APPLICATION NOTE

WASTEWATER TREATMENT FACILITY COMPLEMENTS ON-LINE MONITORING WITH AUTOMATED CONTROL

Integrated treatment control system improves efficiency and effectiveness of phosphorus removal for Minnesota River Valley Public Utilities Commission (MRVPUC)

Summary

The Minnesota River Valley Public Utilities Commission (MRVPUC) provides wastewater treatment for the City of Le Sueur and the City of Henderson in south-central Minnesota. Its wastewater treatment plant serves a domestic population of about 4,500; however, more than 50 percent of treatment plant influent flow and load consists of industrial waste. This unusually high percentage of industrial load often results in large, unexpected volumes to the system. A significant factor is the highly varying phosphorus load that challenges operators to meet the utility's annual average discharge limit of 1.0 mg/L total phosphorus.

MRVPUC has found that a Real-Time Control Solution for Phosphorus Removal (RTC-P) from Hach Company, which automates control of ferric chloride treatment based on continuous, real-time monitoring, has reduced ferric chloride usage by half. Further, it has eliminated approximately 80 percent of the manual adjustments previously required for proper treatment of this facility's inconsistent influent.

The Challenge

The MRVPUC Wastewater Department upgraded its wastewater treatment process from stabilization ponds to an extended air-activated sludge treatment process in 2009. The plant now treats 1 to 1.5 million gallons per day (mgd) of domestic and industrial waste, with at least 100 pounds of phosphorus received daily. Initial installation of an on-line phosphate analyzer provided continuous monitoring of orthophosphate levels in clarifier effluent. This revealed that this stream can see a 50 percent increase in phosphate levels from one day to the next and spikes of up to 160 to 170 pounds of incoming phosphorus. With this on-line monitoring to guide them, operators were continually adjusting ferric chloride treatment levels to accommodate shock loads that their existing SCADA program could not detect. Using the data from the analyzer and the effluent flow meter, they

attempted to build their own control program to manage the ferric dose. After repeated attempts to fine tune the program themselves, they decided to look for other options.

The Solution

Brian Skok, General Manger of the MRVPUC and Director of City of Le Sueur Water/Wastewater Facilities, described how the utility worked closely with Hach's field installation team to set up an evaluation unit of the company's Real-Time Control platform for Phosphorus Removal (RTC-P). The platform integrated fully with the in-place phosphate analyzer and with the utility's specific treatment control process. Based on post-treatment analyzer measurements, the RTC-P uses a calculated feedback loop to adjust ferric chloride dosing as needed to maintain target effluent phosphate concentration.

Time period	31 days
Previous dose, average	12 gal per hour
Ferric chloride consumed, average, for 31-day period	8,769 gal
RTC-P platform dose, average	9 gal per hour
Ferric chloride consumed, indicated by RTC-P	6,323 gal
Ferric chloride savings	
Quantity	2,446 gal
Percentage	28 %
Cost per gallon	$3.43
Total savings during evaluation period	$8,390

Table 1. Ferric chloride savings realized by automated control

"Working together with Hach's field specialists, we learned a lot about how the platform's RTC-P module and sc1000 Controller could complement the real-time monitoring we had in place and enable us to better manage our process and meet our treatment challenges," Skok emphasized.

During initial evaluation of the new RTC-P platform, the MRVPUC Wastewater Department manually correlated the orthophosphate measurements provided by the analyzer and total phosphorus identified through operator-conducted sample digestion and measurement. This manual tracking showed the ferric chloride dosing identified by the RTC-P module and delivered by the controller was much more accurate than the program developed in house, allowing the utility to develop significant confidence in the complete system.

The Results

Figure 1 shows how the RTC-P platform adjusts ferric dosing to maintain post-treatment phosphate concentration at approximately 0.4 mg/L.

With the RTC-P platform's automated dosing control, the MRVPUC staff realized it was not only saving operator time previously spent on dosage adjustment, but was also reducing ferric chloride usage from 500 to 600 gallons/day to a level of about 200 to 300 gallons/day. See Table 1.

MRVPUC staff also valued the contracted yearly service support provided by Hach instrumentation experts.

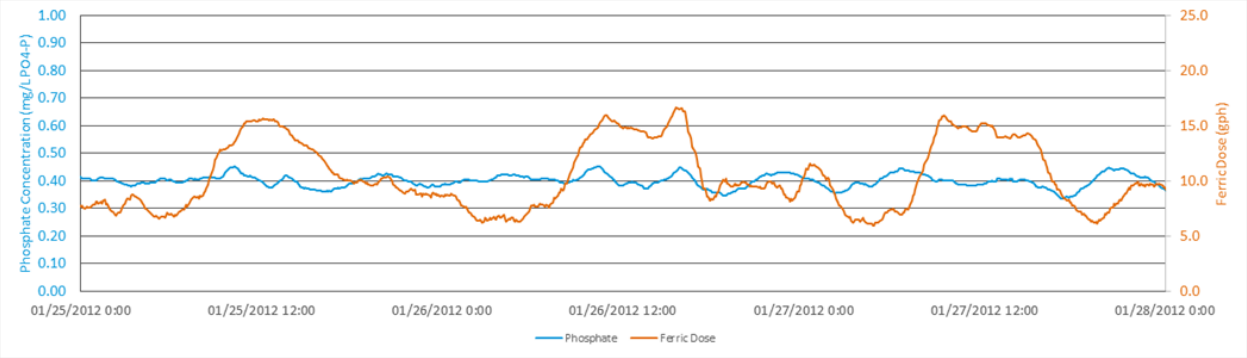

Figure 1. The orange line identifies ferric chloride dosing identified and controlled by the RTC-P platform based on the phosphate analyzer's continuous measurements. The blue line shows the targeted and consistent effluent phosphate concentration that result with this solution.

"We realized a return on our investment in the RTC-P system in a little less than a year," Skok concluded. "The RTC-P platform was the missing piece to the treatment control solution our treatment facility needed to optimize operation and meet our treatment targets."

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