Plant Services

Quincy COMPRESSOR

What you don't know about vacuum systems could cost you

What's your air compressor control strategy?

If you don't know, then there are likely problems with your system efficiency.

Ron Marshall, Certified Engineering Technologist

Compressed air is a costly energy source for the tools and equipment your plant, and it should be produced and used wisely. The typical power conversion ratio of an air compressor is eight units of energy in for every one unit of energy out, but this is achieved only with very good compressor control. If your compressors are poorly controlled, this ratio can more than double.

So what is your compressor control strategy? If you don't know, then there are likely problems with your system efficiency. So often the compressors are installed and just left at the factory default settings or have the settings determined by the maintenance service personnel.

What's the problem with that? Well, the people determining your strategy may have other priorities. They may benefit if your compressors run longer and require more maintenance. A poorly thought-out compressor control strategy usually results in plant pressures that are higher than needed, air compressors that are running longer than required, and system configuration missing valuable components, such as storage receivers.

The planning for the control strategy should start when the compressors are purchased. Typically, compressors are purchased in a bid process in which one vendor is competing against another. This often results in vendors offering lower-price options with valuable energy-savings features missing so they don't lose the sale. If there is a choice, often a lower-quality, less-efficient compressor may be offered rather than a premium efficiency model. Perhaps little or no storage receiver capacity might be offered, dooming the compressor to lower efficiency for its lifetime.

When the compressor is installed, the plant operators may leave it up to the installers to set up the unit. Perhaps it is a compressor that is rated at 125 psi, so that's where the unit is set, but this setting may be far higher than is actually needed in the plant. This higher pressure causes more air to flow in the plant and more energy consumption by the compressor. If multiple compressors are installed, it is not uncommon to see the units all set to the same pressure, resulting in the compressors fighting for control and running many wasteful hours in the unloaded condition. Often, too, energy-saving features such as auto-start are not activated, resulting in higher-than-desired compressor-run hours and inefficient compressor operation.

Good control strategy would start with the selection of efficient compressors. The most-efficient compressors would be selected to reduce lifecycle cost by referring to the Compressed Air and Gas Institute (CAGI) data sheets. Large storage would be purchased with the compressors to ensure good compressor operation and connected with properly sized piping to reduce any compressor room restrictions. Efficient components would be selected so that dryers, filters, drains, coolers, pressure regulating valves would all help to reduce the energy costs of the system. Finally, the compressor pressure set points would be selected so that reasonable plant pressures would result. If a single compressor runs feeding partial loads, this compressor should be selected for the best part load efficiency. If multiple compressors must run,

THE PLANNING FOR THE CONTROL STRATEGY SHOULD START WHEN THE COMPRESSORS ARE PURCHASED.

then all the compressors except one should be fully loaded or off. The remaining unit, again, must be the one with the best efficiency. If there are more than three compressors in a system, or if the compressors are located in separate rooms, then an external compressor controller may be required to properly orchestrate the control.

You can get help with this by calling a reputable compressed air service provider, preferably someone who has attended a Compressed Air Challenge level 1 or 2 seminar. Or you might be able to do it yourself. Learn more about compressor control at Compressed Air Challenge's next Fundamentals of Compressed Air Systems seminar. Check out the calendar at www.compressedairchallenge.org. ◻

Ron Marshall is a certified engineering technologist in the province of Manitoba and has received certification as an energy manager, demand side management, and measurement and verification professional through the Association of Energy Engineers. He was the first Canadian participant to qualify as a DOE AIRMaster+ specialist and is involved as a committee member and instructor with the Compressed Air Challenge. Marshall has worked in the industrial compressed air field for 22 years, first as an industrial systems officer for Manitoba Hydro, and currently as owner of a compressed air consulting company. He is also an international consultant with the United Nations Industrial Development Organization and a frequent contributor to Plant Services. Contact him at ronm@mts.net.

What you don't know about vacuum systems could cost you

You've optimized your compressed air system, but have you taken the time to understand your vacuum system?

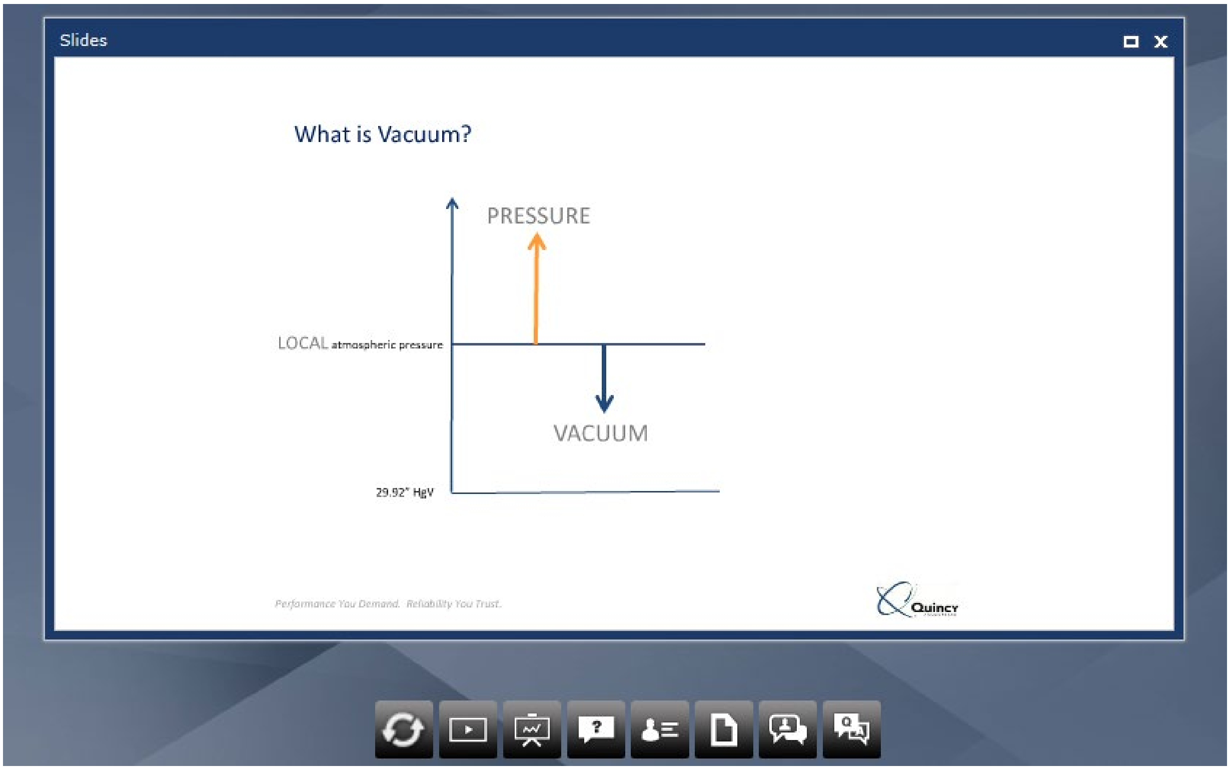
◻ Vacuum is an important, but often underappreciated, component of most manufacturing facilities. If you find the whole idea of vacuum systems confusing, you're not alone. With its strange pressure scales and varying flow rates, vacuum is often misunderstood and neglected.

In a recent Plant Services webinar, Darren Cartney, vacuum business line manager for Quincy Compressor, explored myths about industrial vacuum systems that can be expensive and troublesome for maintenance and production. The unintended consequences of falling for one or more of these myths can range from higher electric consumption to increased capital investment or unplanned maintenance.

MYTH #1: I NEED 29.9"HGV

Over time, 29.9"HgV has become more of a generic term than an actual measurement. You could even liken it to the relationship between Kleenex and facial tissues. People often use the phrase '29.9"HgV' instead of really thinking about what is needed in their facilities. They strive to achieve the best possible vacuum, believing that it will provide the best results. Generally, at 29.9"HgV, ultimate vacuum is achieved, or the deepest vacuum that that particular unit or technology can attain.

According to Darren Cartney: "When the vacuum pump reaches its ultimate vacuum, it is creating no flow. It is drawn down as deep as it can be, flowing no more air at that time. What could be causing that? It's often going to be to leakage, tolerances, and limitations of the technology or design. For



example, a vane vacuum that can get down to 29.9"HgV does not mean that all vane vacuums can get to 29.9"HgV or cannot go lower; it just means that that is the specific design of that unit."

MYTH #2: LEAKS DO NOT IMPACT MY VACUUM SYSTEM

Leaks have a huge impact on vacuum systems. Vacuum has a very limited pressure band to work with, so pressure issues are magnified intensely. For example, vacuums at sea level only have 14.7psi to work with. This can be a very difficult thing to overcome.

According to Darren Cartney: "Pressure drops also need to be examined when addressing leakage because drops will amplify any leakage that you may have. A certain amount of leakage will not affect your system, but in many larger centralized systems, drops might not be a huge deal until you add in leakage. Almost every vacuum system in the world is going to have some level of leakage. Hopefully, the leakage is small enough that the system can overcome it, but pressure drops can greatly impact the vacuum flow."

MYTH #3: STORAGE IS REQUIRED

In some scenarios, this myth might be true, but only in cases dictated by local code. Storage can be helpful but cannot be relied upon to overcome undersized systems.

According to Darren Cartney: "With compressed air, the user has a 15% differential pressure, meaning that we often run our compressors at 10 to 15 PSI higher than the actual requirement. This allows us to build a great amount of storage. But then when we move into vacuum, our entire pressure range is at 14.7psi at sea level. If an application needs 27"HgV, then we can only go from 27 to 29. That only leaves about 1 PSI as the pressure differential. Although storage can be effective, it can be very costly and not always a good alternative like it is in compressed air systems."

To learn more about all five myths, watch the on-demand webinar: http://info.plantservices.com/quincy-the_5-myths-of-vacuum-systems-2017-ca