Innovation in today's pumping technology

Improving system performance, reducing energy consumption and meeting regulatory requirements remain the three biggest challenges facing today's pumping industries. A recent international webinar hosted by Nicole George, product manager at Eaton, explored some modern technologies to help address these challenges easily, effectively and quickly.

The pumping industry is growing. "It is not a small market sector and spans many industries from utilities to mining and metals, oil and gas, buildings and agriculture to name a few. In the US alone it was just shy of a $8 billion industry last year," says George.

There are, however, some real challenges that impact on the opportunities the industry might present.

"Around the world pumping industries are battling with high energy costs," says George. "Water facilities account for up to 40% of a city's energy usage. Another market trend we are seeing is the challenge of dealing with aging infrastructure while more pump users are under pressure to find ways to protect their equipment more efficiently."

She says research has indicated that while pump applications might vary these challenges are remarkably the same across industries.

"Pumps and systems are not inexpensive and so much effort and resources are going into keeping this equipment running."

According to a study by the American department of energy 30 – 50% of energy consumed by pumping systems could be saved through effective equipment and/or control systems.

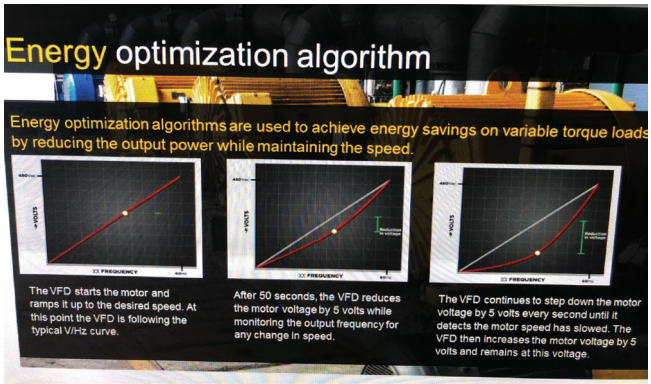
"It's a pretty staggering number," says George who states that energy optimization algorithms are increasingly being used to achieve energy savings on variable torque loads by reducing the output power while maintaining the speed.

"So, assume there are 20 motors (230V, 0,16A) operating at 30 Hz for the majority of the run time. If the motors run eight hours a day, five days a week for 50 weeks out of the year, one could save approximately $3 450 annually through energy optimization algorithms."

This is because as the motor voltage decreases, the motor current also decreases in proportion to the voltage.

"The end result is an optimized state in which both voltage and current are at the lowest possible values to maintain the required speed," she says. "We are seeing customers who are saving anything between 2 and 10% without changing any other systems or features on their pump systems, but only introducing energy optimization algorithms."

She says it is all about maximizing up time.

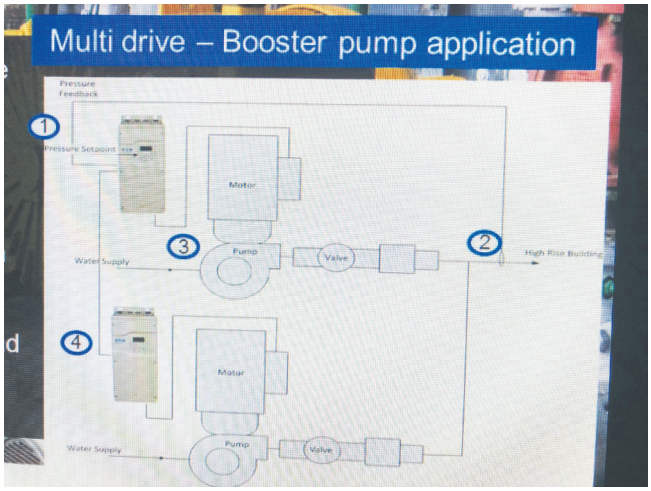


According to the American Society of Civil Engineers the useful life of electrical components in a treatment plant is about 15 to 20 years.

"But unexpected things happen, failures occur and one does not always capture the whole lifespan," says George. "More often than not aspects of Variable Frequency Drive (VFD) such as these algorithms are being used to maximize equipment and gain on infrastructure lifespan. Even leveraging just one year extra for a pump can make a major difference."

Another way to save energy is introducing a multi-pump function to operations.

"It is used in process applications where multiple pumps or fans are used to maintain pressure or flow," explains George. "A single proportional-integral-derivative (PID) loop in the VFD is used to maintain a process set point. If a single pump or fan is not able to meet the demand, additional fans or pumps are used to boost the system. Two types of multi-pump controls are available – a single



drive which is effectively one VFD used with one motor or a multi drive where each motor has a VFD."

George says the multi-pump function is an external control system that provides cube feet per minute set point to VFD. "Pressure feedback measures the air flow and VFD adjusts the speed of the fan motor to maintain the desired CFM. "

Protect pumping systems

Another industry challenge currently being seen around the world is preventative maintenance, says George.

"Maximizing uptime and protecting equipment is crucial for operations. Achieving energy saving and reducing maintenance and repair possibly are the best opportunities for improving pump systems," she says. "Critical systems components require proactive maintenance such as impeller inspections and pipe cleaning."

One way VFD can protect a pump is when it comes to deadhead and dry run protection.

One can also protect the fan motor with broken belt protection or protect the contents and people in a building with fire mode.

"Deadhead is a condition where the system pressure (head) exceeds the pressure the pump is able to produce," explains George. "Water is unable to leave the pump circulating inside the impeller generating heat and damaging the pump. VFD detects this without sensors and automatically shuts down the pump for inspection."

VFD can also cut off pumps or slow pumps down in cases of loss of prime or dry well, says George.

"This is primarily used with well pumps. It compares current draw or torque at speed variables for significant changes. If the torque drops off or is erratic, no water is running through the propeller. The pump is then cut off or slowed own to allow the water level to rise."

George says ultimately VFD has the features built in to improve efficiency and reliability of pumping systems ultimately saving costs and addressing many of the challenges industry face.

Nicole George, Eaton, www.eaton.com