

Control The Flow

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Controlled-volume metering pumps (also known as metering pumps, feed pumps, or dosing pumps) are reciprocating positive displacement pumps typically used for proportional liquid blending or metered single liquid transfer. These pumps need to be able to perform flawlessly, which means highly accurate, repeatable, and adjustable flow rates. Components need to be able to work harmoniously together and system design is critical.

Pumping Accessories

“Metering pump system performance can be improved by the installation of proper accessories,” stresses Jeff Ives, Eastern area sales manager for Milton Roy, a manufacturer of controlled volume pumps and related equipment to handle a variety of fluids. These accessories, critical to pumping system performance, include back pressure valves, pulsation dampeners, calibration cylinders, pressure gauges, and safety relief valves.

“Many installations do not have the necessary differential pressure as chemicals are delivered into open tanks or basins,” says Ives. All metering pumps require differential pressure for accurate flow control throughout the flow turndown range, which a back pressure valve provides. “A back pressure valve is required to provide adequate differential pressure and improve accuracy at all flow settings.”

Pulsating flow is also characteristic of positive displacement pumps and pulsation dampeners, removing a percentage of these pulsations, are required to reduce or eliminate vibrations and movement within the piping system and create a smoother flow. “Chemical delivery into the process can be dramatically improved from ‘slug flow’ delivery to continuous flow delivery,” Ives explains. Pulsation dampeners also allow more stable discharge line pressure gauges and accurate safety relief valve settings, he adds.

The flow can be further controlled via a calibration cylinder, which “reduces time spent trouble shooting metering pump systems and allow many problems to be quickly identified and corrected,” says Ives. “Metering pump flow rate can be verified easily by the installation and use of a simple inexpensive calibration cylinder.” Metering pump valves can be validated without disassembling a calibration cylinder – the liquid level in the cylinder drops with each pump suction stroke. An increase in this liquid level following the discrete drop indicates suction check valve backflow, explains Ives, which is a “simple test that can save hours of trouble shooting time.”

Working Together

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With all of these components playing a critical role in metering pump functions, users need to also take system design into consideration to create a successful operation. "System design is very critical for metering pump installation reliability and ease of trouble shooting," Ives says. "The installation location of each accessory component must be considered for ease of operators and maintenance personnel."

Metering pumps must be located close to their source tank and "an NPSH evaluation using acceleration loss should be conducted," explains Ives. An NPSH evaluation checks that the "proposed" pump installation will provide enough suction pressure for the pump to operate properly. He goes on to explain that the calibration cylinder and pump suction isolation valves should be located no greater than three feet apart, "as calibration checks require both isolation valves to be operated at the same time." The elevation location of a calibration cylinder in relation to the source tank is especially important for use at low tank levels. "It is often more practical to route a line from the pump discharge line and fill the calibration cylinder with fluid pump," he adds. Once full, a calibration check can be conducted. This installation allows the calibration cylinder to be used until the tank is empty, Ives explains, or even in suction lift installations.

When installing dampeners, the recommended distance from the pump discharge connection is 10 to 20 pipe diameters, but they "are often installed too far from the pump," says Ives. It is important to keep in mind that discharge line pulsation dampeners' efficiency and performance declines with increasing distance from the discharge connection.

Other important distances to consider in the pump system are those of back pressure and safety relief valves, which should be "located to allow adjustment." Back pressure valves should be placed to attain the minimum differential pressure requirements while the metering pump is operating at minimum flow. "If the metering pump is operated at maximum flow to set the back pressure valve," Ives explains, "the differential pressure may not be adequate while operating at pump minimum flow." This means that safety relief valves should be located between the pump and the first isolation valve, and back pressure valves should be located between the pump and the first isolation valve. Keeping maintenance in mind, Ives adds, "All valves should be positioned at an elevation from the floor to allow access for adjustment without the use of a ladder."

Valuing Performance

Investing in a quality metering pump system performance means focusing on what is important to the specific application, stresses Ives. Metering pumps, generally in the fractional horsepower range, are not significant energy consumers in most facilities, so the decision often comes down to system value. "Every installation has a relative value placed on the equipment, based on how critical the process is to the use." Initial cost tends to be the buying trend in less critical applications, while reliability and cost of ownership drives the buying decision when the pumping system is viewed as critical to the user's overall process. So, choose components

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wisely that are able to perform, and control the flow.

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