Chemical Feed Reliability News™

Vol. 4, No. 1 *Reported independently by Catalytic Objective Synthesis™ ** April, 2019

Replacement Vacuum Liquid Feeder for Poly Aluminum Chloride Ends Feed Reliability Problem for SWTP

---Also Cuts Process Chemical Costs---

Raw water is primarily from the Meadow River, and also from Anglin's Creek, near where it feeds into that river. Turbidity typically varies from 3 to 300 NTU, and has been as high as 2000 NTU during a flood in 2016.

Treatment starts with alkalinity adjustment of the raw water using sodium bicarbonate; continues with the injection of PACl (primary coagulate) just upstream of a static mixer; is followed by non-ionic polymer feed just before flocculation; and concludes pre-treatment with sedimentation/clarification.

The Chief Operator for a surface water treatment plant (SWTP) reports that replacement of a troublesome vacuum liquid feeder for poly aluminum chloride (PACl), with a more advanced vacuum liquid feeder, ended the threat of a process upset for operations staff that was caused by the previous unit not being able to hold a constant feed rate. The ability to provide a consistent feed is needed as a key element in the plant pre-treatment process, which features turbidity reduction and clarification.

"The previous unit's roto meter couldn't maintain the desired feed rate, causing us to have to constantly monitor it," said Scott Rader, at the Wilderness Public Service District's 0.5 MGD SWTP in Mt. Nebo, WV. "We made it work for over 10 years, but the feed rate would drop off, and so we were very happy to finally get funding for the replacement unit. It maintains a set point under all conditions, working smooth as silk and slick as a ribbon. We don't have to fear coagulant feed rate failures now."

The replacement feeder was manufactured by JCS Industries of Spring, TX.

"It has a flow meter that can see any change in flow rate, and a variable V-notch valve with a reversing servo motor, to maintain the desired set point under all conditions," Rader added. "We can set it and forget it. In addition to ending the time drain for constant monitoring, we are also using less chemicals now overall in our treatment process."

The JCS Industries vacuum liquid feeder utilizes real-time feed information, via electronic flow sensors that allow for continuous monitoring and control of the chemical feed rates. 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.

The 1979 conventional treatment plant serves a population of about 5,000, including an average of 2100 taps. Raw water is primarily from the Meadow River, and also from Anglin's Creek, near where it feeds into that river. Turbidity typically varies from 3 to 300 NTU, and has been as high as 2000 NTU during a flood in 2016.

Treatment starts with alkalinity adjustment of the raw water using sodium bicarbonate; continues with the injection of PACl (primary coagulate) just upstream of a static mixer; is followed by non-ionic polymer feed just before flocculation; and concludes pre-treatment with sedimentation/ clarification.

The pretreated flow then proceeds to filtration; followed by fluoridation, chlorination, and pH adjustment; and the addition of a phosphate blend for corrosion control before entering the clearwell. From there, the flow goes out to the distribution system. The average flow for the plant is 0.320 MGD, within a range of 0.275-0.350 MGD.

"The sodium bicarbonate addition, to adjust alkalinity, helps the PACl to work right," Rader continued. "The adjusted alkalinity is maintained within a range of 18-21 ppm (18-21 mg/L), because raw water alkalinity can be as low as 5 ppm (5 mg/L) in the winter."

"With the PACl fed at 20-70 ppm (20-70 mg/L), we normally have 1 NTU or less being applied to the filters 98% of the time, which achieves the goal of 95% of the time or better, as outlined in the area-wide optimization program (AWOP) guideline from the West Virginia Bureau of Public Health. Jar tests are normally performed once per shift, to verify proper PACl dose, and are performed more often when raw water quality changes."

The replacement PACl feeder was installed at the end of last year.

"We began searching for an alternate six years ago, and very much liked the concept and design for this replacement unit, and then it took a while to get the funding to purchase it," Rader recalled. "We currently have a capital improvement fund to purchase critical assets like this when needed."

"The first two months of operation, with automatic feed rate adjustment as needed, have been blissful, and it has taken a lot of stress off me as the Chief Operator. We're freed up now for other duties, without worrying about turning our back and losing our process."

The JCS Industries vacuum liquid feeder utilizes 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 from small feeds 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.