The Magazine for ENERGY EFFICIENCY in Compressed Air, Pneumatics, Blower and Vacuum Systems

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April 2013

Plastic Extrusion

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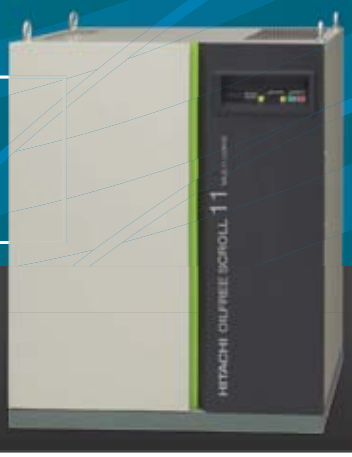

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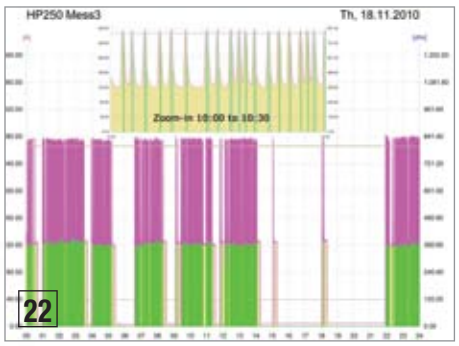

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FROM THE EDITOR | Plastic Extrusions

When discussing the compressed air, vacuum, blower, and pneumatic systems in your plant with your vendors, how much time is spent discussing the products vs. the applications?

Don van Ormer, from Air Power USA, shares an audit story at a plastic extruder, where the plant's high-quality rotary screw compressors supplied the plant with 994 acfm of compressed air. The audit focused on the compressed air applications and reduced plant demand to 453 acfm. Forty-six leaks (worth 174 cfm) were found in the pneumatic circuits on production machinery. Eighty-four "open-blow" applications, on production equipment, were replaced with venturi inducer nozzles — saving another 320 cfm. Focusing on the applications helped the customer reduce air compressor annual energy consumption by sixty-seven percent!

Becker Pumps deployed considerable R&D resources to better understand the plastic extrusion process at MGM Industries. As a result, they developed innovative water separation systems allowing MGM to replace their liquid ring vacuum pumps with dry rotary vane vacuum pumps and regenerative blowers. This not only reduced pump energy consumption, it significantly reduced the chilled water consumption of the plant and eliminated the need to purchase a large new chiller.

More application knowledge is evidenced in Jan Hoetzel's article titled, "Compressed Air Audit of a Powder Coating System". His system assessment identified that the powder coating system accounted for only 20-25% of the plant's air use — yet it's -40 °F dewpoint air quality specification had been adopted for the whole plant. The battery of heatless desiccant air dryers, with unnecessarily high 15% purge rates, was the resulting energy cost to be addressed.

Finally, Scott Minato and Barbara Pontisso, from Numatics, provide a good overview of how to design filtration systems to protect and improve pneumatic performance. Ron Marshall also supplies us with an interesting article titled, "Remote Air Compressor Sensing Saves Energy."

We thank the authors above for sharing their knowledge and thank you for your support and for investing in ***Compressed Air Best Practices®***. BP

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Editor
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COMPRESSED AIR, PNEUMATICS, VACUUM & BLOWER INDUSTRY NEWS

Atlas Copco Acquires French Compressor Distributor

The French Atlas Copco subsidiary Exlair S.A.S has acquired Air et Techniques Energies Provence (ATEP), a distributor of industrial compressors and related products based in Aix-en-Provence, France.

ATEP was established in 1991 and has about 30 employees. The company is privately owned and has annual revenues of approximately 6 million Euros. Headquartered in Aix-en-Provence with sales and service branches in Nimes and Nice, ATEP sells and provides high-quality service for industrial compressors and ancillary equipment to a broad range of industrial customers in the region. *"By acquiring ATEP we further strengthen Atlas Copco's presence in France for the benefit of our customers,"* said Stephan Kuhn, Business Area President for Atlas Copco Compressor Technique. *"ATEP has well-established relationships and a broad customer base in Southern France, complementing our existing organization and supporting our ambition to grow in this region."* The business will keep the ATEP name and becomes part of Compressor Technique Service. www.atlascopco.com

Aerzen USA Honored with Workplace Award

Aerzen USA has been honored with the 2012 Alfred P. Sloan Award for Excellence in Workplace Effectiveness and Flexibility for its use of flexibility as an effective workplace strategy to increase business and employee success.

This prestigious award, part of the national *When Work Works* project administered by the Families and Work Institute and the Society for Human Resource Management, recognizes employers of all sizes and types in Pennsylvania and across the country.

"We are excited to receive this recognition for our workplace practices," said Pierre Noack, President of Aerzen USA. "Our approach to a successful and sustainable business philosophy puts employees at the center of the focus. This is part of Aerzen USA's triple bottom line approach: People, Planet and Profits."

Workplace flexibility — such as flextime, part-time work and compressed workweeks — has been demonstrated to help businesses remain competitive while also benefiting employees. "Our research consistently finds that employees in effective and flexible workplaces have greater engagement on the job and greater desire to stay with their organization. In addition, they report lower stress levels and better overall health," said Ellen Galinsky, president of Families and Work Institute.

The Sloan Awards are unique for their rigorous, two-step selection process, which involves an evaluation of employers' flexibility programs and practices, and a confidential employee survey. All applicants are measured against national norms from the National Study of Employers.

"As a recipient of the 2012 Sloan Award, Aerzen USA ranks in the top 20% of employers nationally in terms of its programs, policies and culture for creating an effective and flexible workplace," Galinsky said. "In addition, what makes this honor so special is that their employees have corroborated this, affirming that it is indeed an effective and flexible workplace."

When Work Works is a national project to educate the business community on the value of workplace flexibility by sharing research and promising practices, and conducting the annual Sloan Awards. It is an ongoing initiative of the Families and Work Institute and the Society for Human Resource Management.

For more information about the *When Work Works* project and the Alfred P. Sloan Awards for Excellence in Workplace Effectiveness and Flexibility, visit www.whenworkworks.org

"Our approach to a successful and sustainable business philosophy puts employees at the center of the focus. This is part of Aerzen USA's triple bottom line approach: People, Planet and Profits."

— Pierre Noack, President of Aerzen USA

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COMPRESSED AIR, PNEUMATICS, VACUUM & BLOWER INDUSTRY NEWS

Aerzen USA is a wholly-owned division of the German manufacturer, Aerzener Maschinenfabrik GmbH, and has been a recognized world leader in the production of rotary positive displacement machines since 1868. Aerzen USA is based in Coatesville, PA. For more information, visit www.aerzenusa.com

Atlas Copco Opens Second Compressor Manufacturing Plant in India.

Atlas Copco has unveiled a state-of-the-art lean compressor manufacturing facility near Pune, India. The built-up area of 19,000 square meters includes a manufacturing plant and an engineering office building. The factory is built in accordance with LEED (Leadership in Environmental Energy and Design.) It contributes to Atlas Copco's goal to reduce carbon dioxide emissions by at least 20% by 2020. The new facility will manufacture industrial and portable compressors. The present factory in Dapodi, India, will continue to produce oil-free compressors and quality-air products. *"Atlas Copco continues to invest in the Indian market, and we are proud to inaugurate this new facility that is built according to lean manufacturing principles,"* said Stephan Kuhn , Business Area President, Atlas Copco Compressor Technique. *"The factory will contribute to increased efficiencies and further support our expansion in India. It will serve customers both in and outside India."* www.atlascopco.com

Reshoring Initiative's Harry Moser Prevails in Economist Debate on Offshoring Manufacturing

Reshoring Initiative founder, Harry Moser recently participated in an *Economist* online debate, presenting in defense of the motion "Do multinational corporations have a duty to maintain a strong presence in their home countries?" Moderated by European business correspondent for the Economist, Tamzin Booth, the debate took place on the weekly magazine's website January 22-30. Harry Moser defeated internationally known Columbia University professor of economics and law, Jagdish Bhaqwati, who presented against the motion.

Despite the clear commitment of *Economist* readers to globalization, the defense held a first day lead at 58% of the vote before falling to 45%-46% on days four thru seven and surging to close at 54%. Jagdish Bhagwati maintained home countries will benefit no matter where the production or R&D is done since the profits will come back to the home country. Much of the late surge was attributed to Harry Moser's arguments that it is in companies' self-interest to reshore American manufacturing jobs that were lost due to corporate failure to recognize the total cost of offshoring. In a point of continual agreement between the two men, Mr. Bhagwati conceded the advantages of reshoring are "now visible" — the essence of Mr. Moser's position.

With roughly 50,000 manufacturing jobs reshored since January 2010, this win reveals solidarity between U.S. small manufacturers, manufacturing employees, machine tool makers and distributors, trade and policy associations, labor, progressive and fair trade groups, and Made in USA companies in support of reshoring.

"I was pleased that Mr. Bhagwati accepted my position that it is in the interest of companies to reconsider their offshoring," said Harry Moser in his closing remarks of the debate. "As I have repeatedly documented, approximately 60% of companies make sourcing and investing decisions based on labor rates, ex-works price or landed cost, ignoring 20% or more of the total cost. Multinational corporations far too often do not see past a low price to reveal a much higher total cost. We insist they make better-informed investment and sourcing decision: offshore vs. home and long term vs. short term."

Details of the debate are still available on *The Economist* website at www.economist.com/debate/overview/245.

Additional information on the Reshoring Initiative is available at www.reshorenow.org.

To read more ***Industry News*** articles,
visit www.airbestpractices.com

THE SYSTEM ASSESSMENT

Plastic Extruder Saves $116,000 in Energy Costs

By Don van Ormer, Air Power USA

Introduction

This plastic extrusion factory spent an estimated $180,711 annually on energy to operate the compressed air system at their Midwestern facility. Based on the air system operating 8,760 hours per year, the group of projects recommended below could reduce these energy costs by an estimated $116,520 or 67% of current use. Estimated costs for completing the recommended projects total $20,100. This figure represents a simple payback period of 2 months.

This system assessment reduces compressed air demand by 506 cfm by repairing compressed air leaks and improving upon blow-off air applications. It then realigns the air compressors and dryers to utilize their most efficient compressor capacity controls.

The Existing Compressed Air Installation

The current compressed air system is located in a one-floor plastic extruding facility. The system has five single-stage lubricated rotary screw compressors using modulating controls. A stable 38 F pressure dewpoint is provided by four refrigerated air dryers. All the equipment is in good working order.

Three compressors, two Sullair 75 hp's and a Palatek 75 hp, are located in Compressor Room #1. The Palatek is located on the mezzanine above one of the Sullair compressors and is used as a backup. The Palatek is the only air-cooled unit in the facility. The other four are water-cooled. The rotary screw air compressors, in Compressor Room #1, feed air through two Pneumatech AD325 refrigerated dryers. They are piped in parallel to allow the air to split between them. From these 325 cfm-rated, non-cycling dryers, the air flows into a 400 gallon receiver before distribution to the plant. The pre-filters and after-filters, for the Pneumatech dryers, are Donaldson brand filters and well maintained.

Outside Compressor Room #1 is a 150 hp Quincy QSI 750 sending compressed air to an Ingersoll Rand TM1400 cycling refrigerated dryer and a 600-gallon receiver. The pre-filters and after-filters, for the Ingersoll Rand dryer, are domnick hunter brand filters and well maintained. Lastly, a Quincy QSI 245 is on a mezzanine in the warehouse. This unit feeds air to an AirCel VX300 non-cycling refrigerated dryer. The pre-filters and after-filters, for the AirCel dryer, are Ultrafilter brand filters and well maintained.

All of the compressors are equipped with Auto Start/Stop. All are set to run continuously, so they won't unload, time out and shut off when not needed. All pressure settings on the compressors should be set with a single test gauge. Installing a quick disconnect in the discharge line of each compressor to facilitate the test gauge was recommended. The Quincy QSI 245 can be adjusted to unload and blow down and idle, then reload when the load in pressure is reached. A five-pound operating band can be used for proper system pressure.

Project	Savings Profile	Energy and Other Savings			Total Project Cost
		AVG kW	kWh	Savings ($)	
Air Compressor Supply					
1. Realign compressor capacity control for Auto Start/Stop. Base load Quincy QSI 750 and trim with QSI 245.	56.7 kW	73	640,111	$52,489	$5,000
Action Item. Realign compressors to allow a 75 hp Sullair to run base load and trim with Quincy QSI 245.	Energy savings of $57,577 can only be attained once demand side measures have been implemented.				
Air Treatment					
2. Shut off two Pneumatech dyrers and Air Cel dryer. Use IR TM1400 for new realigned system	6.6 kW	5.7	49,932	$4,094	$0
3. Replace four timer drains with level-activated drains	12 cfm	2.0	17,348	$1,423	$2,000
Demand-Side System					
4. Repair identified leaks and continue leak tagging and repair program	174 cfm	28.7	251,546	$20,627	$8,100
5. Install Venturi nozzles on listed blows, repair or remove others as listed.	320 cfm	52.7	462,034	$37,887	$5,000
Total	506 cfm	162.2	1,420,971	$116,520	$20,100

Establishing the Energy Baseline

Annual plant electric costs for compressed air production, as operating today, are $174,527 per year. If the electric costs of $6,185 associated with operating ancillary equipment

such as dryers are included the total electric costs for operating the air system are $180,711 per year. These estimates are based upon a blended electric rate of $0.082 /kWh.

The air system operates 8,760 hours per year. The load profile or air demand of this system is relatively stable during all shifts. The system pressure runs from 92 to 95 psig in the headers during production.

Proposed Air Compressor Realignment Summary

With no demand reduction and air consumption still at 994 cfm, this allows the Quincy QSI 750 to carry the main load and trim with the smaller QSI 245. With all the other compressors OFF, there is an estimated savings $52,412 per year.

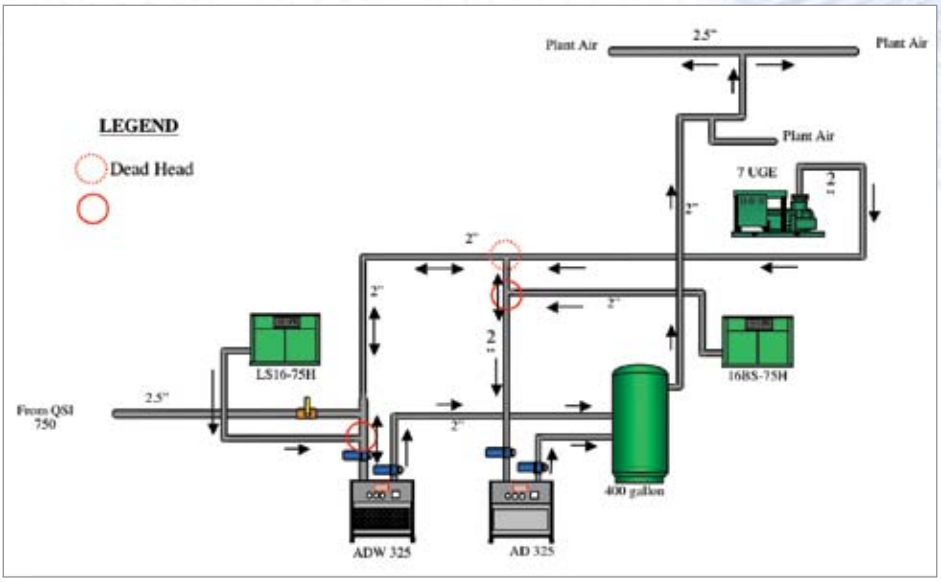

Figure 1. Compressor Room #1.

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TABLE 1. COMPRESSOR USE PROFILE – CURRENT SYSTEM

UNIT #	COMPRESSOR: MANUFACTURER/ MODEL	FULL LOAD		ACTUAL ELEC DEMAND		ACTUAL AIR FLOW	
		DEMAND (KW)	AIR FLOW (ACFM)	% OF FULL KW	ACTUAL KW	% OF FULL FLOW	ACTUAL ACFM
Weekday Shift: Operating at 105 psig discharge pressure for 6,240 hours							
1	Sullair LS 16-75H	62	326	65	40	0	0
2	Sullair 16B-75H	61	330	100	64	100	330
3	Palatek 75UB	62	356	OFF			
4	Quincy QSI 750	126	760	75	95	55	418
5	Quincy QSI 245	43	246	100	43	100	246
			TOTAL (Actual):		**243 kW**		**994 acfm**
Weekend Shift: Operating at 105 psig discharge pressure and 2,520 hours							
1	Sullair LS 16-75H	62	326	65	40	0	0
2	Sullair 16B-75H	61	330	100	64	100	330
3	Palatek 75UB	62	356	OFF			
4	Quincy QSI 750	126	760	75	95	55	418
5	Quincy QSI 245	43	246	100	39	100	246
			TOTAL (Actual):		**243 kW**		**994 acfm**

TABLE 2. COMPRESSOR USE PROFILE – PROPOSED SYSTEM

UNIT #	COMPRESSOR: MANUFACTURER/ MODEL	FULL LOAD		ACTUAL ELEC DEMAND		ACTUAL AIR FLOW	
		DEMAND (KW)	AIR FLOW (ACFM)	% OF FULL KW	ACTUAL KW	% OF FULL FLOW	ACTUAL ACFM
Weekday Shift: Operating at 105 psig discharge pressure for 6,240 hours							
1	Sullair LS 16-75H	62	326	OFF			
2	Sullair 16B-75H	61	330	100	64	100	330
3	Palatek 75UB	62	356	OFF			
4	Quincy QSI 750	126	760				
5	Quincy QSI 245	43	246	92	31	50	123
			TOTAL (Actual):		**95 kW**		**453 acfm**
Weekend Shift: Operating at 105 psig discharge pressure and 2,520 hours							
1	Sullair LS 16-75H	62	326	OFF			
2	Sullair 16B-75H	61	330	98	64	95	314
3	Palatek 75UB	62	356	OFF			
4	Quincy QSI 750	126	760				
5	Quincy QSI 245	43	246				
			TOTAL (Actual):		**64 kW**		**314 acfm**

Once the demand-reduction projects drive air consumption down to 453 cfm, the project uses the Sullair 75 hp unit for the base load and trims again with the 50 hp Quincy QSI 245. The lower air volume allows us to turn OFF two Pneumatech dryers and the AirCel dryer and direct the air from the Sullair compressor to the IR TM1400 dryer. It is a cycling unit and the compressor will only run when the heat load rises. This will deliver an additional $57,577 in energy savings. A well qualified service provider will be needed to ensure the controls are set and maintained correctly.

The estimated savings potential of the projects related to operating the compressors at the lower demand totals $112,425 per year. Adding in the savings potential of $4,094 from other projects related to operating auxiliary equipment (e.g., dryers) provides a total savings estimate for the entire set of projects of $116,520. Together, these projects can be completed at a cost of $20,100, resulting in a simple payback of 2 months

Demand Reduction Projects — Managing Air Leaks and Blow-off Air

Most plants can benefit from an ongoing air leak management program. Generally speaking, the most effective programs are those that involve the production supervisors and operators working in concert with the maintenance personnel. Accordingly, it is suggested that all programs consist of the following:

- **Short Term** — Set up a continuing leak inspection by Maintenance Personnel so that for a while, each primary sector of the plant is inspected once each quarter to identify and repair leaks. A record should be kept of all findings, corrective measures, and overall results.

- **Long Term** — Consider setting up programs to motivate the operators and supervisors to identify and repair leaks. One method that has worked well with many operations is to monitor/measure the air flow to each department and make each department responsible for identifying its air usage as a measurable part of the operating expense for that area. This usually works best when combined with an effective in-house training.

An ultrasonic leak locator is used to identify and quantify the compressed air leaks. Shutting off or valving off the air supply to these leaks when the area is idle would save significant energy use from leaks.

A total of 46 leaks were tagged during our survey. Fixing them will reduce air demand by 174 cfm. This is worth $20,627 in air compressor energy savings (with the compressor realignment discussed). The cost to do the survey and repair the leaks is $8,100. The local utility is expected to provide a rebate to cover the air leak project but this is not figured into the numbers.

TABLE 3. PARTIAL LEAK LIST

NO	LOCATION	DESCRIPTION	EST SIZE	EST CFM	COMMENTS
1	Machine #1	Filter regulator diaphragm seal	small	2	on blender
2	Machine # 2	Filter drain	medium	5	
3	Machine # 3	Regulator	small	1	on air drop
4	Machine # 4	Fitting connection	medium	5	on blender
5	Machine # 4	Filter drain	small	3	
6	Machine # 4	Filter regulator drain	small	2	on air drop
7	Machine # 5	Filter regulator drain	small	1	on air drop
8	Machine # 5	Fitting connection	small	1	on hose reel
9	Machine # 5	Push pull fitting	small	3	on packer
10	Machine # 6	Solenoid valve	small	3	on blender
11	Machine # 6	Regulator seal	small	2	
12	Machine # 7	QDC fitting thread connection	small	3	on blender
13	Machine # 7	manifold block	small	2	
14	Machine # 7	Filter regulator drain	small	1	
15	Machine # 8	Regulator filter drain	small	1	on air drop
16	Machine # 9	Shut off valve	small	1	on air drop
40	Norwalt machine	inside machine	medium	5	
41	Slitter machine	solenoid	small	2	
42	Layer packer	regulator	medium	5	
43	Layer packer	Filter bowl cracked	medium	5	
44	Haumiller	Inside machine	medium	5	
45	Super former box erector	inside machine	medium	4	
46	Decoration	Filter drain	X-large	20	
			Total cfm	**82**	

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TABLE 4. VENTURI INDUCER NOZZLES IN PLACE OF OPEN BLOW

LOCATION	QTY	TYPE / SIZE	ESTIMATED CURRENT CFM USAGE	UTILIZATION %	NET AVG CFM	RECOMMEND VENTURI NOZZLE	NEW AVG NET CFM TOTAL	NET AVG CFM USAGE	EST NET AVE CFM SAVED
Press 1 Sorter exit	1	¼"	15	80	12	48008	7	5.6	6.4
Press 1 Sorter exit	1	¼"	15	80	12	Remove	7	5.6	6.4
Mach 12 Runner reject *	1	⅜"	20	80	16	Repair blast valve	.6	.6	19.4
Mach 15 sorter exit	4	¼"	15	80	48	2 x 48008 remove 2	14	11.2	36.8
Mach 15 sorter double stack	1	¼"	15	80	12	Remove install brush	0	0	12
Mach 15 sorter upside down blow	2	¼"	10	80	16	1 x 48008 remove 1	7	5.6	10.4
Liner 26 Bowl	3	¼"	10	80	24	1 x 48008 remove 2	7	5.6	18.4
Liner 26 exit	1	⅛"	7	80	6.3	--	0	0	0
Liner 26 exit	4	⅛"	7	80	22.4	Remove 3	7	5.6	16.8
Norwalt bowl	7	¼"	7	80	39.2	Remove 4	21	16.8	22.4
Slitter 38 mm in feed	1	⅛"	7	80	6.3	Remove	0	0	6.3
Slitter 38 mm exit	1	⅛"	7	80	6.3	Remove	0	0	6.3
Liner 8 in feed	14	⅛"	7	80	78.4	Remove 6	56	44.8	33.6
Liner 8 Bowl	1	⅛"	7	80	6.3	Remove	0	0	6.3
Collar assembly	1	⅛"	OFF	80	0	Remove	0	0	6.3
FortHill Feeders (Cell 1)	10	⅛"	7	80	56	Remove 5	35	28	28
FortHill Feeders (Cell 2)	10	⅛"	7	80	56	Remove 5	35	28	28
Cell 2 Final inspect (motor cooling)	1	⅛"	7	100	7	Remove – repair motor	0	0	7
Cell 3 Caps	5	⅛"	7	80	28	Remove 2	21	18.8	11.2
Cell 3 Base	2	⅛"	7	80	11.2	Remove 1	7	6.3	4.9
Cell 3 Caps	5	⅛"	7	80	28	Remove 2	21	18.8	11.2
Cell 3 Base	2	⅛"	7	80	11.2	Remove 1	7	6.3	4.9
Line 1 Table	1	¼"	15	80	12	Remove	0	0	12
Line 1 Table	2	⅛"	7	80	6.3	Remove	0	0	6.3
Line 1 Table	1	Exair Air Knife 3"	12	80	9.6	Angle to exit	9.6	9.6	0
Line 1 Table	2	⅛"	7	80	6.3	Remove	0	0	6.3
			Total Current Usage		**536.8**		**Proposed Usage**	**217.2**	**319**

Open Blows

A total of 84 blow-off air applications need to be replaced, repaired or removed. Fixing them will reduce air demand by 320 cfm. This is worth $37,887, per year, in air compressor energy savings (with the compressor realignment discussed). The cost of installing new nozzles is $5,000. The local utility is expected to provide a rebate to cover this whole open blow project but this has not been figured into the numbers. Below are some guidelines to use when installing nozzles.

- Always select the lowest flow nozzles that will achieve the desired result to maximize air consumption savings and noise reduction.
- Install a pressure regulator and gauge in the air line before the air control nozzles and regulate pressure down to the absolute minimum necessary to achieve the desired result. Lower pressures improve safety, reduce noise, and could save hundreds of dollars a year in electricity operating costs.
- To minimize noise, increase the distance between the target surface and the nozzle, if possible. Remember that noise is caused by air impacting on the target work piece, particularly edges or holes.
- Install adjustable ball joints in the supply line, if required, with air control nozzles to provide simple, accurate adjustment of nozzle orientation.

TABLE 5. COMPRESSED AIR SYSTEM PROJECTED SAVINGS				
	CURRENT SYSTEM		PROPOSED SYSTEM	
SYSTEM COMPARISON	PRODUCTION	WEEKENDS	PRODUCTION	WEEKENDS
Average Flow (cfm)	994	994	453	314
Compressor Discharge Pressure (psig)	105	105	105	105
Electric Cost per cfm	$125.13 /cfm/yr	$50.45 /cfm/yr	$107.71 /cfm/yr	$42.45 /cfm/yr
Electric Demand	238 kW	238 kW	95 kW	60 kW
Total Energy Cost	**$180,711 /yr**		**$64,192 /yr**	

- Do not aim the nozzle straight at the target for cleaning applications. Angle the nozzle 15° to 45° to ensure that the contaminants are removed from the product surface.
- Most nozzles, in an appropriate material, can be used with CO_2, Nitrogen, steam, or other compatible gases for special heating or cooling applications.
- To create an air curtain, nozzles do not always need to be positioned as closely as on an air knife. Nozzles can be up to 12" (30 cm) apart depending on the application.
- The nozzle can be aimed to "wipe" sideways across a moving target at a comparatively shallow angle for many blow-off applications. This can reduce the number of nozzles needed.
- Angle the nozzle manifold like a snowplow above a moving conveyor so that the contaminants are forced off the belt, rather than back.
- Proper filtration of compressed air is important for efficient nozzle performance. Be sure to use a filter/separator to remove excess oils and water just prior to the nozzle application.

Conclusion

This plastic extrusion plant spent an estimated $180,711 annually on energy to operate the compressed air system at their Midwestern facility. All the air compressors and refrigerated dryers were well maintained and in good working order. The key to this project was spending time to identify, repair and replace the compressed air leaks and open blow applications. This reduced compressed air demand from 994 cfm to 453 cfm during weekday production. The existing air compressor, with their control systems, then needed to be realigned and set to translate the demand reduction into energy savings. The set of projects recommended, by the system assessment, reduced these energy costs by an estimated $116,520. Project costs totaled $20,100 — representing a simple payback period of 2 months. BP

For more information contact Don van Ormer, Air Power USA, tel: 740-862-4112, email: don@airpowerusainc.com, www.airpowerusainc.com

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THE ENERGY MANAGER

MGM Industries Reduces Chilled Water Requirements with Dry Vacuum Pumps

Compressed Air Best Practices® Magazine interviewed John MacKorrell (Extrusion Process Engineer, MGM Industries) and Dave Brittain, Steve Gilliam, and Wayne Kemp from Becker Pumps.

MGM Industries personnel in front of the innovative Becker water separation system; Jose Cruz, Joey DiGiuseppe, Jay Patterson, John MacKorell, and Abe Gaskins (left to right).

Good morning. Please tell us a little about MGM Industries.

Good morning. MGM Industries is a manufacturer of custom-painted vinyl windows and doors for new construction and replacement projects. The company was incorporated in 1965 and remains a private, family-owned business. MGM is located outside Nashville, in Hendersonville, Tennessee and employs approximately 200 people.

Please tell us about your painted vinyl windows and doors.

MGM is the first vinyl window and door manufacturer to successfully offer painted uPVC profiles for mass production in any exterior color. Until recently, vinyl windows have been seen as a low cost and highly durable choice for builders and architects, but were only available in White and Tan. The reason is that uPVC (Unplasticised Polyvinyl Chloride) has a distortion temperature of 140 ˚F. (If the temperature of the PVC rises above 140 ˚F, it will warp and deform) Consequently, dark colors such as bronze have not been an option for vinyl windows because dark colors absorb too much of the radiant energy of the sun, causing warpage.

MGM Industries realized the possibilities of what an industrial grade painted vinyl window product could mean to builders and architects and developed a totally unique and effective method for painting high quality vinyl windows.

The unique process centers around a custom-built vacuum coater able to dial in the correct coverage ensuring a paint layer (of Reflective Pigment Technology Paint) that will not sag and is of sufficient thickness as to optimize the adhesion of the paint to the substrate. (If the paint is not thick enough when it is applied, it will not stick.)

Finally, each painted uPVC vinyl product is inspected and given a 10-year warranty against industry accepted peeling and fading of paint. Our windows meet all applicable Energy Star and International Building Code (IBC) Standards. They also comply with the ASCE7 commercial window standards.

The natural disaster in the Gulf Coast also led us to develop a product line of Impact Windows — windows that can take impact from flying debris. You would like our test booth for these windows. We use a compressed air cannon to fire 2 x 4 pieces of wood at the windows in our test booth!

I'll have to put your compressed air cannon on my "bucket list"! How are manufacturing operations set up?

MGM is vertically integrated and has three manufacturing buildings covering approximately 400,000 square feet. In Buildings A and B, we cut, paint, assemble, package and ship all of our product lines. Building C is our extrusion facility and supplies A & B with eighty percent of the PVC lineals they require. The PVC lineals

THE ENERGY MANAGER | MGM Industries Reduces Chilled Water Requirements with Dry Vacuum Pumps

> "Becker has proven that a dry vane pump can replace a liquid ring pump, for PVC extrusion, and reduce energy requirements by 50%"
>
> — John MacKorell, MGM Industries

we extrude include sashes on windows, the jams on windows and doors, the head and sill of a window and many other window accessory pieces.

Please describe your plastic extrusion operation.

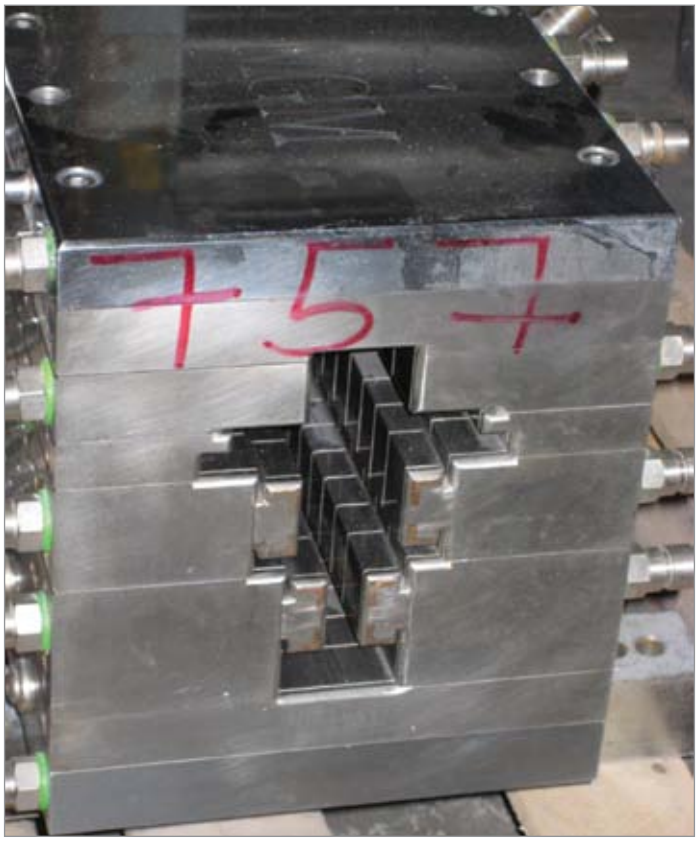
We are currently running eight plastic extrusion lines. We operate a single-screw Davis Standard 50 mm. extruder all the way up to a Davis Standard Conical Twin 65 mm. extruder. We are extruding rigid, foam, and flexible PVC.

On average, we run four to six of the eight extrusion lines at any given time. We run 24/7 a good 48 weeks per year on average.

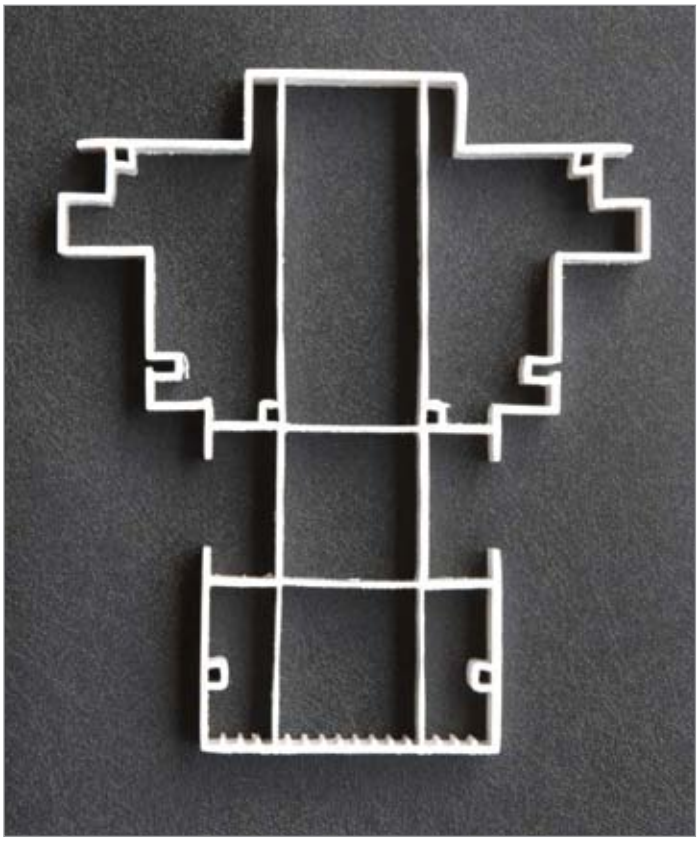
What role does chilled water play in plastic extrusions and how do you supply it?

Chilled water plays a critical role in the process. Our extruder lines require 50-60 ˚F chilled water. We have a centralized chiller. It is an AEC RSR60 Model. It uses air-cooled condensers and provides 60 tons of refrigeration capacity. It's a closed-loop system using heat exchangers and doesn't use much water except for make-up water. We've been very pleased with this system.

On a typical PVC extrusion line, here at MGM, there are three main consumers of chilled water; feed-throat cooling, part-cooling (materials), and liquid ring vacuum pump cooling. The liquid ring vacuum pumps are



A calibrator for a plastic extrusion line.



A plastic extrusion profile from MGM Industries.

the biggest consumer of chilled water. We believe that, from a chiller standpoint, we require on average 0.15 tons per horsepower of chilled water for the liquid ring pumps. That adds up quick.

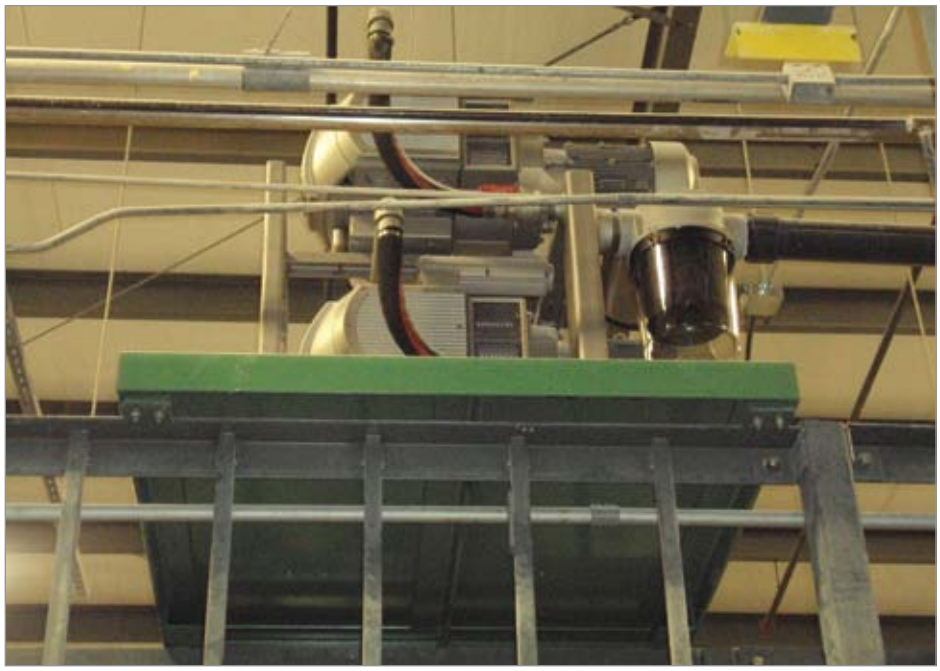
Two years ago, sales were picking up and we began operating six extrusion lines on most days. We had to bring in some portable chillers, to keep up, and we started looking at buying a larger cooling system. We wanted to get rid of the portable chillers and have room to grow into four more extrusion lines. The new system we looked at was a 100-ton system that would have cost us around $150,000 in capital and installation and with a larger monthly electricity bill.

We were about to buy the new 100-ton chiller when our President, Abe Gaskins said, "Hold-on, can we replace the Liquid Ring pumps with something that doesn't consume water"? That was our "Eureka!" moment.

So how did you go about looking for a replacement for Liquid Ring pumps?

First give credit to the culture of our company. Our culture is very different. It's very hands-on and there is a lot of action. Abe Gaskins said, "Treat it like an R&D project and just start moving forward and solve problems along the way. If it fails at least we tried."

Becker Pumps was the only company, out of three pump suppliers we contacted, interested in doing an R&D project. Every one else just wanted to raise prices



The tandem fixed-speed and VSD Becker dry rotary vane pump system.

THE ENERGY MANAGER | MGM Industries Reduces Chilled Water Requirements with Dry Vacuum Pumps

significantly to do a custom project or quoted a standard product that didn't fit our application.

Dave Brittain opened the R&D resources at Becker Pumps and we began a journey towards using dry rotary vane vacuum pumps — that required no chilled water and reduces our vacuum pump horsepower requirements!

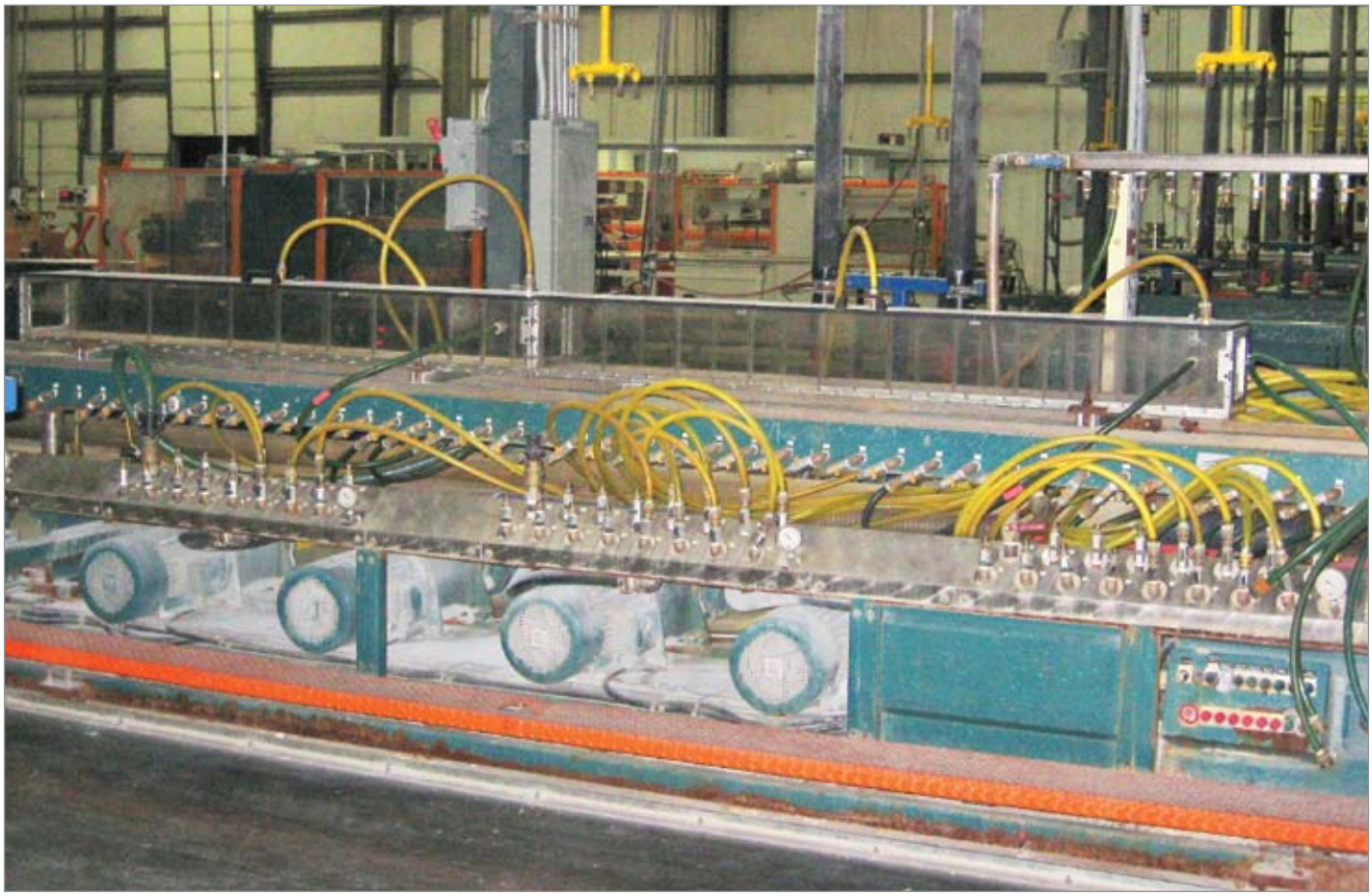
Please describe the Dry Rotary Vane Vacuum Pump solution developed by Becker Pumps.

Dave Brittain, Steve Gilliam, and Wayne Kemp from Becker Pumps have all spent a considerable number of hours getting to know our extrusion processes. We educated them on the varying vacuum requirements of our calibration line and our tank line.

Liquid ring vacuum pumps have traditionally been used, in plastic extrusion processes, because of the large volumes of water used in the extruders. If the liquid ring pump is sucking in water, that's ok. Liquid ring pumps use water as their coolant. Approximately thirty percent of their horsepower is used to move the liquid around in the pump — this makes them less efficient than dry rotary vane technology.

Liquid ring vacuum pumps are also sensitive to water temperature. They are usually looking for 60 °F water. Cooler water increases their cfm output while warmer water will decrease it. They are also sensitive to water quality as deposits can be created in the pump. Their advantage is that they are robust and can handle some debris in the water without suffering damage.

The dry rotary vane vacuum pump has a rotor mounted eccentrically inside a cylinder. Machined into the rotor are a series of slots. In the slots are a series of vanes that look like rectangular plates. As the rotor rotates you have an increasing volume, on the other half you have compression. There is an increasing side (vacuum) and a decreasing side (positive pressure). The vanes are made of a graphite composite. Because the graphite wears, it



Liquid ring pumps formerly used.

fills the pores of the housing and acts as a lubricant. The pump we are using has a corrosion resistant coating because it's in a moist environment.

What are the vacuum requirements of the calibration line?

Vacuum requirements depend upon the part being manufactured. We make twenty to thirty different parts with different profiles all needing different vacuum levels. The "stringing-up" phase needs more vacuum (20-25 inches of mercury) while flat-out production may need 10-20 inches of mercury — depending upon the part.

The calibrator has four different chambers for the different stages of forming the part. There may be three or four different vacuum levels required. There's some black magic and art to this. This is called "tuning" to make sure each part expands like it's supposed to and is running up to the interiors of the design.

We were using four ten-horsepower liquid ring pumps. It needed 20 inches of mercury vacuum. There are small hoses coming off the main manifold. There are small ¼ inch ball valves that open to atmosphere. So if the liquid ring pump is putting out 25 inches, they see this is too much in a chamber and will open up atmospheric air into die #1 to drop it down to 20 inches. We admit air into the vacuum pump and this is how we regulate down.

We have installed 2 x 10 hp dry VTLF Series Dry Rotary Vane Vacuum Pumps. One is a variable speed drive pump and the other

Continued on page 42.

The Becker Dry Rotary Vane Vacuum Pump.

THE SYSTEM ASSESSMENT

Compressed Air Audit of a Powder Coating System

By Jan Michael Hoetzel, Dipl. Wirt-Ing.(FH), Airleader North America

The audited facility is one of the larger office furniture manufacturers in the Midwest. The facility manufactures metal frames for desks, chairs and cabinets. The large powder coating system represents a key competence in the manufacturing process of this facility.

The management of the facility requested the compressed air audit to document/simulate the potential savings generated by the suggested improvements from a compressor dealer. The facility has an established leak detection routine and the review of the demand side (of the compressed air system) was not a part of the scope of this audit.

The facility generates compressed air with six (6) air compressors of various sizes located in three different compressor rooms. In recent years, the entire system converted to desiccant air dryers. Available equipment from other facilities has been utilized. The following is the layout of the facility showing the locations of the compressor rooms.

ID#	compressor type	HP	compressor rated capacity	location	receiver capacity	dryer type	dryer rated capacity	usage from purging	% of compressor capacity
1	Load/Unload	150 HP	706.0 CFM	Mezz 1	400 Gal	Desiccant	750.0 CFM	112.5 CFM	15.9%
2	Load/Unload	150 HP	706.0 CFM	Mezz 1	400 Gal	Desiccant	750.0 CFM	112.5 CFM	15.9%
3	Load/Unload	100 HP	520.0 CFM	Mezz 1	400 Gal	Desiccant	1,050.0 CFM	157.5 CFM	30.3%
4	Load/Unload	150 HP	830.0 CFM	Mezz 2	800 Gal	Desiccant	930.0 CFM	139.5 CFM	16.8%
5	Load/Unload	250 HP	1,202.0 CFM	Mezz 3	2,200 Gal	Desiccant	1,250.0 CFM	187.5 CFM	15.6%
6	Load/Unload	150 HP	706.0 CFM	Mezz 3	400 Gal	Desiccant	720.0 CFM	108.0 CFM	15.3%
		950 HP	4,670.0 CFM		5,400 Gal		5,450.0 CFM	817.5 CFM	17.5%

Table 1. Compressed air system equipment list.

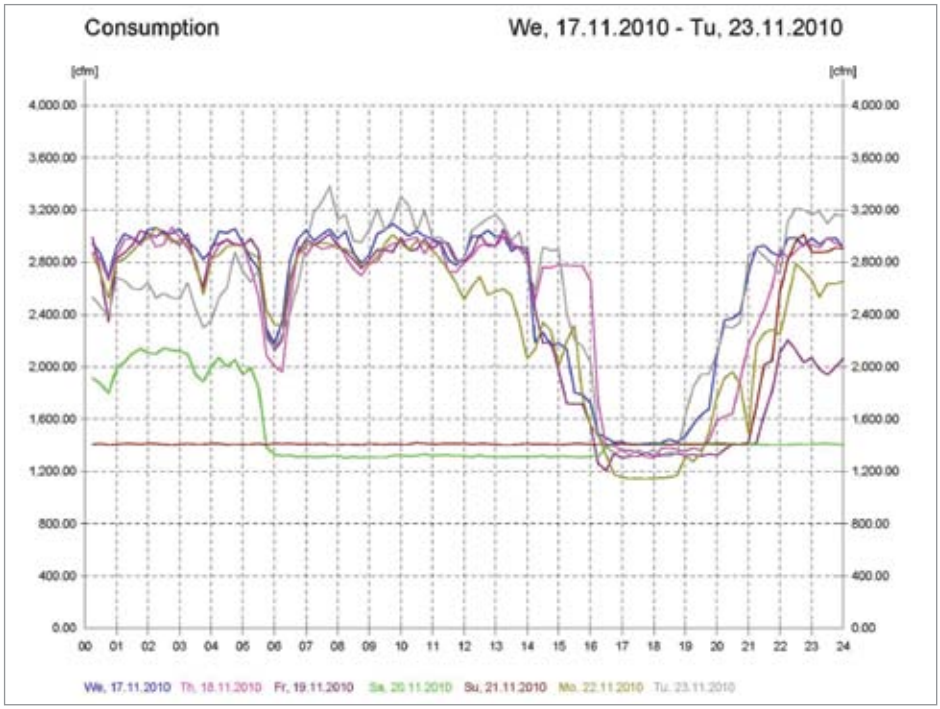


Image 1. Measured Demand Profile.

System parameters

The facility operates on two shifts; first and third shift. The powder coating system needs compressed air 24/7. Annually the compressed air system operates 8,760 hrs. The blended rate for electricity, to be used in this audit, was received from their accounting department and is 8 cents/kWh.

Data Loggers

Data loggers with AMP CT's were placed on all the compressors. Each compressor was tested for voltage and actual kW with a power meter to determine power factor in load and unload conditions. The AMPs of each compressor has been recorded on a one second interval and averaged over 10 seconds to manage the data volume. Data loggers have been installed in each compressor room to log the pressure. A dew point meter has been installed in the center of the facility.

During the walk through it was discovered that all the desiccant air dryers are purging — even when the compressors are not running. We decided to monitor the cycling behavior of the dryers. It is noteworthy that the desiccant dryer for the compressor #3 has more than twice the capacity of the compressor. When asked for the reason, we have been informed that the dryer arrived from another facility and didn't cost them anything.

The Demand Profile

The base demand in the plant is about 1,300 cfm with peak demand being 3,431 cfm. Minimum demand was measured at 1,085 and average 2,231 cfm. The flow chart also depicts similar demand patterns with the 6 AM to 3PM and 9 PM to 6 AM shifts in the plant.

Compressed Air System Performance Overview

The annualized cost to run the system is $288,611 with an unload share of 12.7% or $ 36,813.

During this audit, it was noted that the largest compressor,#5. has the highest unload share whereas the smallest compressor has the lowest unload share. When reviewing the details of the compressor #5, it was detected that the compressor starts but was restricted to run. The restriction had two reasons; one, the pressure set points of this compressor have been the lowest of any of the compressors and, two, the filter had a flow restriction.

The graph in Image 2 shows the performance of this compressor #5 over a day. The zoomed-in graph between 10:00 and 10:30 shows that the compressor does not produce any compressed air. It fills the sump-pump reservoir, the piping and the wet-receiver, but does not really add any compressed air into the overall system. The majority of the produced compressed air from compressor #5, which accumulated to 1,063,750 CF, is lost in blow down. This alone accounts for energy cost of $ 542 per week or $28,286 per year.

The system pressure, particularly when the large compressor #5 came online, bottomed out at about 85 psi and the highest pressure recorded during the audit was 111 psi. The

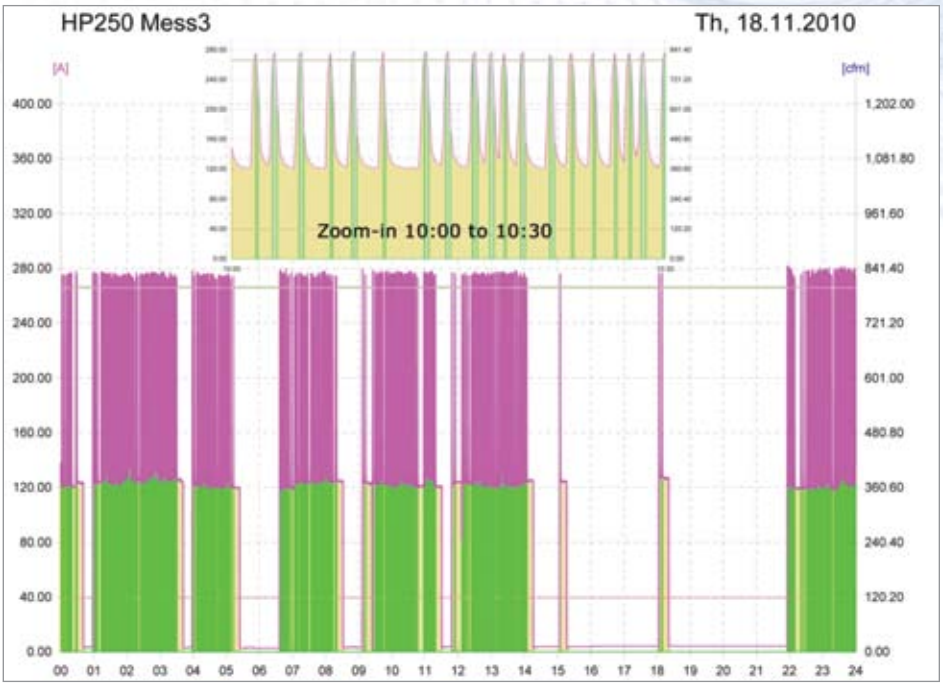


Image 2. Zoom-in of Compressor #5 Performance

TABLE 2. COMPRESSED AIR SYSTEM DATA

	LOADED	UNLOADED	TOTAL
Energy Consumption (kWh)	60,357	8,819	69,176
Load/Unload Run %	87.3 %	12.7 %	100%
Key Performance Indicator (kW/100 cfm)	16.2	—	18.56
Energy Costs Per Year ($)	$251,798	$36,813	$288,611
	AVERAGE	**MINIMUM**	**MAXIMUM**
Compressed Air Consumption (cfm)	2,219	1,085	3,431
Power Consumption (kW)	324	158.5	501.1
Net Pressure (psi)	98	85	110.8
System Utilization (%)	47%	23%	72.6%
Installed Compressor Capacity (cfm)			4,725 cfm
Installed Compressor Power (kW)			690 kW

THE SYSTEM ASSESSMENT | Compressed Air Audit of a Powder Coating System

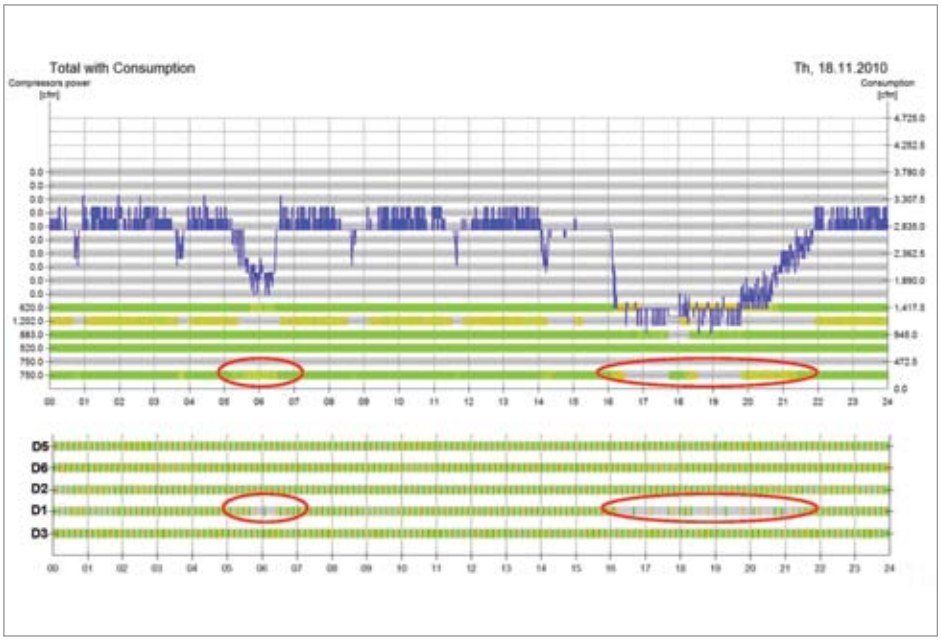


Image 3. Compressor and Dryer Load Profiles

system average pressure during audit was calculated to be 98 psi.

The overall storage of the system is 5,400 Gallons. This is considered a low volume given the size of the system and the demand dynamics. Of great concern is the fact that all storage is wet storage. Dry storage would help this installation. It is highly recommended to remove the moisture before the compressed air arrives at the dryers, which is done with the wet-receivers in this case. However, there is no storage to handle demand spikes in the facility. Also, the large air demands to purge the desiccant dryers cannot be balanced.

Image 3 visualizes the compressor running times in load (green) and unload (yellow) conditions in the upper graph. The Lower graph depicts the dryer cycling. Only the

dryer on compressor #1 (circled in red) is demand based (dew point controlled) whereas all the others are time based. (cycling every 5 minutes).

It is noted that the smallest 100 hp compressor, #3 with the desiccant dryer (which has been obtained from a sister plant) costs over $20,000 to operate per year. It is with good intention to use used equipment, but as in this case, it can come with a high energy bill. A correctly sized desiccant dryer for compressor #3, even with time based control, would use half of the energy.

During the audit, it was discovered that the desiccant air system has been installed mainly to reduce moisture in the facility that was causing problems with the powder coating system. During the installation of the data logger, we also checked the wet receiver tanks and found substantial amounts of condensate in one of the tanks.

The powder coating system was also inspected. After contacting the manufacturer, we learned that the powder coating system has the following requirements:

The pressure dewpoint of the compressed air being provided must be 38 °F or lower at 100 psig (this can be achieved by refrigerated dryers)

The majority of the condensate drains in the system are time-based drains. The hot and humid summers in the Midwest can result in more than 10-times higher condensate accumulation as in winter time. However, in this facility, the timer on the drains were not seasonally adjusted — resulting in accumulated condensate in the receiver tanks.

We suspect that a well-monitored zero airloss condensate system could have avoided the installation of the desiccant dryers. The $98,685 annual energy cost of operating the desiccant dryers accounts for more than 1/3 of the overall energy cost of the system. The estimated cost to run a refrigerated dryer system is about five percent of the cost to run the desiccant air dryers — or $15,000.

ID#	dryer rated capacity	usage from purging	Cycles	Cycle time	Control Method	Utilization	CFM	CF annually	Cost annually
1	750.0 CFM	112.5 CFM	1,072	9.4 min	Dew Point	53%	59.8 CFM	31,442,143 CF	$ 7,847.96
2	750.0 CFM	112.5 CFM	2,014	5.0 min	Time	100%	112.4 CFM	59,071,339 CF	$ 14,744.21
3	1,050.0 CFM	157.5 CFM	1,991	5.1 min	Time	99%	155.5 CFM	81,755,438 CF	$ 20,406.16
4	930.0 CFM	139.5 CFM	2,016	5.0 min	Time	100%	139.5 CFM	73,321,200 CF	$ 18,300.97
5	1,250.0 CFM	187.5 CFM	2,016	5.0 min	Time	100%	187.5 CFM	98,550,000 CF	$ 24,598.08
6	720.0 CFM	108.0 CFM	1,821	5.5 min	Time	90%	97.6 CFM	51,274,157 CF	$ 12,798.03
	5,450.0 CFM	817.5 CFM	10,930				752.3 CFM	395,414,277 CF	$ 98,695.40

Table 3. Calculated annualized cost for the desiccant dried air.

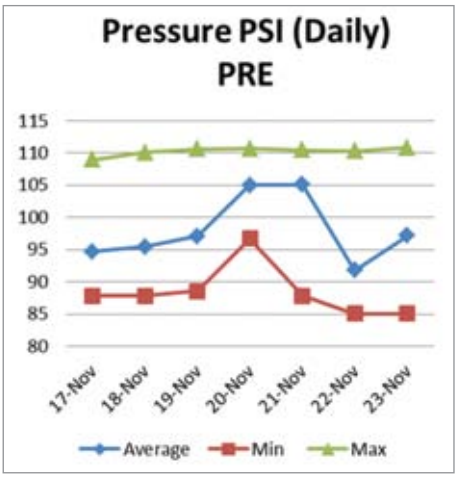
Compressed Air System Simulation Based Upon Existing Parameters

A system simulation was performed with a calculated savings of $54,000 resulting from the master control alone. In addition, the zero air-loss drains and the retrofitted dryers will generate additional savings.

Suggested improvements:

1) **Install Master Control**
A central master control will assure the best use of the compressors and that the smaller compressors are running as the trim compressors. The system also has an energy management component, with energy metering at each compressor and the capability

THE SYSTEM ASSESSMENT | Compressed Air Audit of a Powder Coating System



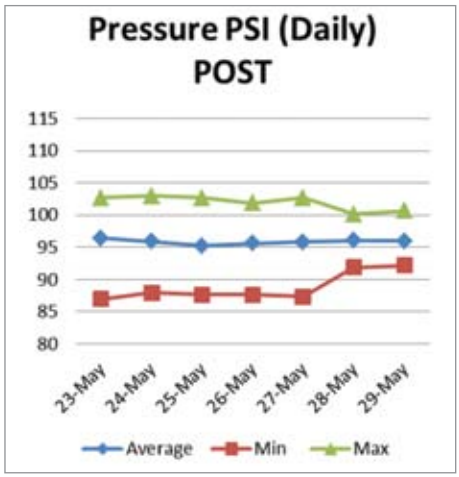


Image 4. Pre and Post-Audit System Pressure Profile.

to continuously record system data. Therefore, future energy efficiency projects can be calculated, verified and documented for the utilities.

2) **Increase Storage Capacity**
It is recommended to add a minimum of 5 Gal/cfm of dry storage to the compressed air system. Based on the 3,500 cfm peak usage, the minimal suggested receiver capacity is 17,500 Gallons. Subtract the existing 5,400 Gallons and this results in an additional receiving capacity of 12,000 Gallons.

3) **Install Zero Air-loss Drains**
It is recommended to install Zero air-loss drains with contacts. The contacts are utilized to connect to the master control in order to send e-mail alerts in case of drain failure.

4) **Compressed Air Dryer System improvements**
A management requirement is to have desiccant dried air for the powder coating system. So the following alternatives have been presented.

a. The compressed air used for the powder coating systems represents between 20-25% of total air usage. Therefore, we recommend replacing desiccant dryers system with refrigerated dryers to provide the plant compressed air and install a dedicated desiccant dryer at the powder coating system.

b. Install "demand based" controls on existing desiccant dryers.

Implementation

Facility management decided to start with the low-cost measures first and get a control and monitoring system in place. This was the motivation for this compressed air audit all along. Also, the control and monitoring system is intended for documenting and verifying potential future compressed air improvements project.

The customer eventually selected improvement recommendations 1, 3 and 4b.

The control system has been installed in Mezzanine 1, on the other compressor in Mezzanine 2, and on Mezzanine 3 to communicate to the master control via the existing Ethernet which eliminated expensive installation of communication wires and resulted in a quick, easy and very cost-effective installation.

The following verification data and charts have been compiled after the installation of the Master control, the retrofitting of additional dryer, and the installation of the zero air less drains.

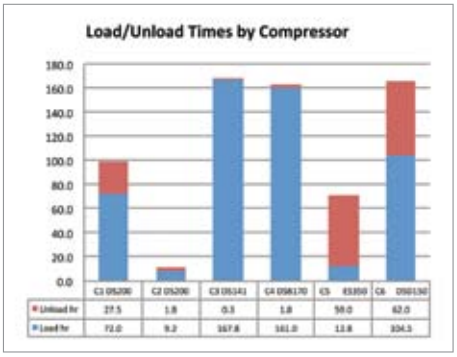
System Performance Verification

The two charts, in Image 4, show pre and post audit pressure profiles. The low pressure was recorded at min of 86 psi compared to 85 psi. The max pressure was max 103 compared to 111 psi and the average pressure has been reduced from 99 psi to 95 psi.

The pre and post installation graphs, in Image 5, show a significant difference in compressor utilization based on size. In the pre installation audit the largest compressor cycled the most. In the post audit only the smallest compressor cycled heavily and the larger compressors have a moderate to small unload share.

Overall compressor run hours accumulated to 679 hours during the audit and 436 hours during verification. That represents a reduction of 243 hours a 35.8% reduction.

The unload share as % of energy cost has been reduced from 12.7% to 6.9%. Further reductions to 1-2% unload share are possible with the installation of the storage volume, as suggested, to 5 Gal/cfm.



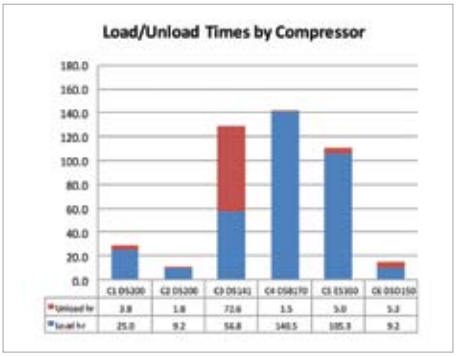


Image 5. Compressor Utilization.

The motor starts have slightly increased in particular for the small compressor. They are still in an acceptable range of less than 16 motor starts per day for the small compressor and 1-5 starts per day for the remaining compressors.

The energy cost was reduced by 21% which accumulates to $ 61,244 per year. The simple ROI of the project was less than 10 months. Unload energy cost was reduced by 58%. Motor starts increased from 73 to 201 per week. This is an average of 4.8 motor starts per compressor per day. Load cycles have been reduced by 70% or from an annualized 285,000 to an annualized 84,500.

Continuous Improvement

At the time this article was written, discussions started again to improve the system by adding storage and by dealing with the oversized desiccant dryer at compressor #5.

Consumers Energy, the utility responsible for this facility, has a good compressed air incentive program. A wide variety of prescriptive measures for compressed air applications as well as custom projects are available. Custom project are being incentivized with 8 cents/kWh.

For more information about the Consumers Program visit their web site: http://www.consumersenergy.com/uploadedFiles/EE_Programs_2011/Business/Applications/business-incentive-catalog.pdf

The installed master control provides the baseline data required by utilities to document the system improvements for custom projects. Data is recorded on one second intervals and stored at 10 second averages. All data are available in excel for review by the utilities.

Conclusion

The audited baseline, the system simulation and the verification with the higher than our conservative predicted savings established confidence and trust in our work and led to additional audits at this client. Particularly, the transparency of the data and the audit was complemented. Compressed air systems are constantly changing and it is a continuous effort to keep and improve system performance. At this point in time, the client has installed additional dew points meters and system parameters and performance data are closely monitored on a continuous basis. BP

For more information please contact: Jan Michael Hoetzel, Dipl. Wirt-Ing. (FH), Owner and Principal of SIGA Development LLC, Airleader Distributor North America, email: info@airleader.us, tel: 616-828-0716, www.airleader.us

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THE TECHNOLOGY PROVIDER

Improve Pneumatic Performance Through Filtration System Design

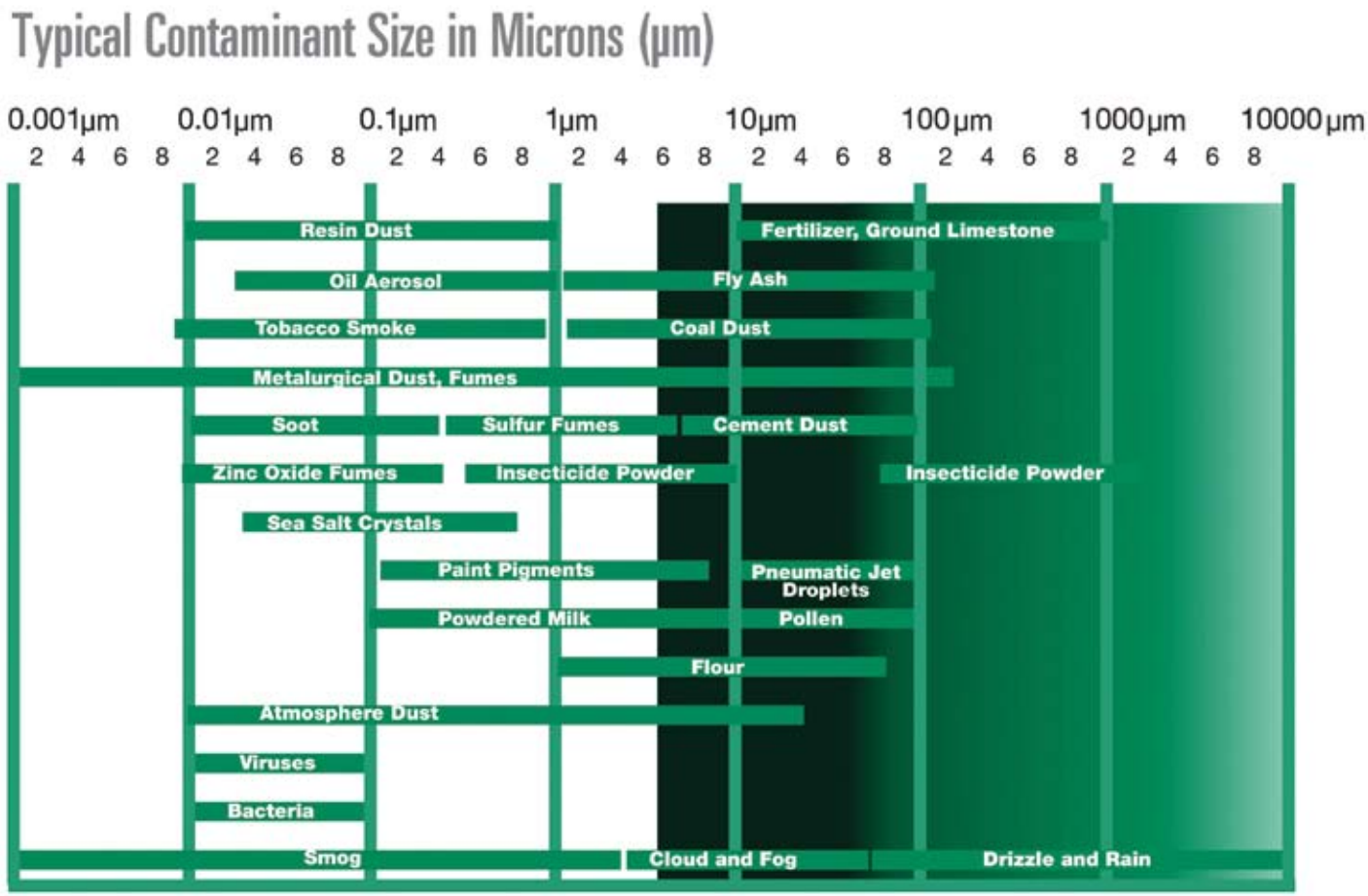
By Scott Minato, Marketing Manager – Air Preparation Products, and Barbara Pontisso, Filtration Products Specialist, Numatics, Inc.

In an ideal world, industrial air or gas supply lines would be free of particulate, water, oil and other contaminants. In the real world, however, supply lines typically deliver some contaminants along with the air or gas they were designed to carry. Left unchecked, these contaminants will cause efficiency losses, maintenance headaches and the premature failure of pneumatic components.

Cleaning up an air or gas supply can be as easy as installing a filtration system. These systems employ one or more filters to remove contaminants before they reach the pneumatic equipment. What's not so easy is selecting the right type of filtration system for a particular application.

In part, the difficulty comes from the different filtration requirements across industries. Food and beverage, semiconductor and automotive plants, for example, all have different filtration needs based on their specific pneumatic systems and operating environments.

And in part, the difficulty in choosing the right filtration approach involves differences in the filters themselves. Not all filtration technologies are created equal in terms of their intrinsic performance characteristics and suitability



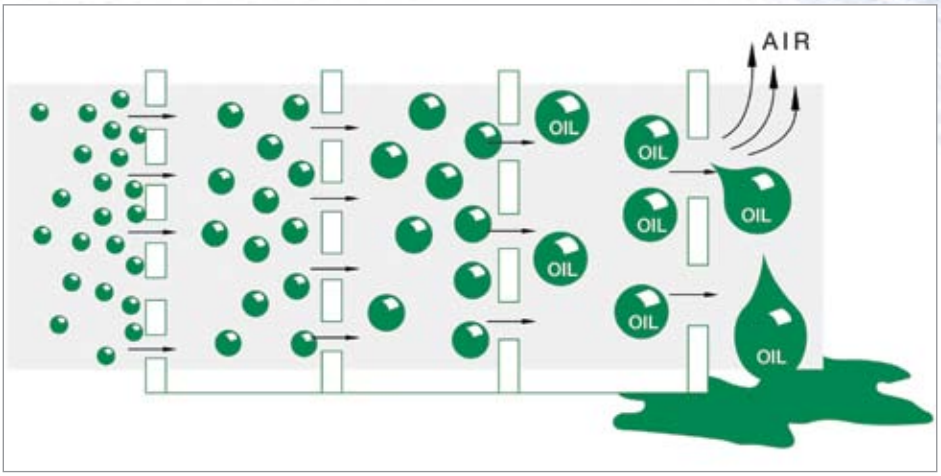
Typical Contaminant Sizes in Microns (µm).

to a given application. Choosing the wrong filter or applying it incorrectly can actually do greater harm than good.

To tailor filtration systems to the job at hand, it's important to understand not only the capabilities of different filter elements but also how to combine them in series.

Filter Types

Effective air filtration starts with an understanding of the different types of filter



Air flows from the inside to the outside of the Numatics filter element through progressively larger openings in the media. As contaminants move through the element, solid particles are trapped, and liquids are formed into large droplets. As the air exits the element, surface tension holds the liquids and allows them to drain to the bottom.

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Improve Pneumatic Performance Through Filtration System Design

media and what they can do. The most common types used in industrial settings include:

- **Water Separators.** Water or moisture can quickly damage pneumatic components, causing valves and cylinders to stick. Water separators use the centrifugal forces generated by an internal spinning mechanism to remove large quantities of water and water-borne contaminants. While typically used to remove bulk liquids and large water-borne solids, water separators also protect other filter elements from large liquid loads that could shorten filter life.
- **Particulate Filters.** Large particles such as rust, debris and desiccant dust can wear out pneumatic components prematurely. These contaminants are often generated by old carbon steel pipes, compressor intakes and desiccant air dryers. The best particulate filters feature pleated designs to maximize the surface area available to trap dirt particles. Particulate filters are often used to achieve up to a 3-micron particle removal in dry systems.

Proper Filtration Solves Moldy Bread Dilemma

Food and beverage processing requires compressed air filtration to protect not just the pneumatics but also the product. Recently a large commercial baker discovered that air filtration is an important ingredient in its bread making operation.

When trying to reduce unacceptable mold levels in the compressed air lines at the plant, the baker's process engineers discovered that the compressed air used to inflate bread bags and blow away the grains after the slicing process was also injecting mold spores drawn in by the compressor. A 5-micron filter had been installed on the air supply, but this level of filtration does not stop mold spores.

To solve the problem, a series of three filters were added to the compressed air supply — a particulate filter to remove water and large particles, a 0.01-micron coalescing filter to eliminate the spores and other ultra fine particulate and a vapor adsorbing filter to remove any oil or hydrocarbon vapor.

After adding these filters, lab tests confirmed that the mold spore count has been significantly reduced, extending the bread's shelf life. This three-filter solution is now being evaluated as a standard for all machines across the company's global baking facilities.

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Numatics Delta Series Details

Numatics Delta Series premium filters are ideal for any application requiring high flows, including industrial, process, medical and compressor applications. All filter types are available in ¼-in. to 3-in. port sizes and are certified to the ISO 8573 compressed air quality standard. Anodized aluminum end caps, a premium manual drain, high-temperature fluoroelastomer (FKM) seals and an optional 2-stage coalescing and 3-micron prefilter combination guarantees optimum air preparation in these applications and many others:

- Automotive Manufacturing
- Food & Beverage Processing
- General Industrial
- Oil & Gas
- Process Control
- Paint Spraying
- Packaging
- Medical & Pharmaceutical Processing

Numatics Compressed Air Filters.

- **Coalescing Filters** are the next line of defense in an air filtration system and can do a good job removing water, oil, rust and other contaminants from the air supply. The design of coalescing filters differs from manufacturer to manufacturer. The Numatics Delta Series coalescing filter elements, for example, consist of a porous network of borosilicate glass fibers. As air moves through the filter element, solid particles are trapped and liquids are formed into droplets that drain away. Coalescing filters come in different grades. Coarse coalescers are often used for mainline plant filtration, while fine coalescers are used for applications such as paint spraying, robotics and pneumatic tools. The ultra fine coalescer is mainly a point-of-use filter specified for critical processes such as semiconductor packaging and instrumentation.

- **Adsorbing Filters.** As a final step in certain applications, an adsorbing filter may be added to remove oil and hydrocarbon vapor from the compressed air stream. This type of filter is used immediately downstream from a coalescing element. Because optimum adsorption takes place at lower temperatures, it's best to install the filter as close to the point-of-use as possible. Adsorbing filters are often used for breathing air preparation as well as food and drug applications that have direct product contact with exhaust air.

Filter Design and Construction

While these common filter types are sometimes referred to generically, keep in mind that there are substantial quality and performance differences between filters from different sources — even if they have the same nominal filtration specification. These differences often boil down to design and manufacturing methods.

Consider coalescing filters as a prime example of why design and manufacturing matters. Commodity coalescing elements typically employ a mechanically wound filter media. Numatics Delta Series coalescing filters, by contrast, employ a vacuum formed filter media composed of glass fibers and an epoxy binder.

This manufacturing difference is not trivial. The vacuum formed design traps contaminants through the entire cross section of the filter. The result is a lower pressure drop and more capacity than a comparable wrapped filter that traps contaminants primarily on the surface and quickly clogs as a result. These filters have an initial pressure drop of just 1.5 psi in a dry condition at rated flow, far lower than a typical wrapped filter.

Vacuum forming also allows the customization of filter element recipes to achieve desired

filtration levels. Our engineers can tweak the vacuum forming process to an extensive range of gradient densities to form coalescing elements ranging from .01 micron to 1 micron.

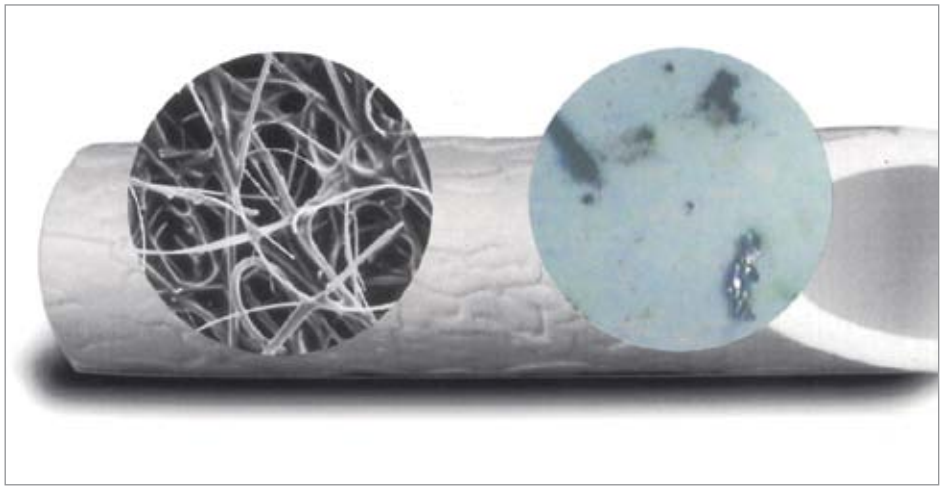
Construction differences apply to other filter types too. The Delta Series adsorbing filters, for example, consist of fine activated charcoal impregnated on polyester. These activated carbon particles have a strong affinity to vapor and are highly efficient due to the extensive surface area present.

Effective Filter Combinations

Most filtration systems require multiple filter elements, working together to remove the full spectrum of particulate sizes and compositions capable of harming down-stream components. The specific combination, or series, of filters will vary depending on the application's air quality requirements.

Food and beverage or semiconductor applications, for example, may require three different filters, including ones capable of removing sub-micron particles. Others such as main line plant filtration may require just a coarse particulate filter. Here are a few examples of filter combinations used in various applications:

- Blow molding — 3-micron particulate filter; 0.01-micron fine coalescer; vapor adsorber.
- Electronics — 3-micron particulate filter; 1-micron coarse coalescer; 0.01-micron fine coalescer.
- Food packaging — 3-micron particulate filter; 0.01-micron fine coalescer; vapor adsorber.
- Pneumatic control systems — 3-micron particulate filter; 0.01-micron fine coalescer.



Delta Series coalescing filters consist of a porous network of borosilicate glass fibers that trap solids while allowing liquids to pass through. The magnified views show how effective the filters are at trapping contaminants. At left, a 228x magnification shows a new 0.01-micron Numatics filter element. At right, a 40x magnification shows a filter element that has trapped various metal, oil and hydrocarbon contaminants.

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- Process air — 1-micron coarse coalescer; 0.01-micron fine coalescer; vapor adsorber.
- Semiconductor packaging. 3-micron particulate filter; 0.01-micron fine coalescer; vapor adsorber.

Bear in mind that combinations of filters do not always require separate products. In some cases, different filter elements can be combined saving space and simplifying the ordering process. Numatics Delta Series coalescing filters, for instance, have a pleated 3-micron pre-filter available as an option, which can eliminate the need for a separate coarse particulate filter. This two-in-one approach saves both space and money because the prefilter can share the same housing with the coalescing filter.

Delta Series Filter Combinations.

Filtration Is Part of A System

Too many machine builders and installers fail to consider air filtration. Or if they do, it's just an afterthought. Filtration's biggest benefits, however, come when the air filter and pneumatic components work together as a system. Only then will the filter offer the maximum protection against contaminants while preserving pneumatic efficiency.

Matching the filtration technologies with specific pneumatic system can be daunting. So it's helpful to seek out an experienced filtration supplier who can help strike the right balance between air quality and pneumatic system performance. BP

For more information, please contact Numatics at email: insidesales@numatics.com, tel: 248-596-3200, www.numatics.com

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REMOTE COMPRESSOR SENSING SAVES ENERGY

By Ron Marshall for the Compressed Air Challenge®

KNOW PRESSURE COMPRESSED AIR CHALLENGE®

➤ One of the strategies discussed in Compressed Air Challenge seminars is to use remote sensing to better control multiple air compressors. The use of a pressure signal from a common location downstream of air dryers and filters allows air compressor controls to "see" the downstream pressure better and provide more accurate pressure control. A characteristic of this strategy that is often missed is that remote sensing can also provide better pressure control for single compressor systems, where only one compressor normally runs to feed the plant loads, and can result in lower average compressor discharge pressure and lower more accurate plant pressure regulation, which saves energy.

Where Compressors Sense Pressure

All air compressors must sense pressure for control purposes to ensure the pressure they produce is maintained within certain limits. An uncontrolled system with high pressure would overload the compressor motor, cause catastrophic damage to compressed air equipment, and would consume significant energy. Uncontrolled low pressure would obviously cause major production problems in a plant and would not be desired. The goal of any compressed air system control is to maintain a constant stable pressure, not too high so as to cause increased energy consumption, and not to low so as to affect production conditions.

The control sensing point in an air compressor is often located before the air cooler or alternately at the compressor discharge, just inside the compressor package. Regardless of the location the compressor control will act to maintain a regulated pressure at that exact point, but the pressure at this location may be very different than the actual plant pressure.

The pressure differential across air treatment system; the air dryer and filters, will cause a

> "The goal of any compressed air system control is to maintain a constant stable pressure, not too high so as to cause increased energy consumption, and not to low so as to affect production conditions."
>
> — Ron Marshall, Industrial Systems Officer, Manitoba Hydro

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sag in plant pressure causing a deviation in plant pressure, even though the compressor discharge pressure may be holding steady. A control point location inside the compressor package cannot compensate for this sag, even compressors with very expensive and precise VSD controls. Figure 1 shows the sag across the treatment system associated with a 150 hp VSD controlled compressor. It can be seen that this compressor does a very good job in maintaining a very accurate pressure at its discharge, however the plant pressure sags to as low as 102 psi during high flows.

Because the critical pressure applications in this plant require at least 100 psi the compressor discharge pressure must always be maintained at a higher than desired pressure so there will be enough pressure to overcome the sag during plant peaks. The plant peaks, however, occur a small percentage of the time which means for a large percentage of the time the discharge and pressures are higher than they need to be to maintain the minimum acceptable pressure. This causes higher average discharge and plant pressure, reducing system efficiency.

REMOTE COMPRESSOR SENSING SAVES ENERGY

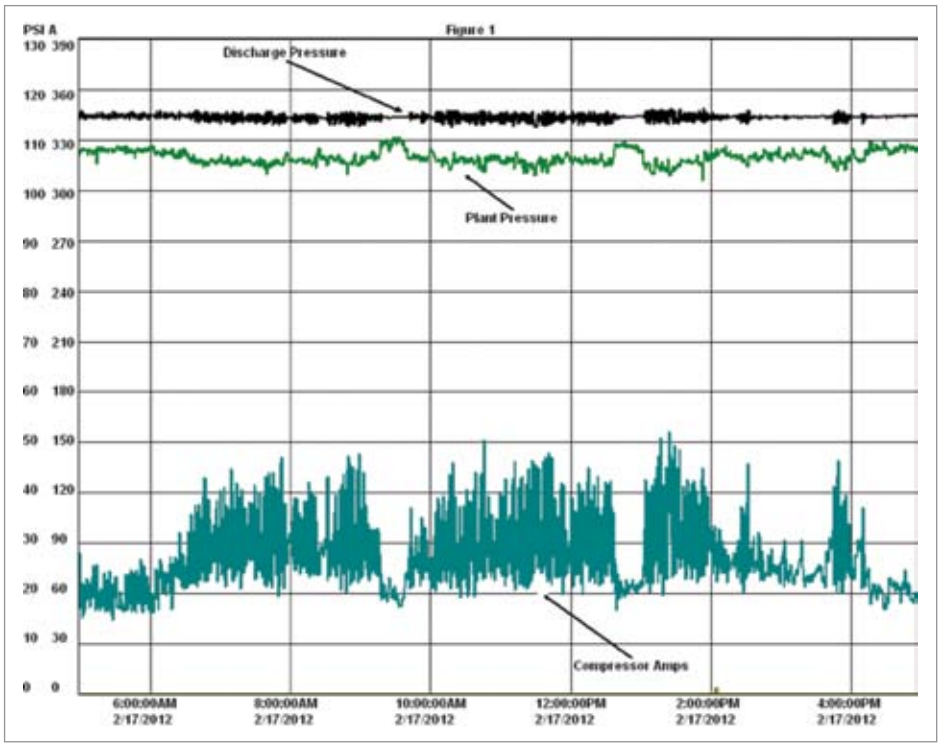

Figure 1: Compressor Discharge pressure is precise but plant pressure sags if sensing is at the compressor discharge.

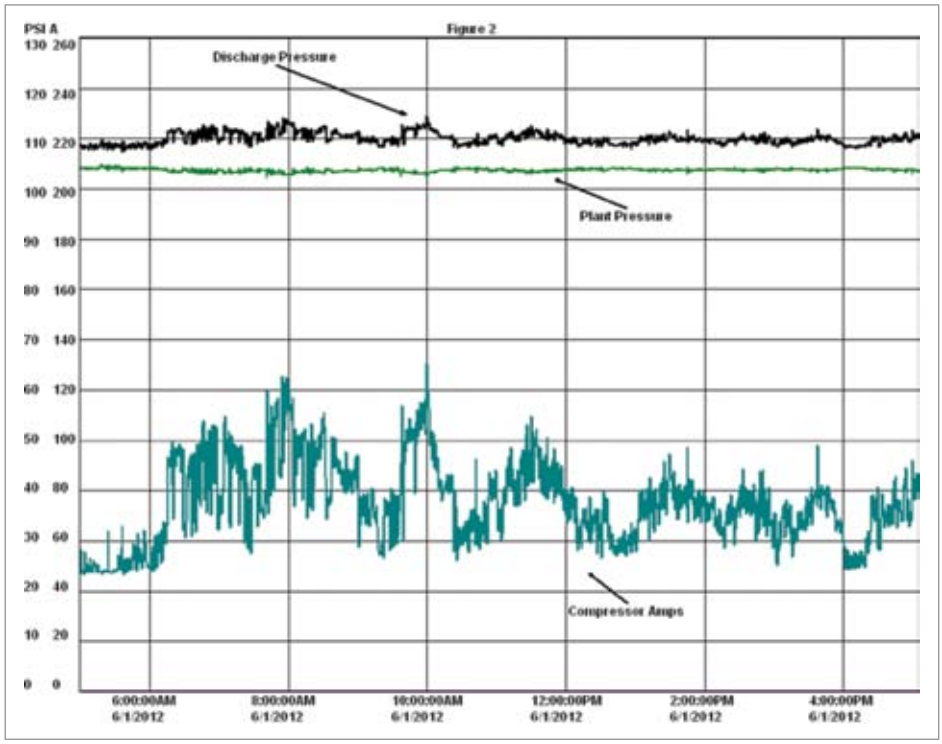

Figure 2: Using remote sensing provides constant plant pressure and more stable compressor operation.

Remoting the Sensing

If the pressure sensing is relocated to downstream of the air dryer and filters the compressor will maintain a very accurate plant pressure by regulating the discharge pressure up or down at the time it is needed to compensate for the pressure differential caused by the varying flow. This adjustment keeps the plant pressure very flat, as is desired with a VSD compressor, rather than allowing the plant pressure to sag during high flow. The discharge pressure only goes to high levels when the occasional plant peaks occur, but overall the average discharge pressure levels are lower than before the change. The pressure setpoint of the air compressor can be set at a level slightly higher than the minimum pressure required by the critical plant pressure, in the case of Figure 2 the average plant pressure is 103 psi which is 4 psi lower than the previous average plant pressure of 107 psi. The average compressor discharge pressure is now 110 psi, which is 5 psi lower than the previous condition. The resulting energy saving due to the relocation of the sensing is about 5% which saves about $2,000 in energy costs per year, paying back the cost of the change in about 6 months. As can be seen in Figure 2, relocating the sensing has also better stabilized the VSD operation in that it has slowed the compressor response cycles making it easier for the compressor to maintain stable pressure. This is because the compressor now "sees" a large storage receiver located downstream of the air dryer and does not have to "look through" the dryer and filters.

Benefits to Fixed Speed Compressors

Relocation of the sensing to downstream of the compressor cleanup can better stabilize the compressor control for fixed speed compressors too. Consider a load/unload compressor that might have a 10 psi wide pressure band and well sized large storage of 5 gallons per cfm located at the discharge of the air dryer. If the air dryer and filters have 8 psid pressure differential the storage receiver will only "see" a pressure fluctuation of 2 psi during the load/unload cycles. This results in the storage receiver being 80% less effective in reducing the compressor load/unload cycles, or in essence having the effective equivalent of being a receiver sized at 1 gallon per cfm. Looking at Figure 3, a compressor loaded at 60% average capacity would consume 92% of its full load power at this less effective level rather than 78% if it could "see" the whole receiver capacity. Relocating the pressure sensing in this case could save 15% due to more efficient reduced compressor cycles if the average discharge pressure was adjusted and maintained at the same level as before.

Cautions About Remote Sensing

If you are considering relocating your compressor sensing location there are some cautions to be considered. Because the modified air compressor is not sensing pressure at its discharge anymore, if someone inadvertently closes the compressor discharge valve, or a filter or dryer plugs up, some excessive pressures may develop that could damage

Best Practices for Compressed Air Systems Second Edition

This 325 page manual begins with the considerations for analyzing existing systems or designing new ones, and continues through the compressor supply to the auxiliary equipment and distribution system to the end uses. Learn more about air quality, air dryers and the maintenance aspects of compressed air systems. Learn how to use measurements to audit your own system, calculate the cost of compressed air and even how to interpret utility electric bills. Best practice recommendations for selection, installation, maintenance and operation of all the equipment and components within the compressed air system are in bold font and are easily selected from each section.

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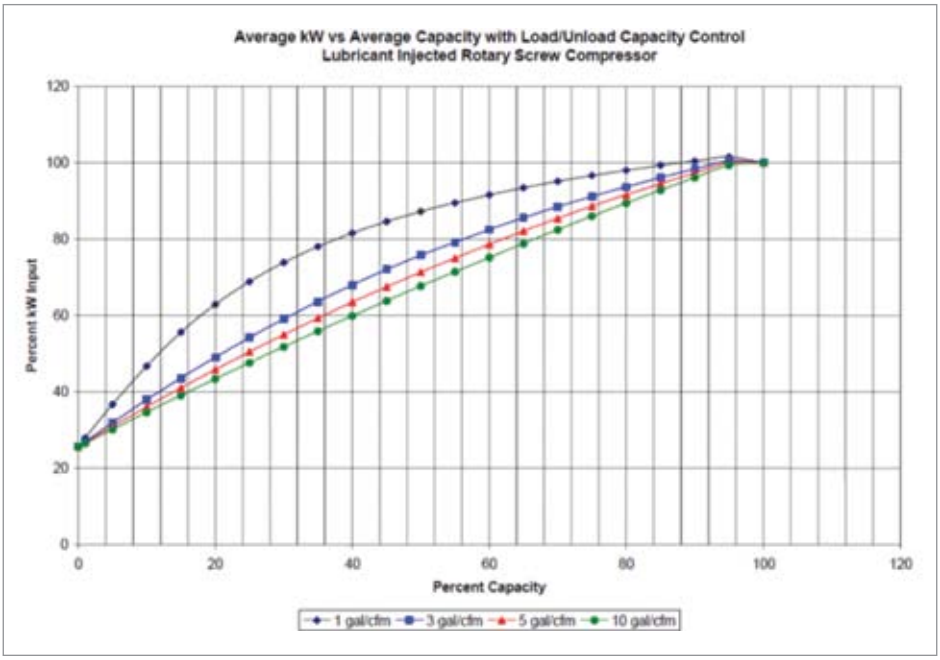

Figure 3: Compressor efficiency depends on the size of effective storage.

an air compressor or cause a catastrophic failure of auxiliary equipment. Also, some compressors may sense pressure differential across their internal oil separators using the now relocated pressure sensor, and since it is now sensing the pressure differential across the dryer and filters too, there may be a high separator differential alarm. For these reason it is important to carefully design in secondary local pressure protection at the compressor discharge to sense high pressure conditions and unload the compressor to keep it safely operating. Pressure alarms may also need to be recalibrated. Consultation with the compressor supplier or manufacturer is recommended to prevent these problems.

Often the best bet for remote sensing is to use a separate compressor controller that may be provided by the compressor supplier or some third party to provide the remote sensing while keeping the local compressor control sensors in place. These units are normally designed with pressure protection strategies to prevent local compressor discharge pressure issues. These controls can also provide intelligent operation of backup compressors, rotate compressors to share hours, and provide other benefits such as remote system monitoring. More information about these types of controls can be found in CAC's seminar workbooks. BP

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Ron Marshall C.E.T, C.E.M, has been employed with Manitoba Hydro, the crown owned electricity and gas utility in Manitoba, Canada since 1977. He is a Certified Engineering Technologist and has received certification as an Energy Manager, Demand Side Management and Measurement and Verification Professional through the Association of Energy Engineers.

Ron was the first Canadian participant to qualify as a DOE AIRMaster+ specialist. Ron has worked in the industrial compressed air field since 1995 as an Industrial Systems Officer for Manitoba Hydro's Customer Engineering Services Department. Ron is Manitoba Hydro's industrial compressed air systems expert and his efforts contribute to the utility's Power Smart Performance Optimization program, a utility incentive program that supports industrial customer energy audits and electrical and gas efficiency projects.

Ron is a member of Compressed Air Challenge's Project Development Committee and Chair of CAC's Marketing working group. Ron is a frequent contributor to various CAC related magazine articles.

THE ENERGY MANAGER | MGM Industries Reduces Chilled Water Requirements with Dry Vacuum Pumps

Continued from page 21.

The water separation system for the dry pumps at the calibrator.

is a fixed speed pump for the base load. You are able to use a lot less bleed air by using speed-regulated machines.

Please describe the innovative water separation system.

Remember this was an R&D project for both of our companies! Our initial testing was true trial & error. We shot water 22 feet out of a pump once! One of the real innovations here has been the engineering of a new water separator system that allows the Becker dry rotary vane pump to operate in this "wet" environment.

We go from the calibrator to a water separator. The housing is made out of PVC. The internals are stainless steel. Water enters the separator and goes through a physical separation process that is unique to Becker. It's a custom-built and assembled separator designed by Becker. Water goes to the bottom of the separator where it is drained out. There are remaining airborne water droplets (or mist). We have a second stage in the filter that removes water mist/droplets. Now we just have vapor remaining. We have a ball float shut-off valve that is a fail-safe shut-off system that prevents water from entering the dry pump.

The water goes into a drain tank. There are level switches inside isolating the separator tank from the drain tank. We have a valve system that allows the drain tank to be evacuated without affecting the vacuum level in the separator. This is key because a change in vacuum in the calibrator will cause a production stoppage.

What are the vacuum requirements of the tank lines?

We were running 3 x 10 hp liquid ring pumps flat-out. Part of MGM's challenge is depending on what profile you are running, it changes the tanks needed. The water and vacuum hit the hot vinyl and the dies are creating the final size. You have leaky tanks that have a hard time maintaining vacuum. We were taping them and using cellophane on the tanks to eliminate the leaks.

We went to a separation system and a Becker VariAir VSD dry, corrosion resistant regenerative blower. We were able to get 2-3 inches of mercury on the water tanks when using Profile 379 on Line 7 as an example.

In testing, we ran 2 inches of mercury at full production at only 49 hertz (50%) on the blower- it's a 12 hp blower running at half speed. We tested the blower to see how low we could go and ran it down to 31 hertz. We were pulling 6 ½ hp when at 41 percent load.

"At MGM, we are very pleased to have reduced our chilled water requirements — we didn't have to buy that new chiller and we have cooling water now to accommodate our future growth plans!"

— John MacKorell, MGM Industries

With the liquid ring pumps, we still had to bleed in a lot of atmospheric air to get the required turbulence. With the blower, we closed off all atmospheric bleed-in. We were pulling better suction on the tanks and this helped speed up the production on the machines. We are at 2 inches of vacuum.

What about the water separation on the tank line?

We are using two-phase flow carrying the water vertically up to a liquid separator similar to the one used on the calibrator system. We are separating up to 20 gallons of water per minute. The calibrator system is 2 gallons per minute. Because of the water volume, we can't use the drain-tank system because it would have to be too large.

So, we had to come up with a high-volume drain system that would work. We found the solution with a barometric leg system. This allows us to drain on a continuous basis. The separator drain goes into a hot well. It then runs into an existing cyclone system that separates and recycles the water. Everything is at atmospheric pressure — yet we hold the vacuum in the tanks to protect the process.

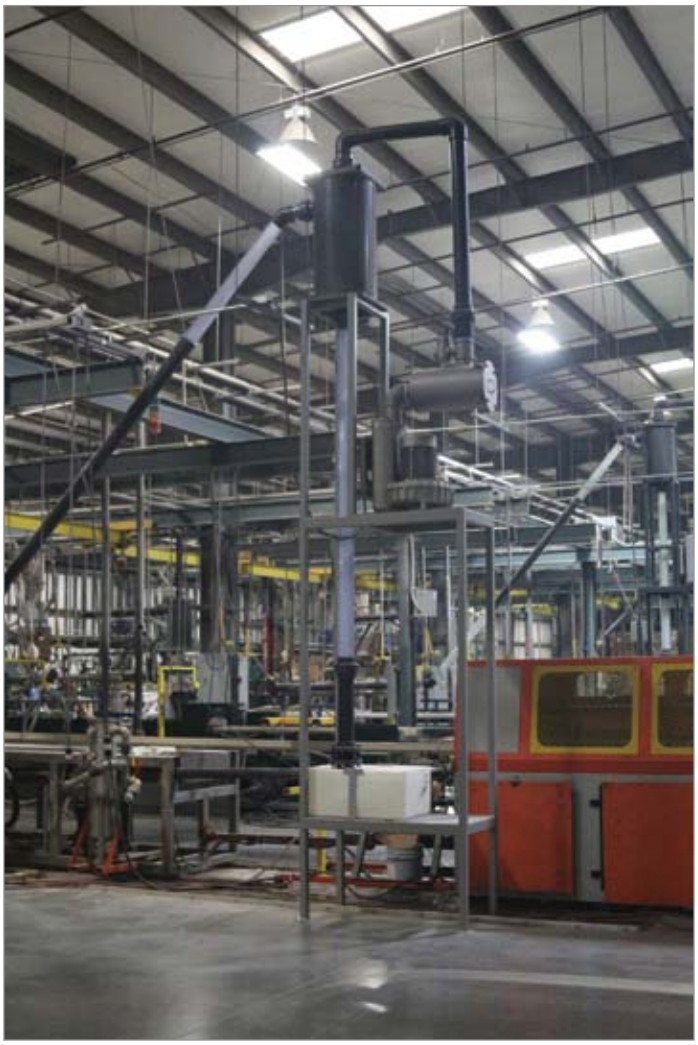
The floor space required is only four square feet for the calibrator and eight square feet for the tanks. It's a plug and play system requiring very little floor space.

What are the future plans for this system?

The next step in this is we think we'll be able to run two different extruder lines with the same set of pumps. Using vacuum regulators, made out of PVC, we will adjust vacuum levels independently for the different lines. This will eliminate the need for air bleeds, and this will further reduce the loads on the vacuum pumps.

Extruders are big on "plug and play vacuum pump systems". The control system is new and there is one control panel for all the devices. There is a remote that allows for fine-tuning of the pumps to slow down the VFD on the device that allows the operator to fine tune at the calibrator. The separators come on a stand, the controls are on a stand, and the system is plug and play-ready. They run three wires into control panel and hook up vacuum and drain lines and are ready to go.

Becker has proven that a dry vane pump can replace a liquid ring pump for PVC extrusion, and can reduce energy requirements by more than fifty percent, and that it can do so for year after year.



The water separation system for the dry pumps at the tank line.

At MGM, we are very pleased to have reduced our chilled water requirements — we didn't have to buy that new chiller and we have cooling water now to accommodate our future growth plans! BP

For more information, please contact Rod Smith at rod@airbestpractices.com, or David Brittain at Dave.Brittain@beckerpumps.com, or John MacKorell at j.mackorell@mgmindustries.com

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RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

Atlas Copco Compressors Introduces New GVS Oil-Sealed Rotary Screw Vacuum Package

Atlas Copco Compressors has introduced a new GVS oil-sealed rotary screw vacuum system — the company's first packaged vacuum system for "rough vacuum" operations between 29.9 in-HgV and 15 in-HgV. The screw element technology, developed through Atlas Copco's compressor technique business, is a time-tested design, offering superior, reliable performance at the lowest energy cost.

The GVS delivers capacities between 365 to 3,000 cfm, making it the ideal machine for applications in the electronics, woodworking, bottling and canning, packaging, printing and plastics industries. It is especially suitable for plants that would like to achieve significant energy and maintenance savings by replacing multiple remote vacuum pumps with a centralized system.

"Our expansion into vacuum products is a natural fit for Atlas Copco," said Robert Eshelman, vice president, Industrial Air Division, Atlas Copco Compressors. "By extending our proven oil-sealed rotary screw compressor technology to the vacuum, we can now offer our customers an exceptional vacuum system alternative."

The new GVS is fitted with a modulating valve at the pump inlet, allowing capacity to match demand, while minimizing vacuum-level fluctuations and operating at the lowest possible energy point. The GVS can be installed near the point of use, due to its quiet operation, or alternately, as part of a centralized vacuum system in a dedicated utility room. The new Atlas Copco GVS is designed and manufactured in the United States.

Atlas Copco
www.atlascopco.com

Kaeser Introduces New Sigma Control 2™

Kaeser Compressors' new generation of compressor control — the Sigma Control 2™ — presents all the advantages of the Sigma Control plus greatly enhanced communication and control options. Its built-in Web server and standard Ethernet port let you view your compressor information from any PC without any additional hardware or software, and a variety of communications adapters (Modbus RTU, Profibus DP, Devicenet, Profinet, etc.) are available for integration into plant monitoring systems or a centralized control station.

For optimal energy efficiency, you can choose from several pre-loaded operating profiles. The Sigma Control 2 also equalizes runtime, extends maintenance intervals and prevents unnecessary starts with two-unit lead/lag sequencer programming.

TECHNOLOGY PICKS

The new generation control provides full-time protection, monitoring over 20 critical parameters and will shut down the compressor to avoid component damage. The Sigma Control 2 also tracks operating hours and provides maintenance reminders, as well as stores operating data useful in trouble shooting. Enhanced security with RFID prevents unauthorized access. An easy-to-use operator interface allows for accessing the new model's expanded capabilities.

For more information on Kaeser's Sigma Control 2, please call 877-586-2691 or visit us at www.kaeser.com.

Ingersoll Rand Releases New R-Series 50-60 hp Model

Ingersoll Rand recently released the latest model in the contact-cooled Rotary Screw Air Compressor line — the R-Series 37-45 kW (50-60 hp). "The R-Series product line offers reliable, productive and efficient air compressors in the ranges our customers need," said Scott Hardeman, marketing manager — Customer Center and Association of Ingersoll Rand Distributors (AIRD) channels, Ingersoll Rand. "We also offer add-on features so each customer can customize the product for their unique application requirements."

The 37-45 kW compressor is equipped with the same V-Shield™ technology as the larger 55-160 kW units. The V-Shield ensures that the compressor's piping system is composed of stainless steel pipes, metal-flex hoses and elastomeric face seals to prevent leaks. The piping system is also configured to minimize the adverse affects of vibration, including loosening of connections, unwanted flexing in joints, air leaks and extreme noises.

Along with the V-Shield technology, the 37-45 kW compressor comes in fixed-speed or Nirvana Variable-Speed Drive (VSD) options. Fixed-speed units are best suited for constant-demand systems; VSD units increase the efficiency of variable-demand applications. The VSD compressor is also equipped with a Hybrid Permanent Magnet motor — the highest-efficiency motor available from Ingersoll Rand — to increase energy savings.

The R-Series compressor is manufactured with a sequential cooling system for added operating efficiency. Independently mounted coolers reduce thermal stress, decrease discharge temperatures and lower the energy required to remove condensation in downstream air treatment. As a result, the compressor produces dryer air more cost effectively.

Coupled with the sequential cooling system, the compressor's Progressive Adaptive Control (PAC) continuously monitors filtration and temperatures. This control technology defines operating parameters and eliminates moisture build-up that can damage internal components of the compressor and result in unexpected downtime.

The integrated Total Air System (TAS) previously introduced on the 55-75kW Ingersoll Rand R-Series compressors is available on the 37-45 kW units. The TAS combines the dryer and filtration systems into a single package which eliminates air leaks in the piping between units and results in better flow efficiency.

The R-Series compressor relies on the Xe-Series controller to continuously monitor vital system data and automatically adjusts to stay within key operating parameters, preventing damage and unexpected downtime. The Xe-Series controller has real-time electronic maintenance indicators and changes the fan speed according to ambient temperature to reduce noise and optimize

energy use. The web-enabled control system allows plant managers to remotely access vital compressor data via the internet by a computer or mobile device with standard web browsers for quicker response times.

For more information about the R-Series Contact-Cooled Rotary Screw Air Compressor,
Ingersoll Rand
www.ingersollrandproducts.com/air

RESOURCES FOR ENERGY ENGINEERS

TECHNOLOGY PICKS

New Generation BOGE S Series

The BOGE-built S series sets standards for efficient and reliable compressed air production and is used in many sectors of industry. The compressed air specialists have now further enhanced their range of screw compressors. While retaining the proven quality, it has been possible to significantly optimize the efficiency, smooth running properties and sound level.

BOGE effilence for maximum compressed air delivery

The new generation S series uses the most efficient air end ever incorporated by BOGE — the BOGE effilence. Included as standard in every compressor in the S-3 series, BOGE's effilence contributes to the increased air delivery and enhanced efficiency achieved by the new compressor generation. Its innovative rotor profile geometry, smooth rolling properties, optimized configuration of performance ranges, low performance losses and high volumetric efficiency are further hallmarks of its quality. Its efficient compression *(efficiency)* and quiet operation *(silence)* give BOGE effilence its name.

The new 5:6 screw profile of the rotors (five main rotor teeth and six secondary rotor teeth) makes for low differential pressure between the chambers and so a minimum loss of volume flow. The small radius of the secondary rotor teeth means that the blow hole is as small as possible, thus ensuring high air end efficiency. The optimized speed is significantly lower than in previous air ends. The resulting reduction in splashing losses enhances efficiency and extends the life of the air end. Thanks to the wind tunnel-designed fan unit and the reduced air end speed, the BOGE S-3 series is quieter than ever. A noise reduction of up to 12 decibels is achieved.

Premium quality for long life

With this array of technical innovations, compressed air users will benefit from the proven quality of one of the most reliable screw compressors on the market. To ensure maximum efficiency and service life, the three key areas of BOGE screw compressors — the electronic unit and drive, the compressor and the self-sufficient cooling system with a separate fan — are positioned along the main cooling airflow. Every component can be easily accessed. All maintenance work can be carried out in no time from just one side, without the need to dismantle any components. This keeps maintenance costs to a minimum. The compressor control in its standard version uses the comfortable and easily accessible FOCUS control which provides numerous monitoring and control features.

BOGE SYPREM S for maximum performance

Customers purchasing a compressor from the new S-3 series benefit from the added bonus of a first filling with BOGE SYPREM S premium oil. This is a fully synthetic coolant and lubricant which substantially increases the life of the air end and filter medium through reducing the residual oil content. Being thermally stable and resistant to oxidation, it cools the compressor thanks to its excellent heat dissipation. SYPREM S is designed to reduce friction and wear, resulting in significantly reduced maintenance hours and costs for users.

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TECHNOLOGY PICKS

Michells' High Precision Chilled Mirror Hygrometer Improves Engine Test Stand Operation

The Michell Optidew chilled mirror hygrometer is now available to assure precise humidity and temperature intake air control on some of the world's highest quality engine test stands. Humidity and temperature are important combustion air control parameters for evaluation of heavy duty, passenger, commercial, marine, high performance and fuel cell engines using traditional or alternative fuels.

The Michell Optidew offers a wide measurement range from 0.5% to 100% relative humidity at ambient temperature. For elevated temperature testing, the Optidew is capable of operating up to 130°C environmental temperature.

The Optidew hygrometer is based on the fundamental, optical dew point measurement principle for precise, long term drift free performance. The hygrometer's Dynamic Contamination Correction (DCC) system automatically eliminates the effects of particulate contamination in the sensor.

The Optidew's humidity sensor can be located remotely, up to 820 feet away from the meter body. Its humidity output can be connected directly to a data acquisition system. The sensor uses a corrosion resistant gold plated mirror while the meter enclosure is rated NEMA 4X weatherproof.

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THE MARKETPLACE

JOBS

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Contact Cheryl Kiker at aicd@aicd.org or visit www.aicd.org

A.I.C.D.

Sustainable Energy Savings with Compressed Air Best Practices®

Compressed Air Best Practices® is a technical magazine dedicated to discovering **Energy Savings** in compressed air systems. Each edition outlines **Best Practice System Assessments** for industrial compressed air users — particularly those **managing energy costs in multi-factory companies.**

"Retrofitting the 8 case packing machines with 3-position valves reduced our idle cfm from 80 to 15 cfm – on each case packer. With the right air compressor controls allowing the electric motors to turn down, the annual energy savings from one case packer paid for the whole project."

– Gregory Rhames, Asset Reliability Manager/Site Energy Manager, Verallia Glass, Jan/Feb 2012 Edition of Compressed Air Best Practices®

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Tel: 412-980-9901

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A Publication of: Smith Onandia Communications LLC
217 Deer Meadow Drive
Pittsburgh, PA 15241

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THE MARKETPLACE

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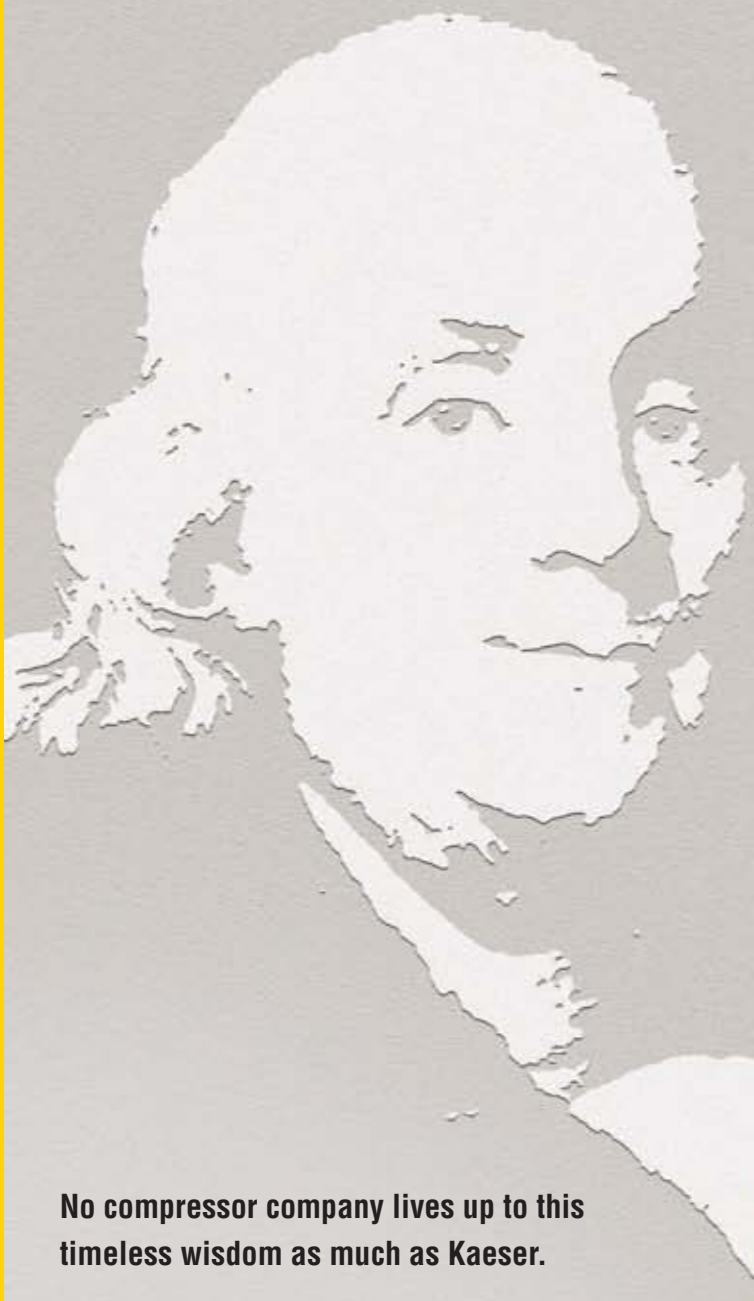

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