Selecting the Right Metering Pump

A search for technology to increase system accuracy, reduce maintenance costs, and enhance an advanced SCADA system led a Rancho Cucamonga, Calif., utility to replace its diaphragm-type pumps and gas–chlorine injection system with peristaltic pumps. **BY BILL McDOWELL**

BUILT IN 1989, the 60-mgd Lloyd Michael Treatment Plant (LMTP) in Rancho Cucamonga, Calif., treats raw water from the California Aqueduct system to provide drinking water for a multicity service area. In November 2012, the Cucamonga Valley Water District began upgrading the plant to enhance treatment processes and comply with new federal water quality standards. The upgrade is expected to be completed by spring 2014.

As part of the upgrade, the anionic and cationic polymer, ferric chloride 43 percent, sodium hydroxide 50 percent, and gas–chlorine chemical-feed systems will be replaced. Jerry Griffith, plant mechanic, began looking for new technologies to increase each system's accuracy, reduce maintenance costs, and integrate operations into an advanced supervisory control and data acquisition (SCADA) system.

Jerry Griffith, plant mechanic, makes an adjustment to the chemical injection manifold at the main line.

EXISTING PROBLEMS

The plant's diaphragm pumps and gas–chlorine injection system had a variety of problems that needed to be reduced or eliminated during the upgrade. Challenges included system maintenance, chemical-metering accuracy, ease of use, SCADA system requirements, system flexibility for emergency operations, and limited space requirements.

The pulsating diaphragm pumps required frequent adjustments and maintenance. "They always needed cleaning, the oil needed to be replaced frequently, and the stroke length needed to be adjusted manually," said Griffith.

The pulsating diaphragm pumps were also hard on the piping system, causing occasional leaks. Piping and ancillary components, such as pulsation dampeners, calibration columns, and pressure-regulator valves, also required additional maintenance and floor space and made the system more complex. In addition, the diaphragm pumps weren't providing much information to the SCADA system.

As part of the upgrade, the gas–chlorine injection system will be replaced with a liquid chlorine and ultraviolet (UV) system.

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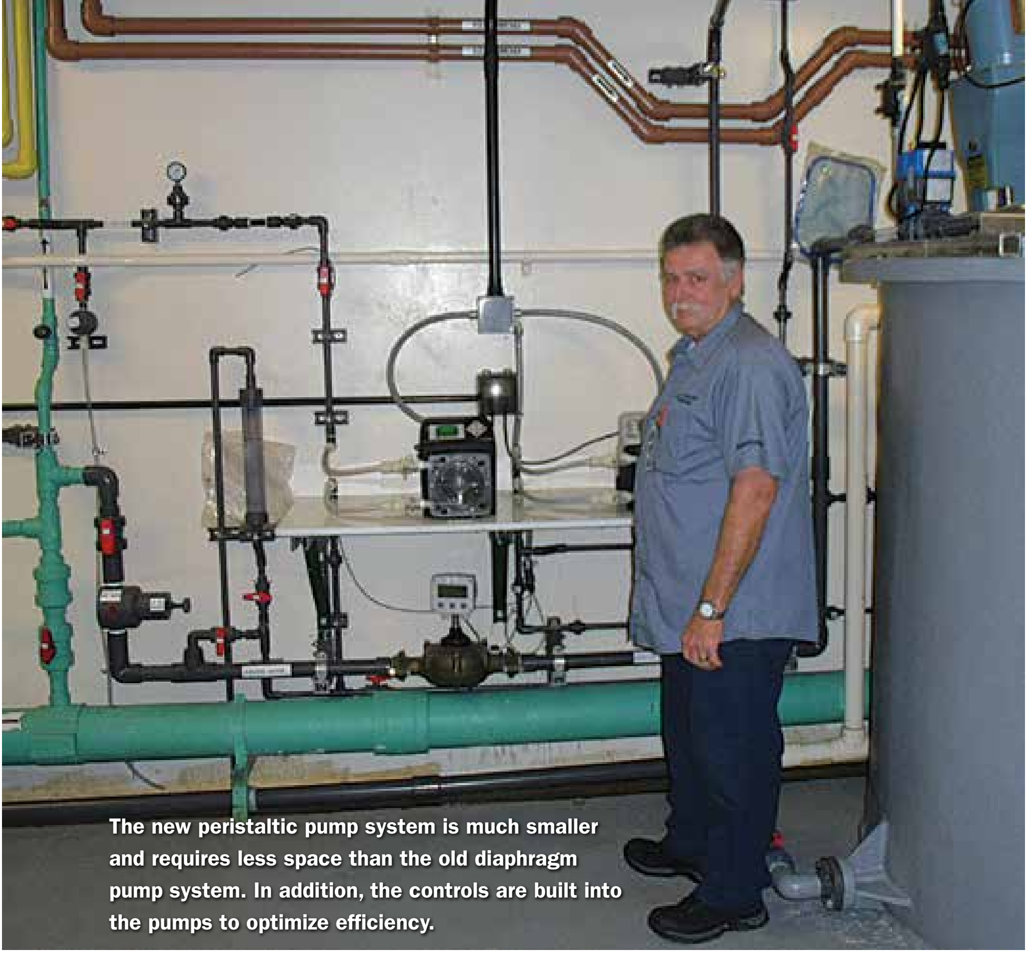
The new peristaltic pump system is much smaller and requires less space than the old diaphragm pump system. In addition, the controls are built into the pumps to optimize efficiency.

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The gas system is expensive to maintain, costing $10,000 per year for scrubber and injector cleaning and maintenance. Using lower-concentration liquid chlorine and UV technology will help the plant maintain lower trihalomethane (THM) levels. The new liquid chlorine system, which uses peristaltic pumps, will be installed in the chemical room. When the gas–chlorine system is removed, the area will be transformed into a much-needed workshop.

CHOOSING THE RIGHT CHEMICAL PUMP

After reviewing and testing various types of pumps on the market, LMTP personnel chose peristaltic-style metering pumps to replace the diaphragm pumps in all applications, including gas–chlorine injection, for several reasons.

Low Maintenance. Although peristaltic pumps require periodic tube changing, such maintenance is predictable and inexpensive. For example, Griffith replaces the pump-tube assembly of the new anionic polymer system every six months, regardless of wear.

Ease of Use. The peristaltic pump is easy to use, and the pump-tube assemblies can be replaced quickly and easily. In addition, the menu-driven software and display allow operators to quickly adjust the pump's many electronic features.

Higher Accuracy. Even when pumping high-viscosity polymers, the peristaltic pumps are accurate to within about 3 percent over their operating output range and over the life of the tube. The SCADA system can easily set and maintain 1 ppm without requiring operators to make manual adjustments.

SCADA Ready. The peristaltic pumps communicate with the SCADA system better than the diaphragm pumps did. Now more process information is available to the SCADA system, including multiple alarm outputs and output volume data. In addition, the system can react more quickly to commands, such as a quick shutdown of the system. The highly automated plant is monitored and controlled in real time using handheld devices. Rob Hills, water treatment superintendent, can now access and control anything in the plant with his smart phone or personal digital assistant.

Flexibility. The peristaltic pumps are self-contained. The motor and controller are located inside the pump enclosure for portability. The pump's small size and light weight allow operators to move the pump to a remote location if treatment is required at a different injection point. For example, if a system failure requires a particular section of pipe to be shutdown, the pump can be relocated as required and run manually to prevent plant shutdown. With the San Andreas Fault less than a mile away, LMTP operators are alert to potential damage to piping systems from earthquake activity. They try to maintain as much system flexibility as possible.

Space Requirements. The peristaltic pumps occupy a smaller footprint, further increasing efficiency in the chemical room and reducing maintenance. The entire gas chlorination system will be replaced by peristaltic pumps and relocated to the chemical room with the other systems.

Quiet Operation. The new peristaltic pumps produce significantly less noise in the chemical room. Operators didn't realize how loud the diaphragm pumps were until they were gone, according to Griffith. Less noise helps reduce the stress of working in the chemical room for extended periods.

Consistency. With the features and capabilities to handle all applications, the peristaltic pumps reduce the complexity and amount of operator training required as well as the number of spare parts necessary for system maintenance.

Customization. Custom designed by LMTP staff, the new anionic and cationic polymer, ferric chloride, and sodium hydroxide chemical systems feature

- custom-built, easy-access polyethylene pump mounting tables with quick-release pump mounting brackets.
- a plastic texture-coated flooring grate system over the containment area.
- a below-grate flushing pipe system.
- quick-release polyvinylidene fluoride cam-lock inlet and outlet pump fittings.

SMOOTH OPERATION

Peristaltic pumping technology has simplified maintenance and helped LMTP personnel function more efficiently, maintain and upgrade plant equipment, and comply with federal water quality standards.