The Magazine for ENERGY EFFICIENCY in Compressed Air Systems

COMPRESSED AIR BEST PRACTICES

airbestpractices.com

October 2018

Hospitals

What's your number?

When it comes to savings and efficiency, we all have a target.

Sustainable Productivity

Atlas Copco

We're all on an efficiency journey. Maybe you're just starting, or perhaps you're already a rock star in saving energy. Either way, we have a solution to drive you to the next level. The box that makes up your air system, whether it be a compressor, blower or vacuum pump, should be the cornerstone of your strategy.

The key to making your number is our number. Here it is: 866-472-1013.

Call today and let us help you discover what's possible!

www.atlascopco.com/airusa

SUSTAINABLE MANUFACTURING FEATURES


16


22

COLUMNS


38

FROM THE EDITOR

Our Focus on Sales Engineers, Engineering Consultants and Manufacturing Plant Personnel

The inaugural BEST PRACTICES EXPO & Conference, took place September 17-19, 2018 at the Chicago O'Hare Crowne Plaza. We are happy to say feedback has been very positive from both conference attendees and exhibitors. A total of 750 people attended the free EXPO featuring 65+ exhibitors and the Conference featuring 96 expert speakers. I'd like to personally thank so many of you in our industry who have been part of making this dream come true. Due to the positive feedback, we figured we'd do it again! We've announced the 2019 Best Practices EXPO & Conference taking place October 13-16, 2019 at the Music City Center in Nashville, TN! For more information visit www.cabpexpo.com.

As a kid, I used to collect aluminum cans littered about parks, ponds and lakes in rural Kansas. I believed in the idea of protecting nature, recycling and eliminating waste — but let's be honest I was mostly was looking for a payday! I guess I haven't changed and suspect many air compressor sales engineers and manufacturing plant personnel feel the same way about compressed air projects — which eliminate waste and can have a significant financial and environmental pay-off.

For this reason, at the 2018 Best Practices EXPO & Conference, we recognized sales engineers, engineering consultants and manufacturing plant personnel as the only ones eligible (they did have to visit at least 10 sponsor booths) to participate in our TREASURE HUNT Raffle! The reason is at the end of the day — these are the ones recommending and deciding upon the profitability and carbon footprint of a compressed air system. Treasure Hunts were a theme at the event because they are a fast and high-ROI way for plants to begin doing "energy" projects. A compressed air leak audit is an example. We had a lot of fun with the raffle and the participants have never had better odds at winning — note this will be repeated in Nashville in 2019!

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

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

Zach Peterson from Dakota Fluid Power receiving the Treasure Hunt $1,000 1st Place Award from Best Practices' Rod Smith (left to right).

Greg Smith from Atlanta Compressor receiving the Treasure Hunt $500 2nd Place Award.

Tom Sherman from Sustainable Energy Services receiving the Treasure Hunt $250 3rd Place Award.

2018 MEDIA PARTNERS

A POWERFUL COMBINATION OF

RELIABILITY, DURABILITY AND PERFORMANCE

SULLAIR LS SERIES AIR COMPRESSORS

EXPERIENCE THE SULLAIR DIFFERENCE IN

ONE HARDWORKING PACKAGE

RELIABILITY
including the full-color, easy-access Sullair Touch Screen controller

DURABILITY
including the patent-pending, new generation Sullair air end

PERFORMANCE
including highly efficient Electronic Spiral Valve technology

Find your local authorized Sullair distributor today at ***Sullair.com***

SULLAIR®

A Hitachi Group Company

SULLAIR.COM

INDUSTRY NEWS

Inaugural BEST PRACTICES EXPO & Conference A Success

The inaugural BEST PRACTICES EXPO & Conference was held September 16-19, 2018 at the Chicago O'Hare Crowne Plaza and Conference Center. The event was produced by the publishers of Compressed Air Best Practices® Magazine who said the event, Co-Sponsored by Chicago's utility provider ComEd and by the Compressed Air & Gas Institute, exceeded their hopes for the first-time event. "Attendance reached 750 confirmed attendees out of the over-all 950 registrants and feedback has been extremely positive," said Show Producer Rod Smith. "The four primary attendee groups were Energy Managers from manufacturing plants, engineering firms and utility incentive program personnel, Sales Engineers and Managers from air compressor/blower/vacuum distributors and OEM's of compressed air, blower, vacuum and cooling system technologies."

The EXPO portion of the event sold out the entire exhibit space and featured 65+ exhibitors of compressed air, blower, vacuum and cooling system technologies. Exhibit hours ran from 12-6 pm on September 17-18th with EXPO admission free-of-charge for qualified professionals. "We are very pleased with the experience and outcomes of this first BEST PRACTICES EXPO & Conference," said Parker Hannifin Product Manager Allan Hoerner. "We have been very busy showing our new desiccant dryer and nitrogen generator technology to existing and prospective customers." Compressed air technologies at the booths included oil-free and lubricated rotary screw and rotary vane air compressors, compressor controls, dryers, filters, flow and dewpoint measurement instruments, nitrogen generators, piping, lubricants and condensate management products. At least ten booths featured blowers, rotary screw and rotary vane vacuum pumps, lubricants, piping and controls. There were also five cooling system technology products exhibiting chillers, heat exchangers and custom cooling systems.

The Opening & Plenary Sessions included presentations from Leslie Marshall (General Mills), Dana Bolton (ComEd), Chris Gordon (Blackhawk Equipment), Frank Mueller (CAGI), Doug Barndt (Ball Beverage Packaging), Joe Maney (NTN Bearings), Walt Tunnessen (ENERGY STAR for Industry) and Rod Smith, (pictured-BEST PRACTICES).

The Conference consisted of four tracks running simultaneously for 2 ½ days featuring almost 100 speakers. Speaking were some of the leading system assessment experts from the U.S. and Canada as were representatives speaking from the Compressed Air & Gas Institute, ComEd, Compressed Air Challenge®, Association of Energy Engineers, Department of Energy Better Plants Program, and ENERGY STAR® for Industry. Leading Energy Managers from General Mills, Ball Beverage Packaging, Fiat Chrysler, NTN Bearings (to name a few) gave very motivational speeches explaining their investments in optimization projects. Chicago-region air compressor/blower/vacuum/cooling system firms like Harris Equipment, Air Services Company, Fluid-Aire and Brabazon both exhibited and lent their expertise by speaking at the event.

- Track 1: Compressed Air Supply Strategies
- Track 2: Compressed Air Demand Reduction
- Track 3: Blower & Vacuum System Optimization
- Track 4: Cooling Systems & Energy Management

At the conclusion, the 2019 BEST PRACTICES EXPO & Conference was announced to be taking place October 13-16, 2019 at the

hertz
KOMPRESSOREN

One of the best supply partners in the industry

Work With Us Building The Future!

- Hertz Kompressoren is known for its Fast Response and Fast delivery
- Hertz Kompressoren is known for its reliable, dependable, easy to use and simple service
- Hertz Kompressoren is known for its collaborative and unique team

HERTZ KOMPRESSOREN USA Inc. 3320 Service St. Charlotte, NC 28206 USA // P: +1-704-579-5900 F: +1-704-579-5997

INDUSTRY NEWS

Music City Convention Center in Nashville, Tennessee. For more information please visit www.cabpexpo.com and for the Exhibitor Prospectus or Presentation Proposals please contact Rod Smith at email: rod@airbestpractices.com or tel: 412.980.9901.

Platinum Sponsor Sullair team members were excited to present their new oil-free rotary screw air compressors.

System assessment expert Don van Ormer, Air Power USA, leads the discussion in a Track 2 Session on Compressed Air Demand Reduction.

Only a Mattei Gets You ImPROVable Performance

Intertek, a third-party Total Quality Assurance provider, has proven that Mattei's proprietary rotary vane technology simply improves with time.

Thanks to a micro-polishing process, Mattei's rotary vane blades develop a mirror-like, frictionless finish as they slide in and out of their slots – while gliding on an oil film only microns thick. The result? A machine that gets better with time and maintains its improved efficiency and airflow over its 100,000-hour lifespan.

Testing proved that*:

- Specific power (kW/100 CFM) improves by 3.78%
- Rated capacity at full load improves by more than 1%
- Input power at full flow decreases by more than 2%
- Input power at zero flow decreases by more than 2%

Can your current compressor compete?
Get ImPROVable Performance. Get a Mattei.

* Measurements taken from a MAXIMA 55 X rotary vane compressor at zero and 500 hours

9635 Liberty Road, Suite E
Randallstown, MD 21133

(410) 521-7020

www.MatteiComp.com

EXPERIENCE THE REVOLUTION

INDUSTRY NEWS

Sullair Celebrates One Year Anniversary as A Hitachi Group Company

Sullair recently celebrated its one-year anniversary of becoming A Hitachi Group Company. The celebration drew more than 1,200 Sullair and Hitachi employees and family members, Hitachi executives and local dignitaries from Michigan City and the state of Indiana.

The celebration drew more than 1,200 Sullair and Hitachi employees and family members.

Sullair President and CEO Jack Carlson.

Hitachi Executive Vice President Masakazu "Mike" Aoki, Sullair President and CEO Jack Carlson, and Sullair COO Charlie Takeuchi spoke of the many successes and achievements of Sullair in its first year as A Hitachi Group Company. The first year included the introduction of several new products, including the OFD1550, LS Series, SRL Series and DSP Series; the addition of new distributors in key markets; and increased employment.

Following its acquisition by Hitachi, Sullair has combined the strength of both compressor companies to rapidly expand its oil free product offerings. The OFD1550 is the company's first Tier 4 Final portable oil free rotary screw air compressor. Built on Hitachi engineering, both the DSP and SRL Series compressors are certified under the ISO standard — ISO 8573-1 — for Class 0 oil free air, making them suitable for a variety of applications requiring oil free air.

The Sullair LS Series of oil flooded rotary screw air compressors — recently expanded up to 200 hp (160 kW) and 200 psi (13.8 bar) — are the first to utilize a new, patent-pending air end design and patent-pending package design. The Sullair LS Series is also the first to offer Electronic Spiral Valve technology in all models.

At the celebration, Aoki described Sullair as the "keystone" for the Hitachi air compressor division's growth and how the acquisition has been viewed as a great success for Hitachi.

Reflecting on the occasion, Takeuchi added, "Hitachi is very keen on expanding the Sullair business in Michigan City. We look forward to continuing to positively impact the local community. In the past year alone, we have added more than 110 new employees, and we look forward to continuing to work closely with the City of Michigan City as we grow."

Also at the event it was announced the street on which the Sullair Michigan City campus lies has been renamed in commemoration of the company to 1 Sullair Way.

"We are proud of our longstanding relationship with Sullair and now Hitachi," said Michigan City Mayor Ron Meer. "A great deal of work went into this, and we are proud to recognize the impact Sullair continues to have on our community."

For more information please visit www.Sullair.com

Announcing the new address of 1 Sullair Way are Michigan City Mayor Ron Meer, Sullair COO Charlie Takeuchi, Sullair President and CEO Jack Carlson and Hitachi Executive Vice President Masakazu "Mike" Aoki (left to right).

INDUSTRY NEWS

Jan and Rick Dekker from DEKKER Vacuum Technologies (left to right).

DEKKER Vacuum Commemorates 20th Anniversary

DEKKER Vacuum Technologies, Inc. has reached a momentous milestone, celebrating 20 years of delivering vacuum solutions and high-quality vacuum pumps and systems to a wide array of industries around the world. The company has grown from humble beginnings through tremendous dedication of founders Rick Dekker and his father, Jan Dekker to what it is today.

This 20th anniversary year has been a record-setting year for DEKKER Vacuum. Their allegiance to becoming the quintessential partner for distributors eager to increase profitability of their vacuum business, and the ideal choice for end-users searching for vacuum technologies with optimal performance is why companies from a myriad of industries turn to DEKKER Vacuum.

The roots of the company began with Jan Dekker in the 60's and 70's, who was designing and building oil-sealed liquid ring vacuum systems for South Africa's gold mining industry. By using oil instead of water and by adding vacuum boosters, vacuum systems were optimized by improving vacuum levels for gold extraction. In 1979, Jan and his family moved to the United States to open a vacuum division for a multi-national manufacturing company. He resigned in 1983 to start on his own, with Rick joining him in 1993 as an Applications Engineer. Determined to improve the old-fashioned ways of the vacuum industry, they established DEKKER Vacuum Technologies in 1998.

Jan Dekker, one of the leading authorities in the world of vacuum, reminisces on the landmark achievement stating, "With the advantage of our knowledge and previously developed business relationships, Dekker Vacuum Technologies was established in 1998 by Rick and myself in the basement of our home in La Porte, Indiana. Over the years, the company has grown into one of the foremost vacuum pump and system suppliers in the country, offering our exclusive Vmax™ systems, and the design and manufacture of systems for many other unique applications. The fact that we have an excellent fabrication facility allows us to tackle any design and gives us the capability to handle almost any job in-house, a major advantage over our competitors. I am pleased to say that we have accumulated a great team of capable people, under the leadership of Rick and Charles, to allow the company to further grow and strengthen our position in the market place. I am very proud to be a part of this!" At 81 years young, Jan can still be found in the office consulting for numerous projects, a testament to his desire to be involved and support DEKKER's customers.

DEKKER Vacuum was founded with a strong focus on providing excellent customer service before and after the sale. This philosophy has resonated with customers, driving strong sales growth over the years. The firm reached profitability after only twelve months of operation and the company has more than tripled the size of their facility since the inception. The company is led by the original founding executives and has maintained its privately-held ownership throughout its history. This has allowed DEKKER Vacuum to control key strategic and business decisions that have ensured a consistent focus on meeting the specific needs of its customer base. Today, DEKKER Vacuum has grown to employ over 70 full-time employees, supplying vacuum pumps and systems to over 60 countries around the world.

Rick Dekker, Chief Executive Officer of DEKKER Vacuum Technologies, reflects on the company's 20th anniversary, "It is amazing that it is already 20 years since we started DEKKER Vacuum. We could not have accomplished this without our customers and vendors having faith in DEKKER Vacuum over the years and for that, we thank them. Most of all, I am proud of what our team has accomplished over that period of time. We continue to work hard to improve every aspect of DEKKER, committed to world-class quality and service."

DEKKER's daily operations take place in a 90,000 square foot manufacturing, distribution and warehouse facility in Michigan City, Indiana. A talented management team leveraging more than 100 years of experience in vacuum, combined with a hard-working and dedicated support staff allows DEKKER to deliver the highest level of service in the industry. DEKKER has achieved these goals through ongoing commitment to excellence coupled with strong customer loyalty.

BEST PRACTICES

2019 EXPO OCTOBER 13-16 NASHVILLE, TN

COMPRESSED AIR / VACUUM / COOLING

CABPEXPO.COM






October 13-16, 2019 / Nashville Music City Center

Host Hotel: Sheraton Grand Nashville Downtown

EXHIBIT SPACE AND SPONSORSHIP OPPORTUNITIES

Contact Rod Smith, tel: 412.980.9901, email: rod@airbestpractices.com, www.cabpexpo.com

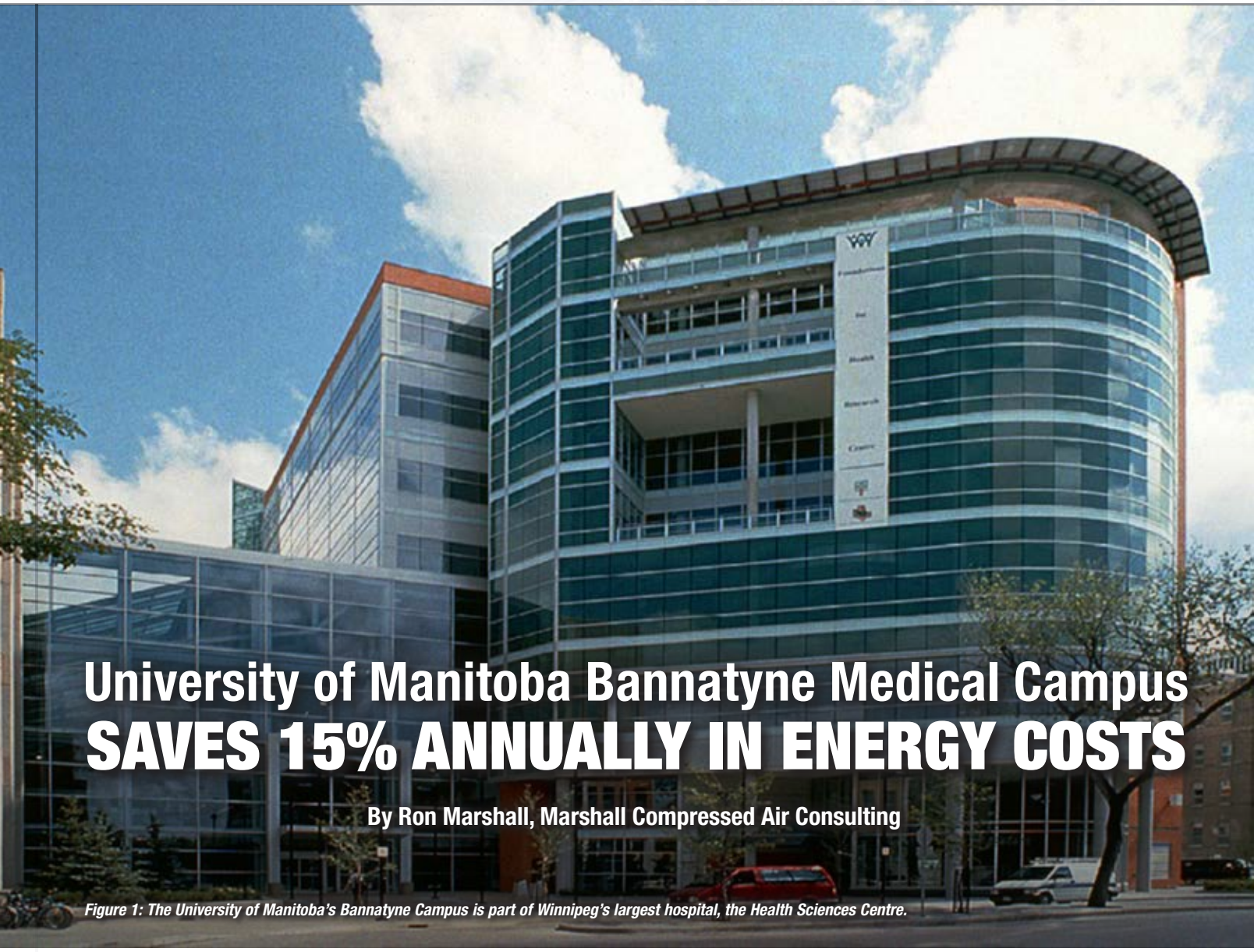
INDUSTRY NEWS

In 2010, Charles Mitchell joined the DEKKER team as Vice President of Finance, bringing over 20 years of management experience with multi-million dollar companies to the organization. Proving to be an integral part of DEKKER Vacuum's success, he was appointed to President of the company in 2015. "The last eight years that I have been a part of DEKKER Vacuum have been both exciting and challenging," Charles said. "We have grown as a company and as a team and are branching out to new applications and new markets. Even more exciting is the future beyond these 20 years where we will continue to explore our potential and continue to push ourselves to new opportunities, applications, and even more markets. History defines our past capabilities and limits. Our future is what we choose it to be and can best be defined as unlimited."

The company's product offerings have developed significantly over the last two decades in response to customers' evolving expectations and industry regulatory demands. "We compete in a unique market that offers a wide variety of products", Rick states, "What sets us apart is that our competitors try to fit their products to an application, while we provide solutions." DEKKER's emphasis on application and product knowledge has proven to be the key to innovative, customized solutions for their customers.

DEKKER Vacuum's confidence in continued growth is attributed to their ability to engineer solutions based on customer's stringent needs, retaining their reputation as one of the leading vacuum equipment suppliers in the industry. The team commemorates 20 years of business by reflecting on their unrivaled history and heritage, with eyes fixed towards a new decade of prosperity.

For information on Dekker Vacuum's products and services, please visit www.dekkervacuum.com or call 888-925-5444.



University of Manitoba Bannatyne Medical Campus SAVES 15% ANNUALLY IN ENERGY COSTS

By Ron Marshall, Marshall Compressed Air Consulting

Figure 1: The University of Manitoba's Bannatyne Campus is part of Winnipeg's largest hospital, the Health Sciences Centre.

The University of Manitoba Bannatyne Campus, Winnipeg, Manitoba, Canada, upgraded its compressed air system to include variable speed drive (VSD) air compressors and the use of internal heat-of-compression (HOC) drying, replacing oil-free air compressors and refrigerated dryers that reached the end of useful life. In doing so, the campus reduced annual energy consumption by 15%, improved the quality of the compressed air to modern day instrument air standards and gained additional compressed-air capacity. The local utility also awarded the medical campus an incentive of $13,500, offsetting the cost of the initiative.

> "Importantly, the use of VSD air compressors and HOC drying — instead of the 75 HP fixed-speed air compressor with heatless desiccant drying — resulted in an energy cost reduction of 28 percent when compared with the new base case of $24,600."
>
> — Ron Marshall, Marshall Compressed Air Consulting

Background

University of Manitoba's Health Sciences teaching and research facilities, known as the Bannatyne Campus, houses various medical related faculties. Within the complex are ten separate buildings for Basic Medical Science, Immunology, Pathology, Pharmacy, Dentistry; and Medical Services training and research. These buildings need compressed air for building heating and ventilation controls, laboratories, and for medical air used in dentistry.

The facility has always used oil-free air compressors to service the load, with the air compressors located in the physical plant equipment room. The old, 50-horsepower, air-cooled compressors, running at a pressure of between 105 and 115 psi, were installed in the early 1990's and were starting to have components fail. The units had refrigerated dryers installed to condition the compressed air output, and a system of filters to remove particles, lubricant and water droplets from the discharge of the dryers.

These oil-free air compressors ran on a 24 x 7-basis, with the units set up so one that one provided the main capacity, with the other remaining active as a hot spare. A number of years ago, these small compressors were sized large enough that they operated with an average duty cycle of about 60%,ensuring there was enough remaining capacity to handle transient compressed air demands with no pressure decay. However, over the years, additional functions and facilities were added to the system, loading the compressors to near 100% capacity.

In addition, the air-quality requirements for compressed air used in the dental and laboratories had become more stringent, with any upgrades to the compressed air system now requiring instrument-quality air.

UNIVERSITY OF MANITOBA BANNATYNE MEDICAL CAMPUS SAVES 15% ANNUALLY IN ENERGY COSTS

Air Compressors and Dryers Carefully Vetted

When looking to upgrade, the University of Manitoba's physical plant management considered various sizes and types of air compressors, including the water-lubricated type. They also looked at various dryer styles that could provide instrument-quality air to the facility, included heatless desiccant and externally heated. Both dryer types require purge air to regenerate the desiccant inside the dryers, needing additional compressed air to be produced by the compressors, about 15% over and above the facility requirements. This would have added to the required air compressor capacity and annual operating costs. For example, a 500 cfm heatless desiccant air dryer sized for the two existing 50 HP air compressors would consume 75 cfm of compressed air from the already heavily loaded main air compressor, requiring the second backup air compressor to start and run lightly loaded.

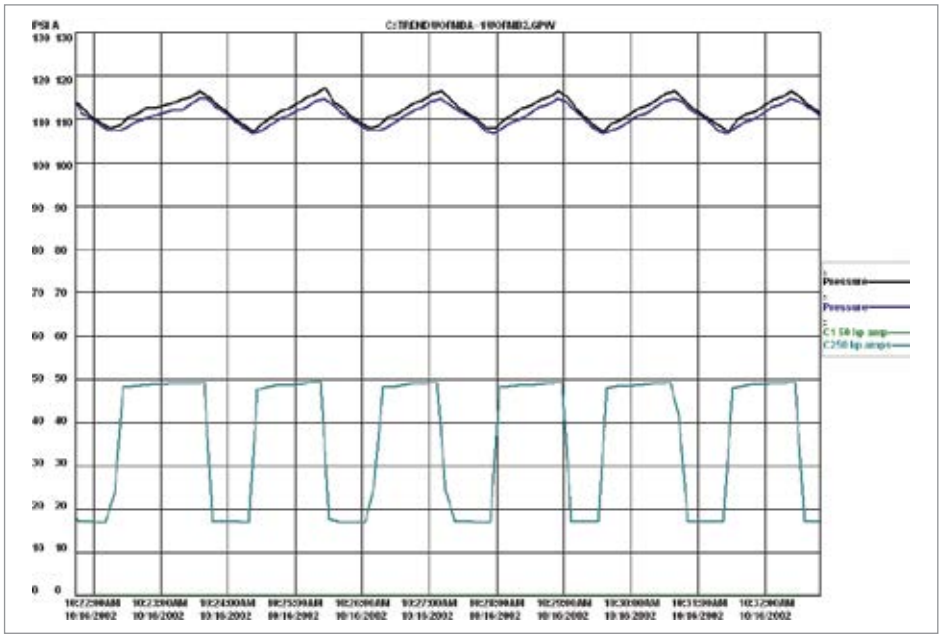


Figure 2: Years ago the original air compressors had enough capacity to meet compressed air demand at the campus.

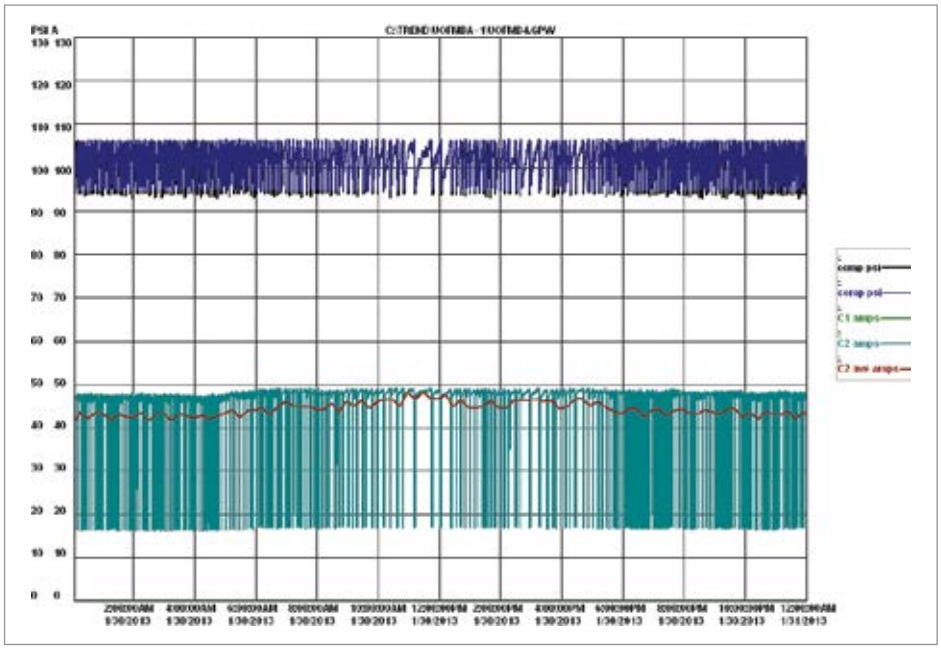


Figure 3: Over time, the original air compressors became too small, with no margin for transient flows.

Plant management also looked at available HOC air dryers that could be used with oil-free compressors. These dryers consume no compressed air, and other than some additional energy for a small motor for a drum drive, use no additional compressed air or external energy. The heat generated within the compressor is redirected into dryer with a system of piping to regenerate the desiccant (See Figure 4). This is a very good use of waste heat that would otherwise be directed outdoors and wasted. Management selected an oil-free air compressor type that has an HOC dryer within the enclosure of the compressor.

Analyses Demonstrate Potential Energy Savings

The local power utility Manitoba Hydro helped the Bannatyne Campus staff calculate existing compressed airflow and the baseline energy consumption. The analyses demonstrated the potential for energy savings.

The existing smaller 50 HP air compressors and dryers consumed about 346,000 kWh per year, which cost about $21,000 per year to operate. But because plant management chose to purchase a larger 75 HP fix-speed air compressor, and considered heatless desiccant

drying, the team set a new base case that estimated 405,000 kWh of annual consumption costing $24,600.

The utility also helped calculate the potential savings if the campus used a 75 HP, VSD air compressor and HOC dryer instead. The calculations predicted the upgraded system would consume about 312,400 kWh, costing about $19,000 per year.

Interestingly, the analyses compared a similar sized oil-free fixed speed air compressor from the same manufacturer to the VSD variant of the air compressor. It predicted that the VSD air compressor would consume about the same power due to drive losses and lower overall internal compression element efficiency. However, because the VSD unit operates at a fixed-target pressure, with a setting lower than the load/unload pressure band of the fixed-speed type, the savings due to the lower pressure was estimated at about $1,100 per year. In addition, the prediction showed the HOC dryer would save about $4,600 per year in electrical costs. As a result, the utility was able to offer about $13,500 in incentives toward the project.

Conclusion

The project was verified after installation and the compressed air load was found to be lower than expected, making the savings higher than predicted.

Instead of the expected 148 cfm the actual facility flow was calculated at 130 cfm. The compressor energy was measured at 292,000 kWh costing $17,800 per year to operate, which represents a 15% savings in annual energy costs when compared with the original compressed air system that cost $21,000 per year to operate.

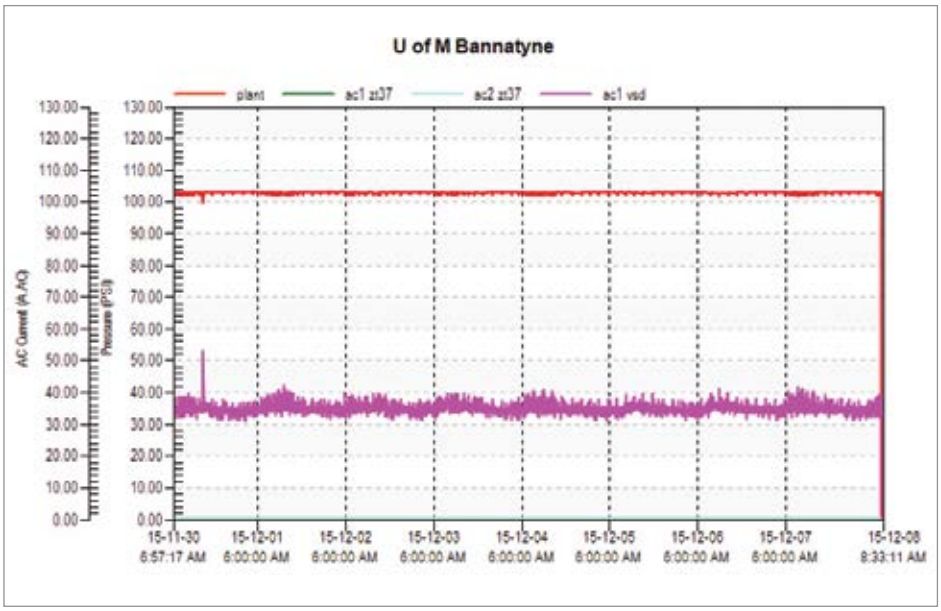


Figure 4: The lower and more constant pressure, and lack of unloaded run time, makes the operation of variable speed air compressors more efficient than fixed-speed units.

BEST PRACTICES
2019 EXPO OCTOBER 13-16 NASHVILLE, TN
COMPRESSED AIR / VACUUM / COOLING
CABPEXPO.COM

3-DAY CONFERENCE & FREE EXPO!

IMPROVING PLANT PROFITABILITY THROUGH INDUSTRIAL UTILITY OPTIMIZATION

BEST PRACTICES EXPO & CONFERENCE EVENT SCHEDULE

SUNDAY, OCTOBER 13, 2019

9:00AM–3:00PM	Exhibitor-Only Pre-Registration
9:00AM–6:00PM	Exhibitor Move-In
3:00PM–6:00PM	Conference Registration Open
6:00PM–8:00PM	Welcome Reception

MONDAY, OCTOBER 14, 2019

7:00AM–11:00AM	Exhibitor Registration and Move-in
8:30AM–10:00AM	Opening Session
10:15AM–12:15PM	Conference Session #1
12:00PM–6:00PM	**EXPO FLOOR OPEN**
1:30PM–2:30PM	Energy Treasure Hunt Workshop #1
2:45PM–4:45PM	Conference Session #2
TBD	Networking Event!!

TUESDAY, OCTOBER 15, 2019

7:00AM–8:00AM	Continental Breakfast*
8:00AM–9:30AM	Plenary Session
9:45AM–11:45AM	Conference Session #3
12:00PM–6:00PM	**EXPO FLOOR OPEN**
1:30PM–2:30PM	Energy Treasure Hunt Workshop #2
2:45PM–4:45PM	Conference Session #4
5:00PM	Energy Treasure Hunt Raffle Winners Announced!!**

WEDNESDAY, OCTOBER 16, 2019

7:00AM–12:00PM	Exhibitor Move-out
7:00AM–8:00AM	Continental Breakfast*
8:00AM–10:00AM	Conference Session #5
10:15AM–12:15PM	Conference Session #6

4 TRACKS PER CONFERENCE SESSION

TRACK 1:
COMPRESSED AIR SUPPLY STRATEGIES

TRACK 2:
COMPRESSED AIR DEMAND REDUCTION

TRACK 3:
BLOWER & VACUUM OPTIMIZATION

TRACK 4:
COOLING SYSTEMS & ENERGY MANAGEMENT

Registration

Conference registration includes, within the specified day, workshop and conference tracks, meals and expo hall access. **Register at www.cabpexpo.com**

	Before 9/13/19	After 9/13/19
Single Day Conference Pass	**$290**	**$350**

- October 14 Workshops, Lunch, Opening Session, Expo Hall & Evening Reception
- October 15-16 Breakfasts, Lunch, Conference Sessions, Expo Hall & Evening Reception

Full Conference Pass	**$550**	**$675**

- October 14-16 all functions and meals

SPECIAL DISCOUNT: Register 4 and get 1 FREE!

2019 EXPO HALL OPEN HOURS	**FREE**

- October 14-15 12:00 PM – 6:00 PM

UNIVERSITY OF MANITOBA BANNATYNE MEDICAL CAMPUS SAVES 15% ANNUALLY IN ENERGY COSTS

Figure 5: A compressed air dryer is installed internal to the air compressor package, saving floor space.

Figure 6: A histogram in the air compressor control panel shows the air compressor remains loaded at its most efficient point, but has additional capacity for future changes.

Importantly, the use of VSD air compressors and HOC drying — instead of the 75 HP fixed-speed air compressor with heatless desiccant drying — resulted in an energy cost reduction of 28 percent when compared with the new base case of $24,600.

In the final analysis, the use of waste heat and the reduction of pressure saved energy over and above the fixed-speed variant with heatless dryer. As a result, a substantial utility incentive was gained and, ongoing annual energy savings achieved for years to come.

In addition to energy savings, the installation of the VSD air compressor with an internal HOC dryer allowed the University of Manitoba Bannatyne Campus to renew its air compressor system, improve their air quality and upgrade its compressed air capacity. The compressed air system now has enough capacity that further increases in compressed airflow can be accommodated without the need to purchase another air compressor or experience low pressure. The new air compressor system also saves valuable floor space because the compressor and dryer are all in the same package. BP

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

To read more ***Medical Industry*** articles please visit www.airbestpractices.com/industries/medical

MEDICAL AIR MONITORING AND QUALITY VERIFICATION

By Mike Grennier, Compressed Air Best Practices® Magazine

➤ Compressed Air Best Practices® interviewed Norman Davis, Jr., President of ENMET, LLC.

Good morning! Tell us about ENMET and detection solutions you offer for monitoring gases in medical air systems.

Our products include medical verification instrumentation, compressed airline monitors, and single- and multi-gas detectors along with ambient air oxygen monitors. Many of these systems are designed to ensure compliance with NFPA 99 (National Fire Protection Agency) Medical Air Systems Guidelines and OSHA monitoring requirements for Grade D breathing air.

ENMET was founded in 1970. We're headquartered in Ann Arbor, Mich., with offices and manufacturing facilities in Kentucky and Michigan. In addition to providing gas detection solutions worldwide, we offer expert technical assistance, as well as advice on system installation and training.

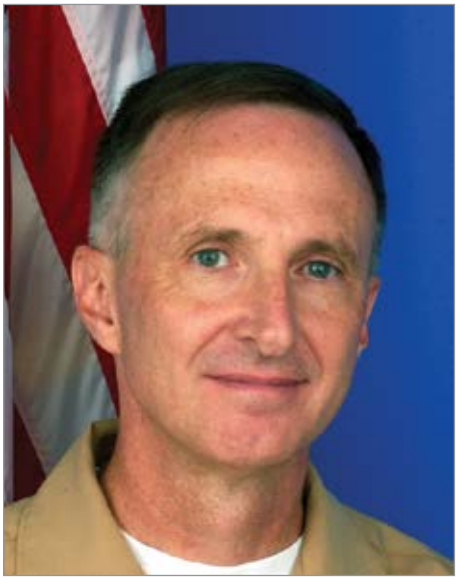
What NFPA 99 guidelines apply when it comes to monitoring of medical air systems?

The NFPA 99 Standard for Healthcare Facilities (2005 Edition) provides requirements for medical gas systems in health care facilities. Our technologies provide air and gas analyses that are essential for meeting these guidelines. These include both Level 1 and Level 2 Medical Piped Gas and Vacuum Systems of NFPA 99.

We monitor and detect target gases commonly found in compressed air systems of hospitals and medical facilities. In these systems, a medical air compressor produces air at 100 psig and feeds it at this same pressure to medical air dryers and filters. The air is then pressure regulated to 55 psig and distributed for use in Level 1 or Level 2 applications. End-use pressure is 50 psig to account for pressure drop.

What are NFPA 99 requirements that pertain to medical air dewpoint?

The need to monitor dewpoint in medical compressed air systems is as critical as it is for detecting targeted gasses.



Norman Davis, Jr., President of ENMET, LLC.

The code requires the compressed air system dryer to provide air at a pressure dewpoint of 32 ˚F (0 ˚C) at any level of demand. It also states dryers must be sized to deliver the specified dewpoint at peak-calculated demand. This means the compressed air dryer must provide air with a dewpoint of 32 ˚F at 33% or 100% load. Our monitoring systems are engineered with numerous alarms to notify users about the status of the medical air system's dewpoint.

What does NFPA 99 specify with regard to medical air dewpoint alarms?

It calls for the need to monitor dewpoint at the dryer's control panel, as well as downstream after the regulators have reduced the pressure from 100 psig to 50-55 psig. If the monitoring system detects any presence of moisture it will trigger downstream alarms.

When will alarms trigger given the need to meet NFPA 99 requirements?

NPFPA 99 is very specific about alarms for the medical air dewpoint, as well as carbon monoxide. It states:

- Dewpoint shall be monitored and shall activate a local alarm and all master alarms when the dewpoint at system pressure exceeds +4 ˚C (+39 ˚F).
- Carbon monoxide shall be monitored and shall activate a local alarm when the CO level exceeds 10 parts per million (PPM). [See 5.1.9.5.4(2).]
- Dewpoint and carbon monoxide monitors shall activate the individual monitor's signal at all master alarm panels if the monitor loses power.

Our MedAir 2200 Compressed Airline Monitor detects both hazardous gases and the dewpoint, which are common threats to the purity of air in medical air systems.

The MedAir 2200 has integral local alarms providing both audible or visual alarm warnings.

What types of gases does the MedAir 2200 monitor and how does it work?

It detects carbon monoxide (CO), oxygen (O_2), carbon dioxide (CO_2), Volatile Organic Compounds (VOCs), trace hydrocarbons and several other hazardous gases. It is also designed to meet monitoring requirements for Occupational Safety and Health Administration (OSHA) Standard 29 CFR 1019.134 Grade D compressed air breathing requirements.

The monitor is connected directly to a compressed gas supply bleed flow. The sample inlet pressure must be regulated to 55 psig. It continuously collects a sample of the compressed air by means of pressure reduction, which is passed over electrochemical CO and O_2 sensors, an infrared CO_2 sensor and a solid-state dew point sensor. This process results in electrical changes and outputs that are used to evaluate the air for target gases. It also has an integral electronic sensor with a fault alarm to monitor for low-flow conditions of less than 0.2 liters per minute.

Sensor data can be integrated into a process logic system (PLC) using a digital communication protocol, or analog 4-20mA outputs. The MedAir 2200 also has integral local alarms providing both audible or visual alarm warnings.

MEDICAL AIR MONITORING AND QUALITY VERIFICATION

Please elaborate on how these sensors detect target gases.

With an electrochemical sensor, which measures CO, and O_2, the gas diffuses into the sensor, through a porous membrane to the working electrode where it is oxidized or reduced. This electrochemical reaction results in an electric current that passes through the external circuit. The chemistry of the cell is designed to favor a chemical reaction that matches the gas of interest. The detection mechanism of electrochemical sensors is usually only suitable for gases that are electrochemically active. The sensors have low-level detection limits and long operational lifetime.

To measure CO_2 with the infrared sensor, a Light Emitting Diode (LED) is energized. The frequency of the light then excites the gas molecules, which causes absorption of the light or energy. Small changes to this process signify the presence of the gas and or absence of the gas. More specifically, the gas absorbs some of the infrared wavelengths as the light passes through it, while others pass through it completely un-attenuated. The amount of absorption is related to the concentration of the gas and is measured by a set of optical detectors and suitable electronic systems. The change in the intensity of the absorbed light is measured relative to the intensity of light at a non-absorbed wavelength. The instrument computes and reports the gas concentration from the absorption.

How does the monitor detect dewpoint of a medical air system?

It utilizes a dewpoint sensor that operates through the use of a conductive polymer membrane technology. The membrane absorbs and releases water vapor, or humidity. The membrane has an electrical

charge corresponding to a water absorption that can be converted by temperature into a dewpoint reading.

Given the importance of dynamic range, the dewpoint sensor must be able to report accurately the low levels of humidity. For most compressor applications, the dynamic range is -46 ˚F to +140 ˚F with accuracy to 3 ˚F as displayed in degrees.

To what extent does the monitor require calibration and maintenance?

The nature of the ambient environment determines the frequency of calibration. Once a pattern of behavior is established, users can determine the actual frequency of calibration.

Generally, quarterly checks are a good place to start. In aggressive hot or cold environments, we recommend monthly calibration checks at first. These intervals can increase over time based on results. In any case, keeping calibration records and response trends are essential to ensure the monitors are working to specification over time, ensuring the breathing air is safe.

Each sensor in the MedAir 2200 has a specific lifetime associated with the sensor technology. Electrochemical sensors last two to three years each and infrared sensors five years each. Dew point sensors have a long life and have a calibration interval of two years, which is when they can be factory refurbished, recalibrated or replaced.

The MATRIX portable gas monitoring system monitors CO, O_2, CO_2 (PPM and percentage volume), CH_4, N_2O, trace hydrocarbons, anesthesia gases and dewpoint.

MEDICAL AIR MONITORING AND QUALITY VERIFICATION

The Importance of Medical Gas Verifiers

NFPA 99 requires independent testing of medical air systems, which means the company that installs air compressors as part of a medical air system cannot perform verification tests.

That's where medical gas verifiers come in, said Corky Bishop, P.E., CMGV, certified Medical Gas Verifier with Apex Medical Gas Systems, Oklahoma City, Okla. Corky is also president of the Medical Gas Professionals in Healthcare Organization (www.mgpho.org).

"A medical air contamination test is required whenever a hospital or healthcare facility gets a new air compressor package, or replaces a major component in the source equipment," Bishop said. In addition to testing using independent third party, the tests must be performed by a credentialed American Society of Sanitation and Engineering (AMSE) 6330 Medical Gas Verifier.

Bishop said medical air system tests are performed to ensure compliance with NPFA 99. Test results must meet specifications in accordance with Medical Air USP as outlined by the U.S. Pharmacopeia (USP), which is a pharmacopeia and essentially a compendium of drug information.

Corky Bishop of APEX Medical Gas Systems.

Bishop said in addition to medical gases a key concern in medical air systems is air moisture.

"Water contaminates in copper piping does lots of damage to ventilators that patients depend on to breath," he said. "It's why proper maintenance should include regularly checking the drains, dryers, and filters."

The bottom line, said Bishop, is ensuring patient health.

"We're looking for a system that is compliant and meets the Health Care Facilities Code," Bishop said. "We want the intake, the source, and the piping distribution system of the medical air system to be clean so that sick people do not become sicker."

For more information, contact Corky Bishop P.E., CMGV, Apex Medical Gas Systems, Oklahoma City, Okla., email: corky@apexmedicalgas.com; tel: 405-728-1272.

A medical air compressor at a healthcare facility.

What trends do you see in medical air systems and NFPA 99?

One clear trend is growth in verification of medical air system gas purity to ensure compliance with the standard. Verification tests are conducted during the construction phase of new buildings, or remodeling projects. The tests are also conducted periodically as required by NFPA 99. They are in addition to continuous monitoring.

Who performs these tests and how are they conducted?

A gas verifier performs them after the medical air system is installed and on a regular basis. A gas verifier is a highly trained and certified professional responsible for the final inspection, testing and integrity of all complete medical gas and vacuum systems. **(See sidebar article.)**

To service this market, we developed our MATRIX portable gas monitoring system, which is an eight-channel, multi-sensor system that monitors CO, O_2, CO_2 (PPM and percentage volume), CH_4, N_2O, trace hydrocarbons, anesthesia gases and dewpoint. It's a self-contained system that eliminates for multiple monitoring systems to perform the tests.

Whether it's continuous monitoring or gas verification, our systems provide the information hospitals and healthcare facilities require to satisfy NFPA 99 and to ensure the medical compressed air system delivers purified medical air to patients.

Thank you ENMET for your insights. BP

For more information, please contact Norman Davis, Jr., ENMET, LLC, Ann Arbor, Mich., email: ndavis@enmet.com; tel: 734-761-1270, or visit www.enmet.com.

To read similar ***Medical Air*** articles please visit www.airbestpractices.com/industries/medical

MEASURING PERFORMANCE of Installed Air Compressors

By Thomas Fischer, SUTO iTEC

Measuring the Free Air Delivery (FAD) of an air compressor can be challenging. With a proper flow meter and some mathematics this task is manageable. This article sheds some light on how to select the flow meter and summarizes parameters to be considered in the FAD measurement task.

The ultimate job of an air compressor is to produce compressed air by sucking in ambient air, pressurizing or compressing it, and discharging it into the compressed air network. Air compressor power is defined by its power rating and the FAD specifications stated by the manufacturer when new. However, as time goes by, an on-site measurement can be very useful. There are several simple questions, which eventually explain the performance of an air compressor:

- How much electrical power is my air compressor consuming?
- How much compressed air is my air compressor delivering?
- What's my pressure profile?

To answer these questions, you may want to measure your air compressor on your own. Performance measurements usually comes into two types:

- Temporary performance measurement, done as part of system assessments, or before investing in a new air compressor.
- Permanent performance measurement, which is performed to monitor the performance at all times in order to trigger services or overhauls timely.

> "Because air compressor manufacturers may state their FADs at different inlet conditions, it's advised to look into the air compressors data sheet and not just take the nameplate numbers!"
>
> — Thomas Fischer, SUTO iTEC

How is FAD Defined?

Flow is measured in volume per unit of time. But air can be compressed easily and its volume changes with the temperature. Meanwhile, the air that an air compressor sucks in contains humidity (water vapor), and the air density (air per m^3) changes with variation in the altitude, temperature and weather patterns. To ensure everyone is talking about the same thing, industry and international standards have been written. For example, ISO 1217 relates to performance testing of displacement air compressors. This standard includes packaged rotary screw air compressors as well.

Clause 3.4.1 of ISO1217 states:

"Actual volume flow rate of a compressor is the actual volume of gas, compressed and delivered at the standard discharge point, referred to conditions of total temperature, total pressure and composition prevailing at the standard inlet point."

This is the actual volume of air delivered by the air compressor referred back to the conditions of the free air at the compressor inlet. So FAD is the amount of free air drawn into the compressor that is actually delivered by the air compressor at its compressed air outlet.

FAD uses volumetric flow units such as m^3/min and l/s etc. The types of flow meters allowed by ISO 1217 initially calculate a mass flow of air, which is then converted to an intake volume flow rate based on a value for the density of the air at the intake to the air compressor. Ideally these are the actual conditions, but for convenience, ISO 1217 suggests the following conditions, provided the actual conditions are within an allowable tolerance:

- Pressure = 1 bar absolute
- Temperature = 20 °C
- Relative humidity = 0%

Corrections are then made for the intake humidity and the amount of water condensed upstream of the flow meter and the speed of the motor compared to its rated speed.

Because air compressor manufacturers may state their FADs at different inlet conditions, it's advised to look into the air compressors data sheet and not just take the nameplate numbers!

It takes more power to compress air to a higher pressure. Also, air losses and control-air use increase with pressures within an air compressor so the compressor motor isn't overloaded at higher pressures. For example, the compression module in an 8-bar rotary screw compressor operates at a different speed than in a 10-bar machine.

Type	:							
n°	:	AP1610530						
P_{max}	:	8bar	–	116 psi	–	0,8 MPa		
Qv	:	230,6 l/s	–	488,6 cfm	–	13,84 m^3/min		
P_{motor}	:	75kW	–	100 hp				
n_{motor}	:	2978 r/min						
m	:	1530 kg	–	3373 lb				
Manufacturing year :						2009		

Typical air compressor nameplate

Working pressure				Capacity FAD			Installed motor power	
Standard		Full Feature						
bar(e)	psig	bar(e)	psig	l/s	m^3/min	cfm	kW	hp
5.5	80	5.3	77	336	20.2	712	90	125
7.5	109	7.3	106	293	17.6	621	90	125
8.5	123	8.3	120	280	16.8	593	90	125
10	145	9.8	142	253	15.2	536	90	125

This extract from an air compressor data sheet shows the dependency of FAD on pressure. Note the power consumptions at different pressures are the same.

MEASURING PERFORMANCE OF INSTALLED AIR COMPRESSORS

What Affects the Efficiency of an Air Compressor?

There are a couple of parameters that affect the efficiency of air compressors. Table 1 lists these parameters and their effects on two common air compressor types — rotary-screw and centrifugal. The effect of intake temperature is different for rotary screw and centrifugal air compressors, but this article doesn't cover these details.

Air compressor manufacturers measure the performance of air compressors according to international standards (i. e., ISO 5389 for centrifugal air compressors) and describe the results in their data sheets. However, these measurements are performed in the factory conditions and not real on-site conditions.

Moreover, the performance of the air compressor may degrade over its life-time and an overhaul might be required. To judge the performance of an air compressor, an on-site measurement is recommended. Further, an active measurement such as real-time monitoring is very important for real-time performance estimation of air compressors.

Methods for Measuring the Discharge Flow

The discharge flow of an air compressor contains air, water, oil and particles. Some measuring methods fail because they cannot handle water and oil in the flow. Others are not suitable because they cause a pressure drop, which in turn, leads to a waste of energy and money. The requirements for a flow meter used at the compressor discharge include:

- Resistant to particles.
- Resistant to water and oil drops.

TABLE 1

PARAMETER	DESCRIPTION
Intake conditions: ambient temperature, relative humidity and absolute pressure (location and weather depending)	Example for a FAD flow of 100 m3/min At inlet conditions (= reference conditions): 20 ˚C, 0% RH, sea level. Flow at reference conditions = 100 m3/min At inlet conditions: 35 ˚C, 70% RH, sea level Flow at reference conditions = 91.4 m3/min
Power supply: voltage / frequency	For a performance measurement, it's recommended to measure voltage, power, power factor, and frequency.
Operating pressure	Specifications for FAD must state at what outlet pressure.
Motor efficiency	Wear of mechanical parts in the motor over life time
Air compression unit	Wear of mechanical parts, friction of air, turbulences
Drains / leakages / internal use	Air losses due to water drains, internal compressor leakages and internal compressed air use.

- Ability to handle high velocities and temperatures up to 70 ˚C.
- Minimal pressure drop, better no pressure drop.
- Insertion-type flow meter suitable for temporary measurement.

Table 2 provides a comparison of the most common flow meter principles toward the preceding requirements.

Based on the comparison, a pitot tube flow sensor stands out as the best choice for measurements at the compressor discharge. This method has proved its robustness in industrial applications. It is also the standard method for measuring air speed in the aircraft industry.

Measuring Flow at the Intake Side

Recently some manufacturers, especially from China, have introduced thermal mass flow meters to be installed at the intake side of the air compressor to determine the compressor performance. In many ways these flow meters

Typical intake flow meter with connection sleeves.

TABLE 2

TYPE	RESISTANT TO DIRTY AIR	RESISTANT TO PARTICLES	HIGH VELOCITIES HIGH TEMPERATURE	PRESSURE DROP	INSERTION TYPE
Turbine	--	--	0	+	--
Thermal mass	--	--	++	+	++
Vortex / Swirl	+	+	++	-	--
Orifice	0	0	++	--	--
Pitot tube	+	+	++	+	++

Key: ++ very good, + good, 0 average, - poor, -- not suitable

MEASURING PERFORMANCE OF INSTALLED AIR COMPRESSORS

Modern pitot tube flow meter for outlet measurements.

beautify/exaggerate the performance because they do not consider:

- Losses inside the air compressor, which cannot be measured.
- Air used to "pump up" (pressurize) the air compressors internal volumes is measured as air delivered, but it's only stored within the air compressor. It is vented (during blow down) to atmosphere when the air compressor unloads.
- For an air compressor operating load/unload this blow-down air can quickly become a big error, especially at low average loads.
- Installation sometimes requires removal of intake filter, thus showing flow rates that are too high. The pressure drop across an air filter can reduce the intake air pressure by 1 to 3 percent.
- Air compressor performance tests standards require the flow measurement at the outlet, and not at the inlet.
- Complicated installation and bulky equipment.
- Applicable to short term tests, no permanent installation.

An air compressor user should insist on measurement at the outlet to determine the performance. Of importance is what comes out and not what goes in!

How to Calculate the FAD From the Discharge Flow

The discharge flow measured by a pitot tube flow sensor must be computed into FAD with additional measurements on the operating temperature and operating pressure.

It's important to understand the operating flow at the air compressor discharge is made of two components:

- Airflow, which is what you want to measure.
- Water flow, which is removed later in the air-treatment section.

To measure the water contents precisely, it's required to measure the humidity in the pipe. This is not an easy task, and you must take into account the almost- saturated-humidity conditions at high temperatures. Many humidity sensors cannot work at such conditions. Interestingly, when the humidity is set to a value between 80 to 99 percent, the measurement error is not more than ± 0.3%.

Based on this finding, you can use a constant setting for the relative humidity. Therefore, you are able to deduct the water contents from the flow and calculate the "dry air flow" at the standard conditions (i. e.,20 ˚C, 1000 hPA).

The intake humidity affects the amount of dry air delivered, but the error is less than other factors. For example, on a hot tropical day of 32 ˚C and 75% RH, the dry air volume is 3.5% less than the intake air volume.

The barometric pressure with changing weather can vary by twice this amount. A dirty air intake filter can also vary the intake airflow by 2 to 3 percent.

By using the gas law and following the intake conditions specified by the air compressor manufacturer you eventually get the FAD computed.

The so-calculated FAD is what the air compressor "really" delivers. If you want to compare it with the air compressor data sheet, make sure to use the same intake conditions.

How to Measure Power

Quite often, amperes alone are thought to be an accurate measurement of kilowatts (kW), which is then used to calculate full-load specific power (m^3/min/kW) or to estimate flow (m^3/min) of an air compressor. This is incorrect!

If you measure only amperes, you cannot know the power factor and the imbalances between the three phases. This will lead to errors of 10 to 30 percent.

It's also very difficult to accurately use this estimated kW to calculate the percent of full load in the capacity-control cycle. These complex calculations can only be done using short-term data as the condition of the air compressor and its controls vary with time.

A correct power measurement requires amperes and voltages measured at all three phases of the air compressors using a power meter, which can calculate the power factor. The power equation is as follows:

$$kW = (A \times V \times 1.732 \times PF) / 1000$$

Key:

kW = Input kilowatts

A = Motor current (amperes)

V = line voltage

PF = Power factor

Conclusion

Performance measurement of air compressors is important. By having permanent monitoring on the compressed-air system, you will realize even more benefits.

The key is to perform predictive maintenance so that components are serviced before they fail. Also, keep track of the energy consumption to ensure the investment will pay off in a very short time. Combined with regular leak surveys, these factors will allow you to enjoy a healthy and efficient compressed-air system. BP

All photos courtesy of SUTO iTEC. For more information, visit www.suto-itec.com.

To read similar ***Air Compressor Technology*** articles visit www.airbestpractices.com/technology/air-compressors.

The Vital Role of Specialized Compressors in Helium Recovery

By Stelios Flessas, J.P. Sauer & Sohn Maschinenbau GmbH

Helium is a precious noble gas that has become invaluable for leak detection, as well as cooling down magnets in medical equipment. This is why consumption of this essential industrial resource is increasing and its price is rising rapidly. To combat a looming shortage of this increasingly scarce resource, new methods of helium recovery are becoming more important than ever — as are specialized compressors for the same purpose.

A Noble and Versatile Gas

Due to its characteristic properties, helium is used for a large variety of industrial applications. With the lowest boiling point of all gases, it is used in cryogenic research for example, as a coolant for magnets found in computer tomography.

Because of its small atomic diameter, it is able to permeate even the smallest openings. This is what makes the gas an ideal choice for leak testing. The fact that it is inert and almost non-reactive makes it extremely versatile.

Helium is also used for quenching in metal working as a superior alternative to oil. The noble gas prevents discoloration from oxidization. In addition, it eliminates the need for subsequently cleaning the work pieces, thus increasing efficiency and improving cycle times.

Exploring New Ways of Recovery and Reuse

Helium is mostly derived from natural gas, in which it is contained in low concentrations. Rising natural gas prices have contributed to helium becoming increasingly expensive over the last few years. The trend is expected to continue since the gas is growing scarcity and there are no viable alternatives for helium production.

This requires a new approach. For a long time, helium, when used as a tracer gas for example, was simply expelled into the atmosphere after serving its purpose. Today, an entire industry is looking into ways of recovering and reusing the precious resource.

> "To combat a looming shortage of this increasingly scarce resource, new methods of helium recovery are becoming more important than ever – as are specialized compressors for the same purpose."
>
> — Stelios Flessas, J.P. Sauer & Sohn Maschinenbau GmbH

Specially designed recovery systems store the helium in large balloons after its use in leak testing. A compressor siphons the helium and compresses it to 2900 psi. In this state it can easily be bottled and stored for later use.

Breathing Air Compressors Not Up to the Task

Many manufacturers sell breathing air compressors used in diving equipment for compressing helium. However, these compressors are not sufficiently gas-tight to prevent costly helium leakage. In addition, with an average service life of 200-1000 hours, breathable air compressors are not made for long-term use. Actual helium compressors are designed to operate for up to 7,000 hours per year.

Special Measures Help Prevent Costly Leakages

The unique properties that make helium ideal for technical applications are the same properties that complicate its compression. Given the low atomic size and viscosity of the gas, special valves and gaskets are necessary in helium compressors. The use of adhesive sealants further helps prevent costly leakages.

Oil-lubricated compressors in particular tend to have shaft-sealing rings installed to prevent oil and gas leakage. However, these seals only provide one-way leak tightness. The risk of contamination from the outside remains high when using standard air compressors. To counteract this, compressors designed for helium applications are doubly sealed. Two opposed shaft lip seals prevent both oil and gas leakage and keep contaminants from entering. Helium compressors are equipped with enclosed safety valves at each compressor stage. When they close, the superfluous gas is not expelled into the surrounding air, but instead, redirected to the

Helium compressors require accurate testing. Photo courtesy of Sauer Compressors.

FREE SUBSCRIPTION

DIGITAL EDITION FREE WORLDWIDE | PRINT EDITION FREE TO U.S. SUBSCRIBERS

COMPRESSED AIR
BEST PRACTICES
airbestpractices.com

Learn How To Save Energy & Improve Productivity In YOUR Industry!

2018 FOCUS INDUSTRIES

- Poultry & Meat Packaging
- Pharmaceutical Process & Packaging
- Food Processing & Conveying
- Furniture & Woodworking
- Plastic Extrusion Injection/ Blow Molding
- Compressed Air System Assessments
- Metal Fabrication & Steel Production
- Wastewater Aeration
- Hospitals & Labs
- Food & Beverage Packaging
- IoT & Industry 4.0

Subscribe at **airbestpractices.com**

Subscribe Now!

THE VITAL ROLE OF SPECIALIZED COMPRESSORS IN HELIUM RECOVERY

compressor's priming chamber connected to the safety valves.

The condensate separator in standard air compressors proves another difficulty when it comes to compressing helium, as it not only expels condensate but also gas that then needs to be recovered. For this reason, helium compressors have condensate drains that enable recirculation of the gas.

Accurate Testing Required for Helium Compressors

In order for helium compressors to meet the requirements of the demanding gas, thorough testing is required. Many manufacturers only measure a static leak rate by subjecting the compressor to overpressure during standstill. However, this is not enough to get reliable test results and to ensure sufficient gas tightness.

Sauer Compressors, based in Kiel, Germany, has devised an extensive 16-hour test procedure for its helium compressors that is unprecedented in the industry. The goal: maximum leak tightness for the lowest possible loss of helium and the highest attainable gas purity.

Instead of using air for testing, Sauer's specialized helium compressors are fully tested with the gas itself. First, a bubble test is performed to ensure that no gas is leaving the compressor. To do so, the compressor is subjected to overpressure and completely immersed in water. If a leak is present, it can be discovered via the emerging bubbles.

The compressor is then subjected to a vacuum in a pressure-rise test to ensure protection from contaminants from the outside. Finally, Sauer employs a pressure-decay test in a hermetically sealed helium cycle. This measures a possible loss of helium during operation at final pressure of 3335 psi, for example. The results of this extensive testing are helium compressors with a maximum leakage rate of only 0,1 mbar x l/s.

Specially Designed Compressors Remain Invaluable

Besides helium, the recovery of other noble gases with similar characteristics, such as argon and neon, will become increasingly relevant in the coming years. In order to ensure an economic use of these resources, specially designed compressors will remain invaluable in the long term. BP

About Sauer Compressors

Industries worldwide rely on Sauer piston compressors for pressures of up to 7,250 PSI to control process and production using high-pressure air or gas. Our starting and working air compressors have proved highly successful in a variety of demanding markets and are among the most modern and efficient in the world. We place great importance on comprehensive and proficient customer support backed by the Sauer Lifetime Warranty. We assist our customers from the initial project phase through after-sales service with specialist consultation for the complete solution while ensuring the best possible efficiency over the entire life-cycle of the compressor. By complementing the supply of compressors with added value accessories, engineering services and assembly, Sauer makes entire solutions possible, ranging from modules to complete turnkey plants. For more information, visit www.sauerusa.com.

About the Author

Stelios Flessas is a Business Development Manager for J.P. Sauer & Sohn Maschinenbau GmbH. For more information, visit www.sauerusa.com, www.sauercompressors.com, www.iter.org, www.airliquide.com.

To read similar ***Air Compressor Technology*** articles visit www.airbestpractices.com/technology/air-compressors.

Missed Demand-Side Opportunities Part 7

THE IMPORTANCE OF SYSTEM PRESSURE CONTROL

By Hank van Ormer, Contributing Editor

Whenever we start a compressed-air energy survey there are always two key topics plant personnel feel are paramount — leaks and reducing pressure. In this installment of our series on missed demand-side opportunities we'll address the importance of compressed air system pressure.

The benefits of controlling system pressure are often obscured by a misconception that controlling system pressure is very important because "for every reduction in system pressure of 1 psig there will be a 1/2% reduction in input energy use." This is a "rule of thumb" that has been misinterpreted — it **ONLY** applies to the "air compressor 100 psig class discharge pressure." There will be different multipliers for other pressure related to the input power/energy.

Actually, effective control of "production system pressure" has a great deal more potential energy savings than the 1/2% reduction of input energy. For example, a 100 horsepower (HP) air compressor delivering 500 cfm at 100 psig will save about 5% power (5 HP) with a reduction in discharge pressure from 100 psig to 90 psig (5 HP). Using this "rule of thumb" the annual potential savings is **$1,790 per year** ($.06 kW/h @ 8000 hr/yr).

There is nothing wrong with this savings and if practical it should be harvested. However, the most important rule to remember when evaluating "missed opportunities" in demand reduction with regard to system pressure is

> "The most important rule to remember when evaluating 'missed opportunities' in demand reduction with regard to system pressure is 'the higher the pressure inlet to almost any process the higher the air flow (cfm) usage.'"
>
> — Hank van Ormer, Contributing Editor

"the higher the pressure inlet to almost any process the higher the air flow (cfm) usage."

The comparable rule of thumb for this situation is in the 100-psig class pressure system. For every 1 psig reduction in air pressure "to the process" it will reduce the flow demand somewhere between .9 and 1%. At 1% the same 10 psig reduction of the 500 scfm flow from the 100 HP compressor to the process will reduce the flow 50 cfm, which will save **$5,000 per year** at .06 kWh @ 8000 hrs/yr.

Before we go too far, using rules of thumb are not totally accurate but are practical — consider that many compressor OEM engineering data sheets reference flow ± 5% and power ± 3%. We have used these guidelines for years and system measurement shows them to be very reliable.

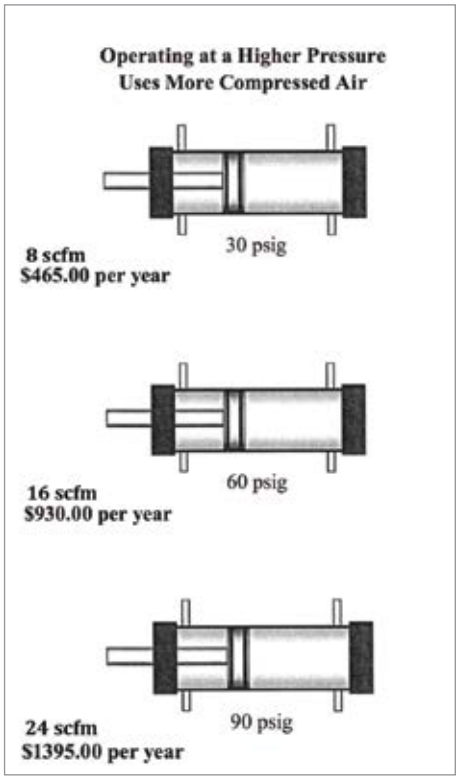


Fig 1 shows this effect on potential excess air inlet pressure to an air cylinder with 4 cubic feet volume at 2 cycles/min.

Higher pressure to the process than necessary will always cause "extra flow," which is often called "artificial demand."

Thinking About Production Air System Pressure and More

It's important to think about production air system pressure.

- Are the headers at a stable pressure throughout the shifts? If so, this may well be a "balanced system." If not, we this should be improved.
- Is every operating process operating at actual minimum inlet pressure for optimum productivity and quality?
- Are all the regulators regulating?
- Do you know the pressure loss from the main header to the operating process? Is it acceptable? If it's too high, where are the restrictions? What is the process pressure at rest? What is it when operating?

Also important is the need to monitor the main feed line to the process. Does it fall when the process engages — or even more important — as the process cycles? This would indicate several things: The feed to the process is not adequate to support the full production — if the actual inlet pressure is lower than the "at rest" feed line pressure and there are no productivity or quality issues this lower pressure is closer to the minimum optimum pressure than the header set pressure.

Always investigate any issues. Some corrective piping or storage changes may deliver a controllable, steady minimum lower pressure with significant compressed air reduction, along with improvements in quality and productivity.

MISSED DEMAND-SIDE OPPORTUNITIES PART 7

Case Study

Figure 2 illustrates this very situation. The header system is set at 98 psig for a grinding process. When the process operates, the actual inlet pressure to the grinder fell to 63 psig from 98 psig due to a very long 3/8-inch hose air feed line. There were significant productivity and quality issues when the header fell below 98 psig. Plant personnel wanted to raise the system header pressure to 125 psig, which is an increase of 11-12% energy input to the compressor. Increasing the feed line to the grinders to a 1-inch pipe eliminated this pressure loss.

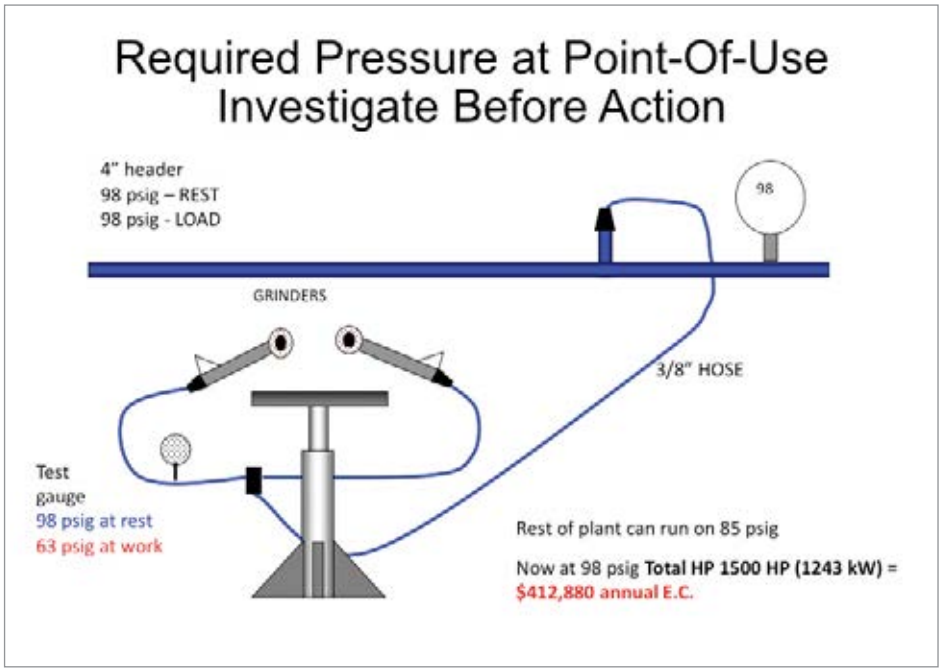


Figure 2

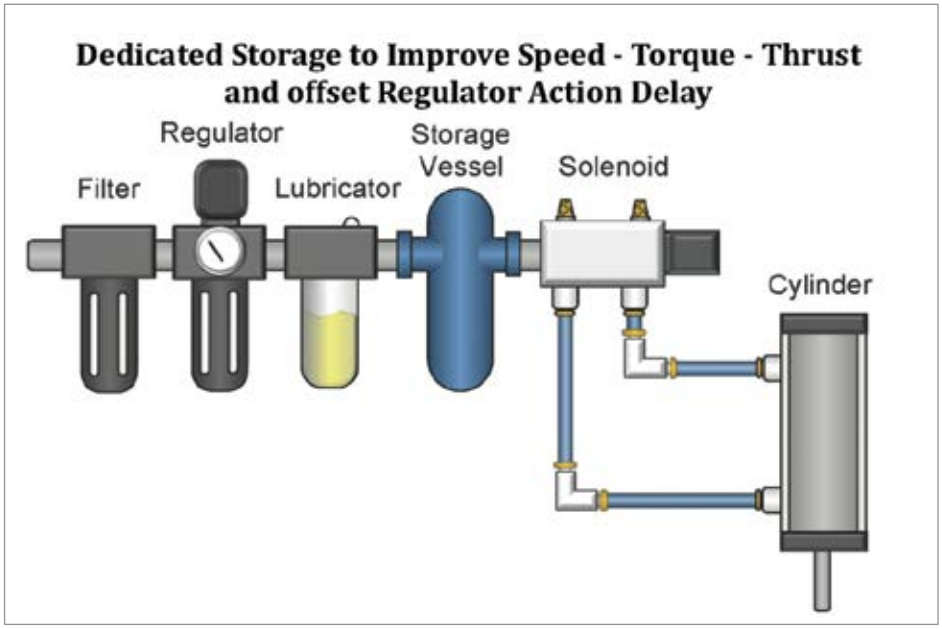


Figure 3

Correction to this distribution system allowed the grinder to operate "optimally" at a measured and regulated steady 75 psig with the overall plant air system pressure reduced to 85 psig. The original system at 98 psig utilized 1500 HP. The modified 85-psig-header system included a 30% increase in total production. Total air demand fell 500 cfm (100 HP less air flow) and there were improvements in quality and productivity, all at less airflow. The results is an operating energy reduction of $28,902 per year at 30% higher production levels.

Are Your Regulators Regulating?

This is the single most significant issue we find in almost all plants. Regulators are often selected by opening size, i.e., 3/4 inch, rather than airflow capacity at the lowest possible inlet pressure and allowable pressure loss.

Double acting air cylinders are often a key place to look for this issue. Often the line from the regulator to the cylinder inlet is too small to hold the volume required to feed the cylinder on its stroke waiting for the regulator to open. This is a function of regulator dynamics and response time and available air supply to the cylinder through its complete stroke at a steady satisfactory operating pressure. Often the stroke is ineffective — the operator responds by opening the regulator to higher or even full line pressure and the air demand increases proportionally.

Figure 3 shows one method to correct this — measure the dynamics and calculate the storage required to complete the stroke, install a small storage vessel to supply the stroke air, which will refill when the regulator opens. Other options that may apply are to increase the size of the feed line to accomplish the

same thing, or change regulators to one with a more appropriate operating profile. The net requirement is to deliver the required minimum volume of air at the lowest steady inlet pressure. Again, when implemented properly and monitored, productivity and quality will be improved and the demand flow will be at its optimum volume.

Be sure to look for the regulator that is not regulating.

Figure 4 shows a regulator installed to a process that is taking in 110 psig compressed air and delivering 110 psig compressed air to the system. In all probability the process does need 110 psig of air to run but something has interfered with the timing and operating dynamics, or the regulator selected is not appropriate for the applicator. Whatever the cause, this situation calls for an investigation.

Summary

These projects when successfully implemented usually deliver high results in compressed air reduction with low investment cost. Generally speaking in a 100-psig-class air system, most processes will have an optimum operating inlet pressure of 70 psig to 90 psig. If the process requires a higher inlet pressure you will probably have higher header pressure.

Figure 4

Future articles will cover some methods to handle such situations, particularly when one process requires significantly higher inlet pressure than the rest of the plant.

Here are key takeaways when it comes to system pressure control:

- Know what the lowest effective pressure to each process is.
- Deliver it in a controlled steady manner.
- Monitor it if feasible.
- Identify your demand reduction and go for the "atta boy." BP

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

Read all the articles of this series:

Missed Demand-Side Opportunities Part 1 – Flow Restrictions from Pipe Headers

Missed Demand-Side Opportunities Part 2 – Integrating Multiple Air Compressor Controls

Missed Demand-Side Opportunities Part 3 – Controlling Open Blowing with Compressed Air

Missed Demand-Side Opportunities Part 4 – Utilizing Air-Driven Venturi Vacuum Generators Efficiently

Missed Demand-Side Opportunities Part 5 – Achieving Energy Savings with Cooling Enclosures

Missed Demand-Side Opportunities Part 6 – Look to AODD Pumps To Lower Compressed Air Demand

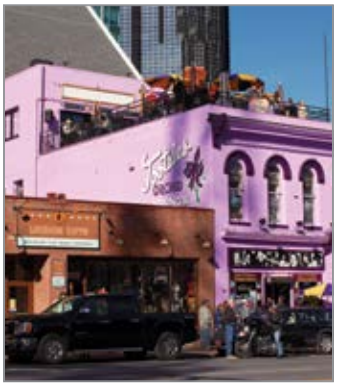
Read all the articles of this series at www.airbestpractices.com

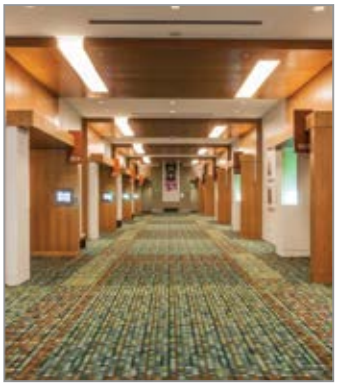
BEST PRACTICES

2019 EXPO OCTOBER 13-16 NASHVILLE, TN

COMPRESSED AIR / VACUUM / COOLING

CABPEXPO.COM


October 13-16, 2019 / Nashville Music City Center

Host Hotel: Sheraton Grand Nashville Downtown

EXHIBIT SPACE AND SPONSORSHIP OPPORTUNITIES

Contact Rod Smith, tel: 412.980.9901, email: rod@airbestpractices.com, www.cabpexpo.com

BLOWER & VACUUM BEST PRACTICES blowervacuumbestpractices.com

COMPRESSED AIR BEST PRACTICES airbestpractices.com

CHILLER & COOLING BEST PRACTICES coolingbestpractices.com

The Best Practices EXPO & Conference is produced by the publishers of the BEST PRACTICES family of magazines.

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Sauer Compressors Meets Compressed Air Demands Aboard Ships

At this year's SMM, the world's leading trade fair for the maritime industry, Sauer Compressors will showcase its entire range of compressors. The solutions meet all compressed air requirements on ships, ranging from starting and working air to SCR-systems for exhaust gas purification. A new state-of-the-art compressor control and various accessories round out the manufacturer's impressive line-up.

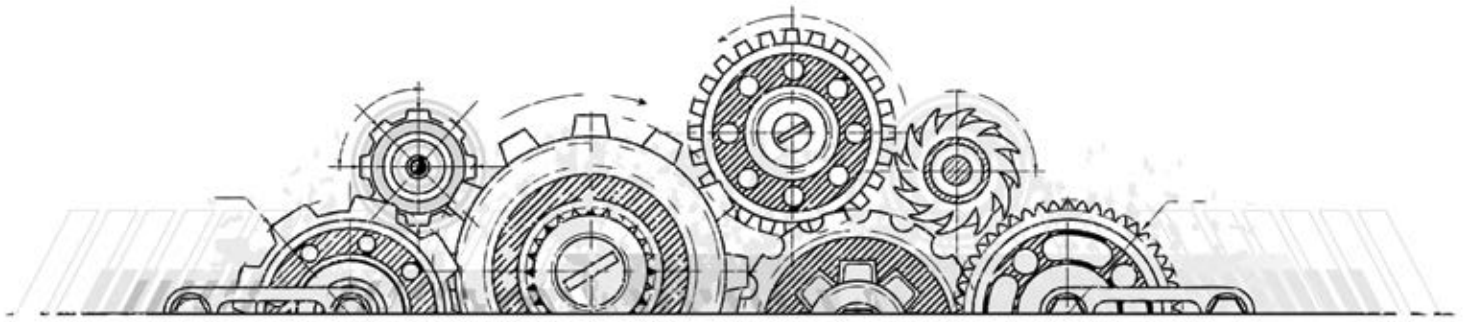
Purpose-made starting-air compressor

As Sauer Compressors' latest machine exclusively developed for commercial shipping, the Levante series has quickly established itself as a go-to for the maritime industry. In its latest incarnation, the 3-stage air-cooled compressor comes with a fill-up capacity of up to 460 m³/h at a pressure of 30 bar. Due to its robust and compact construction, the low-maintenance compressor can fit into any engine room without taking up much valuable space. To improve inter-cooling efficiency, the air flow has been optimized by installing a newly developed cube-cooler between the motor and the compressor – enabling the recooling temperatures to be reduced by a third. For maximum usability and comfort, the Levante comes with an integrated gauge panel and an operator-friendly HMI.

Maximum performance

Same as the Levante series, the 3-stage air-cooled Passat range is known for its exceptional durability in even the most demanding operating conditions. With filling capacities of up to 270 m³/h, the Passat is situated slightly below the Levante. Dividing the compression process into three stages notably decreases operating temperatures.

The 3-stage starting-air compressor Levante WP460L Marine comes with a fill-up capacity of up to 460 m³/h at a pressure of 30 bar. © Sauer Compressors



RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

This results in significantly lower maintenance costs and improved reliability.

New control generation for highest demands

The new MLC 4.0 presents a new high-end addition to Sauer Compressors' range of controls. With its 7" touchscreen and its intuitive operation it provides excellent usability. Given its easy integration into higher-level systems, the new control enables the high connectivity required to meet the demands of tomorrow's vessels.

Oil-free solutions for all gas applications

With the integration of the Swiss HAUG Kompressoren AG, Sauer Compressors has extended its portfolio to include a wide range of hermetically gas-tight and oil-free compressors up to 30 kW. Owing to these properties, HAUG Sauer compressors can be used to compress virtually any gas, including boil-off gas in shipping. Even in operations with long standstills, frequent interruptions and cold starts, these compressors operate with maximum reliability.

Efficient exhaust gas purification

Exhaust gas purification is crucial. To supply state-of-the-art SCR systems for the reduction of nitrogen oxides with compressed air, the new Sauer SC85 and SC99 screw compressors deliver a volume flow of up to 700 m³/h with a maximum power of 99 kW.

Sauer Compressors is a medium-sized German group of companies with twelve international subsidiaries. The company was founded more than 130 years ago, and has over 80 years' experience in compressed air technology. Today, it focusses on the development, production and sale of medium- and high-pressure compressors for applications in the naval marine, commercial shipping, industrial and petro industry sectors. Its modern reciprocating compressors for the compression of air and a wide range of gases reach pressures of 20 to 500 bar.g. It offers customized solutions for individual customers, OEMs and companies that operate on a global stage. With a global network of partners and representatives, Sauer maintains close proximity to its customers. By enhancing its range of compressors with high-quality accessories, engineering services, installation and service concepts, Sauer can offer end-to-end system solutions and compressed air modules, including complete turnkey installations. For more information, visit www.sauercompressors.com

Edgetech Instruments AcuDew Helps NuMat Technologies

Edgetech Instruments' new AcuDew moisture transmitter is helping NuMat Technologies monitor the trace moisture level on their incoming nitrogen line that feeds their Powder Dryer. Too much moisture in the system will damage the performance of NuMat's end products.

Patrick Fuller of NuMat Technologies stated: "I installed the AcuDew and it is working well. Measurement response is right on spec. Edgetech Instruments' people were very helpful and the installation was very simple. The sensor fit into our pipe tee without requiring spare parts. I really appreciated the standard electrical connector and attention to detail was noticed, for example the pre-crimped wire ferrules. Overall, a great experience."

The AcuDew moisture transmitter from Edgetech Instruments

NuMat Technologies, Inc. is an advanced technology company innovating at the intersection of high performance computing, chemistry and engineered systems. As leader in the design and production of metal-organic frameworks (MOFs), NuMat works with leading partners in the semiconductor, healthcare, and industrial sectors to design material-enabled products that meet the most demanding customer requirements. NuMat's expertise lies in the design and integration of materials into next-generation storage, separation and purification systems. In doing so, NuMat enables previously unachievable form factors, performance, and cost-advantaged production economics.

TECHNOLOGY PICKS

Edgetech Instruments Inc. designs and manufacturers accurate and reliable absolute humidity hygrometers and transmitters, relative humidity transmitters, humidity probes, moisture and dew/frost point analyzers, relative humidity calibrators, dew/frost point generators and oxygen measurement instrumentation. Edgetech Instruments products are manufactured, calibrated and serviced to the highest industry standards in a modern, ISO/IEC 17025:2005 accredited, ISO 9001:2015 registered facility located in Hudson, Massachusetts, USA. All certifications and calibrations are traceable to NIST.

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

LA-MAN SuperStar Membrane Dryers

LA-MAN Corporation offers a complete series of SuperStar Membrane Dryers that provide ultra-clean and dry compressed air to applications from a wide range of industries. The unique series of SuperStar Membrane Dryers have been developed as a point of use filter designed to lower the dew point of the compressed air stream.

The innovative SuperStar Membrane Dryer lowers the dew point by continuously removing water vapor and venting into the surrounding atmosphere. With dew point temperatures available as low as -40 Degrees Fahrenheit, a wide range of flow capabilities and various pressure ratings, the SuperStar Membrane Dryer is an ideal solution for an extensive array of applications including food processing, clean rooms, paint spraying, material finishing and powder coating.

A critical standard feature of the SuperStar Membrane Dryer includes the pre-filtration system that incorporates a high efficiency coalescing filter into the process. With these properties the SuperStar Membrane is assured of contaminant and particle free air, allowing for optimal performance. An optional automatic float drain will allow for the discharge of moisture from the Extractor/Dryer® while preventing any system air loss. Maintenance on the equipment is easily accomplished with the installation of the appropriate service kit and without removing the unit from the air system.

The LA-MAN SuperStar Membrane Dryer

In addition to the complete line of SuperStar Membrane Dryer models, other compressed air filtration products available from LA-MAN® Corporation include the Extractor/Dryer, SuperStar .01 Micron Filter, Refrigerated Dryer, Pneuguard In-Line Dryer, and LA-MAN Breathing Air Systems.

For more information, visit www.laman.com or email: sales@laman.com

EXAIR Sanitary Flange Air Conveyors

EXAIR's new Sanitary Flange Line Vac air operated conveyors are the best way to convey materials through systems which require frequent or mandatory cleaning. The ISO 2852 compatible sanitary flanges limit areas where bacteria can grow and help prevent contamination. Made from type 316 stainless steel to provide maximum hygiene and corrosion resistance, these Line Vacs are available in 1-1/2", 2", 2-1/2" and 3" flange sizes. Flanged Line Vacs convert flanged piping systems into a powerful conveyor for product, parts, scrap, trim and other bulk materials. Their larger size makes them perfect for conveying bigger parts and large volumes of material over long distances.

Sanitary Flange Line Vac Conveyors eject a small amount of compressed air to produce a vacuum on one end with high output flows on the other. Response is instantaneous

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

EXAIR's new Sanitary Flange Line Vac air operated conveyors

and regulating the compressed air pressure provides infinite control of the conveying rate. Applications include material conveying, part transfer, fiber tensioning, scrap trim removal and filling operations.

All EXAIR Line Vacs are CE compliant, meet OSHA pressure requirements, and are ready to ship from stock. Additional families of Line Vac are available to fit hose, tube or threaded pipe. Many smaller sizes are available down to 3/8" hose or 3/8 NPT threads and large hose or pipe sizes up to 5". Many other materials are available including aluminum, type 303 and type 316 stainless steel. A Heavy Duty Line Vac is available in hardened alloy for abrasion resistance and maximum conveying power. Sanitary Flange Line Vac prices start at $1095.

For more information, visit www.exair.com.

COMPRESSED AIR BEST PRACTICES®
www.airbestpractices.com

Advertising & Editorial — Rod Smith, rod@airbestpractices.com, Tel: 412-980-9901

Subscriptions & Administration — Patricia Smith, patricia@airbestpractices.com, Tel: 412-980-9902

A Publication of: Smith Onandia Communications LLC, 37 McMurray Rd. Suite 106, Pittsburgh, PA 15241

Compressed Air Best Practices® (USPS# 17130) is published monthly except January-February combined by Smith Onandia Communications LLC, 37 McMurray Rd., Suite 106, Pittsburgh, PA 15241. Periodicals postage paid at Pittsburgh, PA and additional mailing offices. POSTMASTER: Send address changes to: Compressed Air Best Practices®, 37 McMurray Rd, Suite 106, Pittsburgh, PA 15241.

Association of Energy Engineers

2019 Energy Events
Mark Your Calendars

GLOBALCON®
Energy, Power & Facility Management, Strategies & Technologies

March 20-21, 2019
Hynes Convention Center
globalconevent.com

WestCoast EMC®
Energy Management Congress

June 5-6, 2019
Santa Clara Convention Center
energyevent.com

WEEC®
World Energy Engineering Congress

Conference Sept. 25-27, 2019
Expo Sept. 25-26, 2019
Walter E. Washington Convention Center
energycongress.com

aeecenter.org

THE MARKETPLACE

COMPRESSED AIR BEST PRACTICES
airbestpractices.com

ADVERTISER INDEX

Company	Page	Web Site
Kaeser Compressors	Outside Back Cover	www.us.kaeser.com/cabp
Atlas Copco	Inside Front Cover	www.atlascopco.us
DV Systems	Inside Back Cover	www.dvcompressors.com
Sullair	5	www.sullair.com
Hertz Kompressoren USA	7	www.hertz-kompressoren.com
Mattei Compressors	9	www.MatteiComp.com
Best Practices EXPO	10	www.cabpexpo.com
BEKO Technologies	11	www.bekousa.com
Rogers Machinery Kobelco KNW Series	12	www.knw-series.com
JORC Industrial	13	www.jorc.com
Sullivan-Palatek	15	www.sullivan-palatek.com
Mikropor	17	www.mikroporamerica.com
VPInstruments	19	www.vpinstruments.com
ENMET	21	www.enmet.com
Tamturbo	23	www.tamturbo.com
Summit	24	www.sublimedescaler.com
CDI Meters	25	www.cdimeters.com
Case Controls	29	www.casecontrols.com
BOGE	31	www.boge.com/us
LE Lubricants	33	www.LElubricants.com
Clean Resources	35	www.cleanresources.com
Edgetech	37	www.edgetechinstruments.com
Compressed Air Challenge	41	www.compressedairchallenge.org
Association of Energy Engineers	48	www.aeecenter.org

JOBS & TECHNOLOGY

JOBS & TECHNOLOGY

Accurate Air Engineering, Inc.
"Your Compressed Air Specialist"

COMPRESSED AIR SALES SPECIALIST – SOUTHERN CALIFORNIA

Accurate Air Engineering is a premiere Gardner Denver distributor specializing in compressor, blower and vacuum solutions, as well as, designing and building custom compressed air / vacuum packages. We have 4 offices located in California and we currently have two open sales positions: Southern California and San Diego areas. The focus is to grow the business by calling on end users, engineering firms, contractors, and inbound leads. Experience in the compressed air industry is preferred. We offer a comprehensive benefit package. Compensation and relocation negotiable. If you like working in a fun, winning, supportive environment, call Rick Sawaya (Director of Sales) at 714-904-4172 or send your cover letter and resume to rsawaya@accurateair.com.

hertz KOMPRESSOREN

REGIONAL SALES MANAGERS

Hertz Kompressoren USA, Inc. is seeking Regional Sales Managers who are exciting, self-driven & performance oriented compressed air professionals to join our team. The focus of the job is to assist distributors in growing their business through the application and sale of our products. The Regional Sales Managers may reside anywhere within the territory and will be expected to travel extensively when not working from their home office. Experience in the compressed air industry is preferred.

To learn more about us visit http://hertz-kompressoren.us.
Send resume with cover letter to: Stephanie.Pettitt@hertz-kompressoren.us

DANMAR INDUSTRIES

AIR COMPRESSOR TECHNICIAN

INSIDE SALES/CUSTOMER SERVICE REPRESENTATIVE

DANMAR INDUSTRIES, a distributor of Gardner Denver air compressors since 1980, is located in Houston, Texas, and has two open positions offering competitive benefits including insurance and 401k. Visit www.danmarind.com.

Seeking highly experienced technician for field service on electric rotary screw air compressors, refrigerated and desiccant air dryers, and chillers. Must have good driving record and be able to pass drug test. Negotiable pay and relocation costs. Company service truck, uniforms and specialized tools. Contact Raul Ruiz, Service Manager, email: rruiz@danmarind.com, tel: 281.230.1000.

Experienced Inside Sales Customer Service/Inside Sales Rep opportunity. Contact Dennis DePauw, President, email: ddepauw@danmarind.com, tel: 281.230.1000.

THE MARKETPLACE

TECHNOLOGY

5 HP TO 200 HP

QUIET, ROBUST, EFFICIENT

Not only we build lasting products,
we strive to build lasting relationships

LET'S TALK

DV Systems Ltd. Mooresville, North Carolina

dvsystems.com | 1-877-687-1982

BUILT BETTER

Compressed Air That Means Business

And we're in the business of saving you time, money, and headaches.

Our *built for a lifetime*™ rotary screw compressors feature premium quality motors, coolers, and airends. Simple maintenance access, fewer wearing parts, and smart controls keep your plant running day in and day out.

When you're ready to get down to business, call Kaeser. We've got the savings you've been looking for.

Visit www.us.kaeser.com/cabp to learn more.

Solving your system challenges.

KAESER COMPRESSORS®

Built for a lifetime.

Kaeser Compressors, Inc. • 866-516-6888 • us.kaeser.com/cabp