature, parts per million by volume or parts per billion by volume. Locally and remotely mounted display and power supply devices are optionally available. The Field Span Verification (FSV) feature of the AcuDew allows the user to ensure accuracy of the transmitter between annual factory recalibrations.

Bob Kenney, Edgetech Instruments' VP of Sales and Marketing, Aluminum Oxide Division said: "The aluminum oxide moisture sensor is used in greater numbers globally than any other industrial moisture measurement technique. High sensitivity, compact design, high pressure capability, ease of use and versatility make the aluminum oxide moisture transmitter the recognized best choice for continuous moisture measurement in many applications including process gases, high purity gases, glove box environments, compressed air and injection molding. The AcuDew is a high-performance moisture transmitter that represents a true advancement in aluminum oxide moisture sensing."

Each AcuDew Moisture Transmitter is delivered with an ISO/IEC 17025 certificate of calibration, traceable to NIST. The AcuDew is calibrated and supported in the USA, in a modern ISO/IEC 17025:2005 accredited calibration laboratory located in an ISO 9001:2015 registered facility.

For more information about the AcuDew go to http://acudew.com/

For more information about the Edgetech Instruments' Moisture Analyzers contact: Greg Gowaski, Sales Manager, Edgetech Instruments, Inc.; T: 978 310-7760, F: 978 310 7767; E: H2O@edgetechinstruments.com; W: www.edgetechinstruments.com

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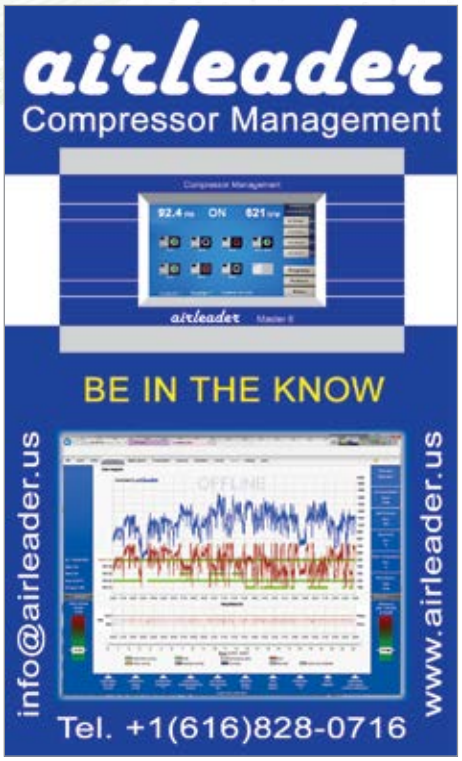

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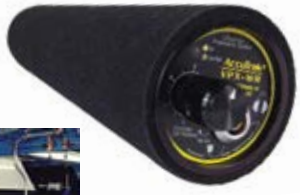

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