MAINTENANCE TECHNOLOGY

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Powering up for the new year. . .

Impacting Energy And The Environment Through Compressed Air Leak Management

Leaking compressed air systems can be some of the biggest energy hogs in industrial operations. Proper monitoring and maintenance of these systems should be one of your top priorities.

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Fig. 1. Maintenance foreman Randy Treadway, of the AFG Industries plant, Greenland, TN, recently was certified in Ultrasonic Analysis by SDT North America. Here he demonstrates the use of the SDT 170MD to detect air leaks.

Compared to water, electricity and gas, pneumatic processes are a necessary utility and an important source of converted energy. In use well before the beginning of the Industrial Revolution, pneumatics derive their name from the Greek word "pneumatikos," which translates as "coming from the wind." In today's modern industrial operations few processes rank higher in terms of importance than compressed air, and no process places a higher demand on energy consumption. As a key utility, its uses include running machinery, conveyance in handling systems and switching for instrumentation and electrical systems, among others.Unfortunately, energy demand is negatively impacted when poor compressed air maintenance practices allow inefficiencies to spiral out of control-with the single biggest culprit coming in the form of system leaks.

Calculating your compressed air investment

Today's compressed air systems are clearly more complex than those from ancient times and (let us hope) far more efficient. Fig. 2. shows a simple breakdown of the typical investment a company would need to make for a simple compressed air system. As this chart reveals, energy accounts for as much as 75% of the total system cost. That's a rather surprising statistic, as conventional logic would have us believe that upfront capital costs and ongoing maintenance costs should dominate.

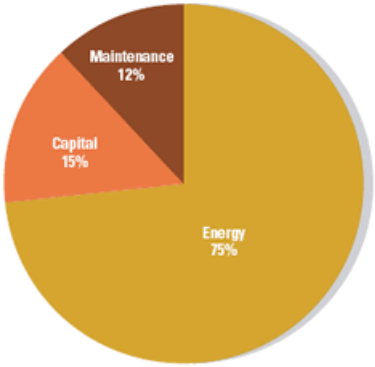

Fig. 2. Breakdown of a typical compressed air system investment

True, capital costs for compressors and delivery systems are significant, but they are not ongoing. If a system is specified correctly and maintained well over time, its capital costs can be depreciated.Yet, a poorly maintained and leaking system will never fulfill demand, continually drain resources and have a negative impact on energy. Furthermore, an inefficient energy-wasting compressed air system hurts our environment

through additional and unnecessary greenhouse gas emissions.

The true cost of leak complacency

The fact that we don't always think of compressed air in terms of energy consumption explains why, even now, so little attention typically is given to finding and fixing leaks in these systems. Such leaks, however, are expensive–very, very.

According to the U.S. Department of Energy, average systems waste between 25% and 35% of their air to leaks alone. In a 1,000 SCFM system, a 30% leakage translates into 300 SCFM. Eliminating that type of leak is equivalent to saving more than $45,000 annually. (Note: depending on where your plant is located and your region's energy costs, the amount saved can be three to four times higher!)

Getting to the core of the problem

A better understanding of leak complacency is needed if we are to get to the core of the problem.Why do some companies pay so much attention to energy-efficient lighting, yet continue to ignore their vastly inefficient compressed air systems? One explanation is that unlike lighting, compressed air leaks are not seen. Another explanation is rooted in how we were raised.Most of us grew up listening to our parents tell us to "turn off the lights," so our interest in lighting efficiency was ingrained early and reinforced regularly. On the other hand, while some of us might vaguely recall airlines in our fathers'workshops, most parents probably never said much about leaks.

In the factory setting, a steam leak is obvious and an oil leak even more so.Air leaks, however, don't create a visible plume, nor do they make a dangerous and slippery mess on the floor.They don't have an unpleasant odor and, for the most part, we simply ignore (or can't hear) their continual hissing. Is this merely a case of "out of sight, out of mind?" Is energy waste/system inefficiency still too low a priority for manufacturers? Could it be that compressed air is a background process taken for granted?

Consider your compressed air system and all the areas where pneumatics are employed at your facility. Expand your thinking beyond the factory walls—compressed air makes possible so many things in science, technology and everyday living. From the jackhammers for road repairs to the drills in your dentist's office; from the tires that roll you to and from work, school and play, to your children's inflated footballs and basketballs , compressed air is all around you. And, yes, you take it for granted.

Dual challenge and dual opportunity

A culture change finally is occurring where it's needed most–the industrial sector–and it's not a minute too soon. Industry is the biggest consumer of compressed air, therefore it represents the area of largest potential gain. In effect, we're faced with a dual challenge and a dual opportunity.

- ***The challenge is to invest in more efficient energy-and environmentallyconscious practices.***
- ***The opportunity is to improve profitability and slow the effects of global warming.***

We have an insatiable thirst for electricity and the fossil fuels necessary to quench it are being used up at rates we can't afford. The diminishing supply of non-renewable fuel sources and the effect that increased levels of CO2 have on global climate change concern everyone on the planet.Dwindling fossil fuel supplies mean that we will be faced with continued higher energy costs for decades to come. Global climate change, however, represents something much more expensive.

Taking a proactive approach

Not all companies are sitting idly by waiting for others to take action. Many have already begun programs that address energy efficiency and specifically target the compressed air system.

AFG Glass is one company that is taking this type of proactive approach.The second largest flat glass manufacturer in North America, AFG is the largest supplier to the construction and specialty glass market. Founded in 1978, the company is headquartered in Kingsport, TN.With its three divisions, it is a fully integrated supplier.One AFG division is responsible for flat glass manufacturing; another for advanced energy efficient coatings; a third fabrication division adds value to its finished product through tempering, laminating and insulating.

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In total, AFG has nine glass production operations, 34 fabrication/distribution centers, four sputter coating lines, five insulating plants and one laminating facility. The company has more than 4,800 employees working in its North American operations.

Some of AFG's manufacturing divisions implemented airborne ultrasound programs in 2006. Ultrasound had been considered primarily because of its reputation as an overall predictive maintenance and troubleshooting tool. But, when several of the company's technicians later attended ultrasound certification training, they learned that the technology they had invested in could be used for much more than troubleshooting.

How ultrasound works

Ultrasonic leak detectors work like simple microphones that are sensitive to high-frequency sounds ranging beyond the human ear. Early detectors enabled users to hear problems with machinery on the factory floor, regardless of background noise. As the technology has grown, though, so has its form and function.

Today's ultrasound detectors can be simple leak detectors or advanced data collectors capable of trending and diagnosing machine failures and plant inefficiencies. The technology utilitizes a sensitive piezoelectric crystal element as a sensing element. Small high-frequency sound waves excite or "flex" the crystal, creating an electrical pulse that is amplified and then translated into an audible frequency that an ultrasound inspector can hear through high-quality noise attenuating headphones.

As a leak passes from a high pressure to a low pressure, it creates turbulence. The turbulence generates a high-frequency sound component that's detected by the crystal element. Higher frequency sounds are directional by nature.By detecting only the ultrasound component of a turbulent leak, the technician is able to quickly guide the instrument to the loudest point and pinpoint the problem.

A typical compressed air system can be surveyed for leaks in one or two days. Larger plants may take longer, but the benefits of finding and fixing leaks are well worth the investment in time.

Several ultrasonic detectors use parabolic reflectors or elliptical reflectors to enhance and concentrate the leak signal–which can be useful when detecting small leaks or scanning at a great distance. Imagine scanning all the overhead piping in your facility without ever again having to climb a ladder or scissor lift. Parabolic accessories associated with ultrasonic technology can be a key element in enhanced productivity and operator safety.

AFG success

Douglas Bowker is the plant maintenance superintendent at AFG Industries' Greenland, TN, operations. He has been instrumental in the implementation of ultrasound testing to improve the well being of his site's equipment.

"Compressed air is not free," notes Bowker. "It costs Greenland approximately $137,000 per year to supply compressed air to the plant. Air leaks, therefore, cost us money. A small leak that is undetected by the human ear can typically contribute to $3,000 of cost per year. The ultrasonic equipment can now be utilized in a cost saving manner to detect such leaks and fix them proactively."

Bowker points out that ultrasonic technology allowed an air leak the size of a pinhole to be detected from a distance of 40 feet. In addition,AFG technicians can detect natural gas, nitrogen and hydrogen leaks. They're also finding that their ultrasound equipment is useful in detecting leaky or malfunctioning valves and helping determine flow in pipelines from a distance.

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(EDITOR'S NOTE: AFG Industries is in the early stages of its compressed air efficiency journey. We'll be checking back with this proactive company in 2007 to learn about other ultrasound wins at its Greenland, TN facility.)