

City Expands Use of Advanced Vacuum Feeders to Solve Reliability and Maintenance Problems for WTP Chemical Feeds

Original Deployment for Hypo Successfully Expanded for Phosphoric Acid; Further Deployment for Caustic Now Being Tested



A municipal water quality manager reports that original use of advanced vacuum feeders for application of sodium hypochlorite (hypo), for improved reliability and reduced maintenance costs versus less advanced vacuum feeders, has now been supplemented with their deployment for phosphoric acid feed, replacing metering pumps. Still further application, for caustic feed, is now being tested.

“Feeding phosphoric acid with metering pumps, to add a corrosion inhibitor, was not sufficiently reliable, with the margin of error in feed rate typically at 10%, and the pumps could also become air-bound,” he recalled. “We weren’t losing compliance, but there was loss of residual strength, calling for a significant monitoring burden.”

“With the advanced vacuum feeders, the margin of error is only about 1%, which doesn’t require ongoing attention, while the maintenance costs are greatly reduced. For the pumps, an outside contractor had to come in twice a year, for a whole day, costing us for oil and parts and labor, while now it’s just a more simple kit of replacement parts for the vacuum feeder, also twice a year, but done in one hour by our own maintenance crew.”

The phosphoric acid is fed to be in compliance with copper and lead regulations, with total feed rate of 5,000 gal./day---1000 gal./day at one location, and 4,000 gal./day at another. One feeder is always on line at each location, with two backup feeders also present. The units have been functioning “very well, no complaints, everything is fine” since the beginning of 2019.

Meanwhile, testing began last month at one of the city’s caustic feed points, at the rate of 5,000 to 6,000 gal./day, also to replace metering pumps that are showing feed rate margin of error at 10%, along with the same costly maintenance burden. The caustic is needed at several locations to help the city maintain its required pH of 7.2.

For the city’s original use of the advanced vacuum feeder units for hypo feed, which started in 2014, the need was to improve reliability and reduce maintenance for less advanced vacuum feeders. Those less advanced vacuum feeders had been installed years earlier, also to improve reliability and reduce maintenance, for metering pumps.

At the city’s 1200 MGD WTP, 15% hypo is fed at the main entry point to distribution shafts, at the rate of 1000-1200 GPD. Subsequent continuous monitoring of chlorine residual is conducted to assure an average level of 1.1 mg/L, and a range of 0.8-1.3 mg/L, per water quality department needs. At one of the feed locations, vacuum dosers were used.

“The problem there was the manufacturer stopped making those units, which meant their annual delivery of preventive maintenance kits was no longer available,” recalled the water quality manager. “We could no longer get the O-rings and other appurtenances, so if there was a leak, there was no fix.”



City’s original use of advanced vacuum feeders for application of sodium hypochlorite (hypo), for improved reliability and reduced maintenance costs versus less advanced vacuum feeders, has now been supplemented with their deployment for phosphoric acid feed, replacing metering pumps.

“We searched for an alternative vacuum feeder, and found one that had references we could contact. We’ve had good performance for five years now with three of their units, each rated at 2500 GPD, which we run two at a time.”

At the city’s 80 MGD WTP, the vacuum feeders’ manufacturer was still in business, but chronic leaks stopped their use after a year of operation.

“They were very maintenance-prone, with repairs needed what seemed like daily or every other day,” he recalled. “Gaskets, O-rings, regulators, and diaphragms were all failing, and each episode was taking a day to fix. The corrosive nature of the hypo is the culprit, but with the replacement vacuum feeder, the hypo apparently doesn’t contact the parts. We’re very satisfied with the replacement vacuum feeder performance there.”

At the 80 MGD WTP, 15% hypo is fed at the rate of 120-150 GPD.

“We also have metering pumps available at that facility, but prefer to use the advanced vacuum units because their feed is more accurate,” he noted. “We can get within 1 or 2% of our target.”

The JCS Industries chemical feeders used at the city’s WTP’s utilize real-time feed information via electronic flow sensors that allow for continuous monitoring and control of the chemical feed rates.

Each feeder automatically regulates in both fixed and variable control modes, including fixed feed rate, flow paced, residual control, and compound loop. The feeder system can dose a variety of aqueous chemicals commonly used in municipal and industrial water treatment systems.

The feeder system is comprised of a vacuum injector to safely introduce the liquid into the feed-water stream; a reversing servo motor coupled with a V-notch valve to regulate the chemical feed rate; an electronic flow sensor to monitor and regulate the feed rate; and a control module for complete electronic control and communications.

A plant’s water flow rate and/or a chemical residual signal are used to adjust the chemical liquid flow rate by electronically positioning the servomotor driving the feed control valve. The ratio of input signal to liquid flow is adjustable over a range of 5% to 400% to enable increased liquid feed in response to additional chemical demand. US Patents have been received for the all-vacuum liquid feeder, which can dose up to 60,000 gal/day.

For further information, contact JCS Industries, 5055 FM 2920, Spring, TX 77388, Tel. 281-353-2100, Fax 281-353-0657, sales@jcsindustries.us.com, www.jcsindustries.u.s.com.

**Catalytic Objective Synthesis™ newsletters, reported independently by Catalytic Reporting, LLC, are sponsored by technology vendors who allow for ob-jective reporting based on interviews of their customers and their engineering firms, who in turn provide review and approval for accuracy and completeness. Titles and headlines are created to help readers recognize solutions for problems and needs, typically related to issues such as quality, reliability, efficiency, and compliance. Circulation and distribution are customized for each newsletter.*



Still further application of advanced vacuum feeders, for caustic feed, is now being tested as further replacement for metering pumps.



For the city’s original use of the advanced vacuum feeder units for hypo feed, now in sixth year at both 80 MGD and 1200 MGD WTP’s, the need was to improve reliability and reduce maintenance for less advanced vacuum feeders. Those less advanced vacuum feeders had been installed years earlier, also to improve reliability and reduce maintenance vs. metering pumps.