Plant Services

Quincy COMPRESSOR

# Installing variable-speed drives in extreme environments

# *How good is your* compressed air EnMS?

As with most systems around a busy industrial plant, items that are deemed the most important get measured and tracked. I'm frequently amazed by strict corporate purchasing policies that keep a tab on even the smallest items such as pencils and paper clips, implemented to prevent sticky fingers from costing the company a few pennies a day, yet the same companies let their compressed air systems run unmeasured, unwittingly wasting thousands of dollars in lost profits.

Most plant personnel have no idea how much their compressed air systems cost to operate, and they don't know whether the compressors are producing compressed air at top efficiency. Also, very few track their plant compressed air leakage and waste. Often, tracking a few key performance indicators (KPIs) will make all the difference in helping to encourage positive change, which will lead to efficiency improvements and savings.

The key is to implement an energy management system (EnMS) to track important system parameters, such as specific power (kW per 100 cfm) and energy consumption (kWh). Perhaps some measurement of leakage can be done during nonproduction hours, too, with repair efforts initiated when unacceptable levels are found. These measurements typically surprise compressed air system operators. For example, it's shocking to learn that your system might be consuming double the normal consumption in power per unit of compressed air output and wasting half of the air produced through excessive leaks. On some systems, the power consumed can be 10 times what would be expected, with leakage levels in the high-80-percent range. Are you in this category? If you are not measuring, who knows?

Most people imagine an energy management system as being expensive and complicated, but this doesn't have to be true. Yes, best practices would dictate that a world-class industrial plant have energy, pressure, flow, and dew point tracked and analyzed by a permanent continuous monitoring system, and yes, the installation of such a system takes some funds. But an adequate monitoring system can consist simply of a log book, a calculator, and a stopwatch (like the one on your phone). Using the compressor hour meters, average compressor power and flow output can be roughly estimated, from which system efficiency and total power consumption can be tracked. And conducting timer tests of compressor duty during nonproduction hours can help you estimate and track leaks. Weekly recording of these parameters can help you see how your system is doing and identify whether any change occurs due to system failures. This tracking can also help you assess the value of your leakage reduction efforts.

If you are interested, more information on how to track compressor key performance indicators for an energy management system can be obtained by referring to Canadian Standards document C837-16 - Monitoring and energy performance measurements of compressed air systems.

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Before retiring in 2016, Ron Marshall was the industrial compressed air systems expert at Manitoba Hydro, where he worked for 38 years. His efforts supported the organization's Power Smart Performance Optimization Program, and he now operates his own compressed air energy efficiency consulting firm and is a member of the project development committee at the Compressed Air Challenge. Contact him at ronm@mts.net.

# *Installing variable-speed drives* in extreme environments

Improve the energy efficiency of your compressed air system, even in tough applications.

One of the challenges of operating a compressed air system is ensuring the reliable application of variable-speed drives (VSDs) in harsh or extreme environments. But with the right technology and the right know-how, you can overcome these obstacles.

In a recent Plant Services webinar, Scott Barker, business line director – rotaries and QAS for Quincy Compressor, offered these tips on how VSD air compressor technology can enable reliable compressor operation in harsh and extreme environments.

### CONTROLS OPTIONS FOR EXTREME ENVIRONMENTS

For fixed-speed applications, the big control modes are load/unload, modulation, and geometry control. These options can be used in extreme, dirty, outdoors, and tough environments. Usually, these modes are paired electrically with a totally enclosed, fan-cooled motor and a NEMA 4 or 4X enclosure to protect against moisture, dust, and dirt. Depending on the installation, whether it's completely exposed outdoors or a sub-zero environment, you can provide additional heat tracing, space heaters, rain hoods, etc. based on the environmental needs.

### LOAD/UNLOAD CONTROLS

Load/unload controls operate at 0% or 100% capacity, either opening or closing the inlet. This option can be efficient if you apply enough storage, but to be extremely efficient, you need 10 gallons per CFM. Finding that much space can be very difficult, and it is not always cost effective on larger systems to apply that much storage.

### INLET MODULATION

Inlet modulation restricts the inlet, allowing the unit to run steady instead of excessively loading and unloading. With this method, you don't have a lot of storage, but it is not as energy efficient. For example, if you have 81% capacity, you're probably pulling 96% power.

### CAPACITY CONTROL

One example of capacity control is lift valves. Lift valves are a type of variable capacity, and they simulate shortening the length of the rotor. When you shorten the stroke, you reduce the power requirement. This option is extremely popular in tough environments because it's easily paired with TEFC, NEMA 4 and package modifications. From an energy standpoint, geometry control or variable capacity is excellent. It almost has a one-to-one ratio, with 81% capacity pulling 83% power.

### VSDs

VSDs, on the other hand, have better turndown than the previously mentioned control options. They're generally tracked, not necessarily on a one-to-one ratio, but very close when comparing consumption versus power. VSDs offer inherent soft starts and stops, and they are not likely to have a significant inrush demand spike. There's also a range of pressure that is available for variable-speed drives.

### VSDs IN EXTREME ENVIRONMENTS

Customers are constantly install-

ing NEMA 1 standard VSDs in tough environments and experiencing issues. They mistakenly believe that the air compressor can handle it. The high demand for energy savings is driving customers to purchase, install, and run equipment, quite often, outside of its designed environment, outside of where it was intended to operate. This results in machine failures, downtime and frustrated customers because it's not the right machine for the right application.

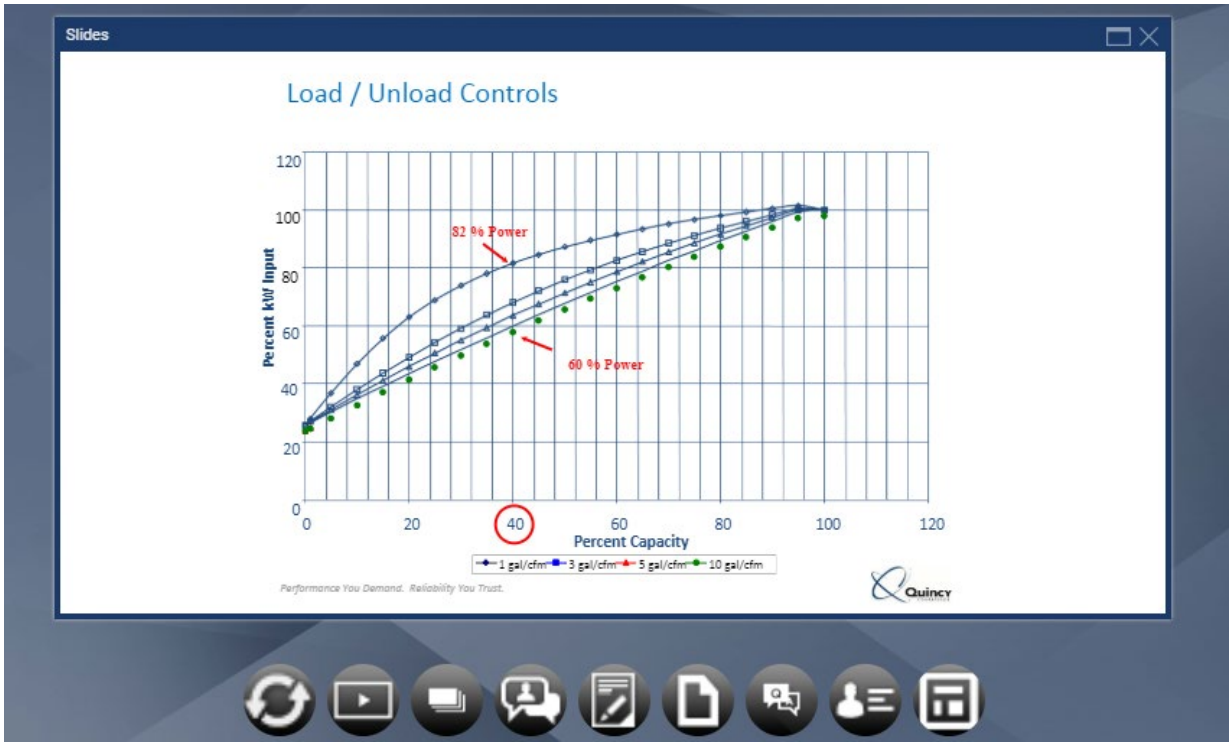
What issues do you have to look for when installing a variable-speed drive with a NEMA 4 enclosure in a tough environment?

- Temperature - If you're using a NEMA 4 enclosure, that means everything is locked tight, trapping in all of that heat.
- Environmental - You need to protect the drive and all of the electronics from the environment, whether that's avoiding clogged filters, dealing with moisture, or combating conductive dust.

**NEW INDUSTRIAL SOLUTIONS**

One solution that's becoming very popular is a through-the-wall mounted drive, which removes the unwanted heat from the very beginning. That means about 85% of the drive heat that's generally produced in an air compressor is automatically outside of the enclosure. You can use a cabinet cooling system or a cold air distribution kit and controls to deal with the remaining 15%.

You will also need some type of official certification or proof that the drive has passed the necessary test to stand up in the extreme environment. So what you end up having is a variable-speed drive designed to go into a NEMA 4 enclosure with the correct flange and sealing gaskets, etc. paired with some supplemental cooling system so that it can survive and thrive in a NEMA 4 environment. ☐




**TO LEARN MORE ABOUT VSDs, WATCH THE ON-DEMAND WEBINAR.**

https://info.plantservices.com/webinar-2018-vsd-air-compressors_ca