

Replacement Vacuum Feeders for Hypo and Bisulfite Boost Disinfection Reliability for WWTP

Also Cut Bisulfite Consumption by 30%, and End Troublesome Maintenance Burden for Instrumentation Tech and Plant Operators



Replacement liquid vacuum hypo feeders provide more reliable chlorination for disinfection requirements.



Replacement liquid vacuum bisulfite feeders provide more reliable dechlorination for zero discharge to effluent, while enhanced control lowered bisulfite usage by 30%.

The operations supervisor for Appleton, WI's 15 MGD wastewater treatment plant (WWTP) reports that replacement of their troublesome liquid vacuum feeders for sodium hypochlorite (hypo) and bisulfite, with a next-generation liquid vacuum feeder, has ended feed outages due to plugging and leaks. He also notes a consequent 30% reduction in bisulfite needs, and the end of a troublesome maintenance burden that distracted their instrumentation technician and plant operators from their primary duties.

“We had been putting up with the frequent feeder outages caused by plugged up injector tube orifices, because we had other priorities. But when we also started to get leaking of the vacuum relief diaphragm, and couldn't find a replacement for it, we decided to seek a new feed method,” recalled Robert Kennedy, the operations supervisor. “Fortunately, our original feeder vendor knew of a manufacturer of a next-generation vacuum feeder that didn't need that troublesome diaphragm.”

“The results have been fantastic. Since we installed the new units in April, we've not only ended the plugging and leaks, but got a major

unexpected benefit. Since we have gained much greater feeding accuracy, we no longer have to overfeed our bisulfite at 150 GPD to be sure we neutralize the chlorine down to zero discharge to effluent. As a result, we've been able to work the bisulfite feed all the way down to 105 GPD. We have found the new, push-button automatic control for the feeders to be accurate to within 1-2%."

"Meanwhile," he added, "our instrumentation technician is now able to focus on his SCADA responsibilities, including telemetry lines, data compliances, and equipment calibrations, virtually eliminating his involvement with the feeders. And our 3 plant operators have also been able to greatly reduce their feeder attention, and instead focus on the rest of the plant liquids operation, including sampling, testing, equipment monitoring, and assessing process stability."

Kennedy said his operations staff was typically spending as much as an hour and a half a day on the feeder maintenance problems, or about a half hour on each shift. Each of five feeders had its own injector tube with an orifice subject to frequent plugging, requiring manual changeout of the injector. While over the years the crew had become adept at the task, attrition and retirement made the problem more of an issue with new operators, whose training had focused on more primary duties.

The conventional activated sludge WWTP provides for seasonal disinfection from May through September, and functions as a secondary treatment process that follows screening and primary clarification. It has some modifications to help it handle a high load of total ammonia nitrogen, and is also responsible for phosphorous removal. There is no tertiary (filtration) step.

The plant began the liquid hypo and bisulfite feeds for disinfection in 1999, as a means of ending safety concerns related to sulfur dioxide and chlorine gas feeds. Three liquid vacuum feeders provided hypo @500-800 gpd, and two more feeders gave bisulfite @150 GPD. The disinfection requirement is stated as maintaining a coliform limit of 400 CFU's/100 mls, and the dechlorination requirement is stated as 38 µg/L chlorine to effluent.

Kennedy said that before making the switch to the replacement liquid vacuum feeders, his engineering firm had considered peristaltic and diaphragm pumping options, and found the replacement vacuum feed to be the most cost-effective solution. The new vacuum feeders were specified to provide capacity of 1200 GPD,

same as previous, while bisulfite capacity was reduced to 300 GPD from 1500 GPD. He added that a minimum of piping work was needed for replacement feeder installation, which consisted of a full component pull, and replacement in-kind.

"Our order didn't go in until at best the first week of April, and they not only had it installed before May 1, but they had their rep in on only four days notice to help with start up," Kennedy recalled. "And he was one of the best startup people I've ever worked with in my 39 years in this industry."

The JCS Industries chemical feeders used at the Appleton WWTP 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.

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