

# Peristaltic Pumps, Diaphragm Pumps, Or Neither? The Basics Of Chemical Feed Solutions

Chemical dosing plays a pivotal role in water and wastewater treatment operations, so selecting the optimal feed system is critical to achieving quality goals and meeting permit requirements. With multiple technologies available, it is important to understand the benefits and downsides of each.

Metering pumps are a proven technology that rely on positive pressure, or displacement, to push chemicals to the point of application. However, the chemicals are constantly pressurized and prone to air locking, as well as spills, without triggering an alarm. Metering pumps also have low turndown rates, so wide feed-rate swings require special arrangements, and they tend to consume a large amount of power. Additionally, this type of equipment needs calibration columns for validation, which is just another point of potential failure.

Automatic liquid vacuum feeders, by comparison, avoid all these issues and have gained wider acceptance as an alternative method for delivering chemicals.

## Diving Into The Technology

There are two types of metering pumps: peristaltic and diaphragm.

Peristaltic pumps are based on alternating compression within tubes, which are the Achilles heel of the equipment. The tubes are prone to



breakage, so in most applications they need to be changed every three months at a cost of \$50 to \$100. When they do break, the tubes can spew chemicals everywhere, thereby creating a safety hazard and wasting chemicals in addition to potentially damaging the pump. Some peristaltic pumps come with a warning system that shuts the pump down when a tube has broken. However, in high-humidity environments the system can trip on its own, so false alarms are common.

Diaphragm pumps are based on a back-and-forth action within chambers, or diaphragms. Because they are “slugging”

chemicals, many of these pumps require pulsation dampeners to reduce the wear and tear on piping. Those dampeners are subject to breaks and, in most cases, there are no alarms available to alert operators, so the machine will just stop feeding the chemicals. Diaphragm pumps are also prone to priming issues. Another potential issue is that manufacturers recommend installation with suction taking place below the pump and then discharge point above the point. In water applications — where big, bulky tanks are involved — that’s not always feasible. Additionally, diaphragm pumps tend to require relatively large amounts of power, and

the annual maintenance kits can run as much as \$1,500.

Automatic liquid vacuum feeders are the alternative to metering pumps. The main component in these systems is an electronic flow sensor that measures the chemical feed rate. Vacuum conditions allow for a safer, more reliable way to feed, while helping to maintain stability, ensuring that over-feed or under-feed conditions are eliminated. Automatic liquid vacuum feeders don't require calibration columns because chemicals are being measured through a flow meter, so the feed is constantly being verified.

The JCS Industries Model 4100 Liquid Vacuum Feeder is an example of this technology. The 4100 offers ease of operation, as feed rates can be seen

through SCADA or the machine's control panel, and its annual maintenance kit is less than \$200.

Another downside to metering pumps is that with a low turndown ratio, typically 10:1, they cannot handle wide swings in the feed rate. For example, a plant that feeds 16 gallons of bleach per day but has an occasional need to feed ½ gallon won't be able to accommodate the lower rate with a pump. This is especially an issue at small to medium municipal facilities.

With a 100:1 turndown ratio, the JCS 4100 offers a solution to the significant turndown demands.

The bottom line is that while metering pumps might be appropriate in some

water and wastewater operations, their limitations and issues can cause disruptions that impact long-term quality goals and the bottom line. With fewer occurrences of failure, and less labor and expense needed for repair, automatic liquid vacuum feeders in many situations can offer lower total lifecycle costs and more consistency.

As a result, water quality managers can have a higher level of confidence in their operations.

By developing safer, highly reliable, and more accurate equipment for chemical dosing, JCS Industries is helping municipalities meet their long-term goal of producing quality water at the lowest possible cost while meeting environmental obligations. ■