RTC Sludge Dewatering Improves Efficiency, Optimizes Polymer Feed at Bowling Green

Problem

At BGMU, operational challenges such as unpredictable sludge consistency, high polymer costs, and highly manual processes at the facility's two centrifuges led to high costs and inefficient operations.

Solution

The plant installed the Hach® RTC-SD Real-Time Sludge Dewatering System to replace grab sampling in the feed sludge with real-time flow and solids measurements to better dose polymer.

Benefits

Continuous analysis provided by RTC-SD helps BGMU optimally treat sludge during the dewatering processes, allowing the plant to run more consistently. This results in 70% fewer manual operations at the centrifuges and contributed to a 58% drop in polymer spend.

Background

The Bowling Green Municipal Utilities (BGMU) wastewater treatment plant (WWTP) is a 12 MGD, sequencing batch reactor (SBR) facility consisting of two, two basin SBR trains. Each train wastes, on average, 130,000 gallons per day of 0.75% solids to three sludge holding tanks. Holding tanks aerate only for odor control; they are not designed for aerobic digestion. The sludge holding tanks are decanted periodically to thicken the solids to 1.5 – 3.0% before solids flow through a grinder and are pumped to the two centrifuges for dewatering.

Measuring Feed Sludge

In 2012, BGMU upgraded its WWTP to increase capacity and automate many of its processes throughout the treatment cycle. However, the dewatering operation remained a manual process. To determine the best polymer dose for dewateringthe sludge, operators relied on grab samples and visually examined the centrate. Each operator took feed sludge grab samples twice per shift, but the intervals between each grab sample were inconsistent due to other obligations in the plant. As each sludge holding tank was drawn down, the concentration of sludge would drop as well. Once the centrifuge lost bar pressure on each tank, an operator would switch the tank feed. This resulted in increased sludge concentrations. When the tank was at the minimum allowable level, the system would automatically switch to a full sludge holding tank that had twice the sludge concentration of the previous tank. Often, the plant would go through tank switches without adjusting polymer for the varying loads. Because of other operations, the plant sometimes had large time gaps between samples leading to inefficient polymer feed. "On the back end, as long as we had clear centrate we didn't have to worry about solids. The more solids moving, the better," said Scott Neighbors, Senior Project Manager, BGMU. "We would look at centrate and decide whether or not to adjust the polymer."

Feed sludge grab sampling processes contributed to issues such as inconsistent cake and inefficient polymer dosing in the treatment process. Further, due to unpredictable sludge concentration leaving the holding tanks, the dewatering process at the centrifuges required manual, reactive adjustments—taking operators' time away from other priorities.

To address the issues of reducing manual operations, improving efficiency, and reducing polymer costs, BGMU decided to look into continuous solids measurements in the feed sludge. Recognizing that if the plant could gain more clarity and knowledge for its feed sludge solids concentration, it could help optimize centrifuge operations and polymer dosage in the dewatering process.

HACH® Be Right™

Solution and Improvements

Initially, the plant wanted to install Hach's Solitax TSS probes to replace its feed sludge grab sampling. "When it comes to instruments, we have used Hach for a long time," said Neighbors. "Since we already use Hach in the SBR basin, we made the decision to keep going with Hach." However, that wouldn't help BGMU optimize its polymer dosing or reduce operators' workloads because the TSS data would still need to be analyzed and polymer feeds would still need to be manually set and adjusted by operators. "I called our Hach rep for solids probes to figure out a percent solids program so that we could program polymer dosage through our own control system," said Neighbors. "I found out Hach already did the hard work with its RTC system."

Rather than building their own analysis program into SCADA, BGMU decided to run a trial of Hach's Real-Time Control System for Sludge Dewatering (RTC-SD). "It sounds easy to do, but if someone has already taken the time to research and develop the system, they likely resolved problems we haven't even anticipated," said the Senior Project Manager. "Where do you control? At the polymer feed or the centrifuge? There are so many different aspects. Once we found out there was something out-of-box, we went with the easier option."

RTC-SD improves operations by measuring feed sludge flow with the existing flow meters and solids concentrations with a Hach Solitax probe in the feed sludge lines in order to optimize polymer dosing in real time. Based on BGMU's existing equipment, the RTC-SD is set up as a feed-forward system. "Once the probes and wiring were in, it was less than a one-day process. It was extremely easy for us," said Neighbors. The Solitax probe reads TSS and delivers the measurements to a SC1000 Controller. The controller includes readouts for BGMU's parameters, signal validation, and Hach's Prognosys system—which allows the operators to view all critical measurements and instrument diagnostics. By doing this, the WWTP optimizes polymer dosage and increases its knowledge of instrument uptime and maintenance needs.

More Measurements, More Clarity

Figure 1 emphasizes the value of real-time, continuous TSS monitoring and analysis. Flow (Blue line), TSS (Black line), and polymer dose (Green line) were analyzed continuously by RTC-SD. Each and every dip and spike represents a moment where the WWTP's sludge changes. Compare that amount of information to taking grab samples twice per shift. It's easy to see that BGMU's sludge varies so much throughout the day that it would be impossible for operators to optimize polymer treatment without continuous measurement and automated control.

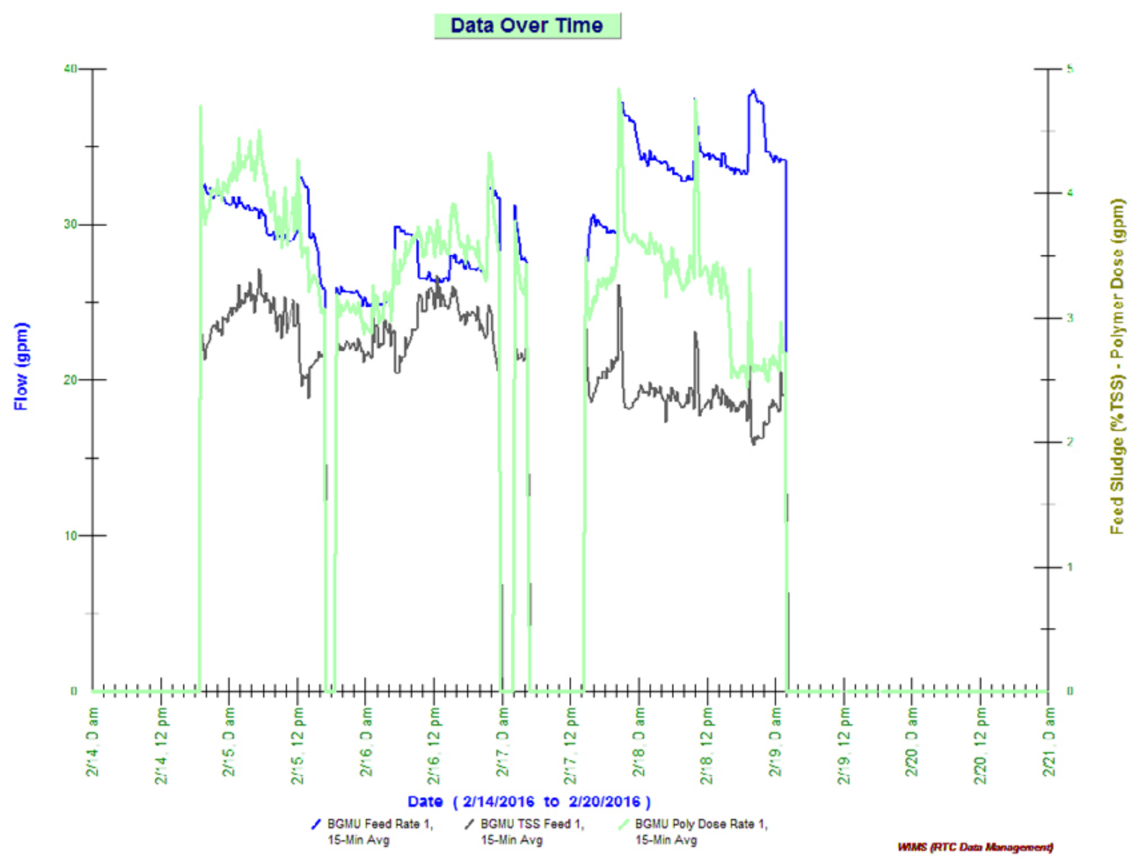

Figure 1: RTC-SD highlights the variability in sludge throughout the day

Finding Clarity in TSS Measurement

Figures 2 captures BGMU's flow (Blue line), polymer doses (Green line), and TSS (grey line) using the RTC-SD analysis over the course of four weeks. Following the TSS and polymer feed rate trends, its apparent that RTC-SD accurately doses polymer based on real-time TSS readings. "Operators start in manual, then put RTC in automatic and let the system take over," said Neighbors. "Then they'll key down on the polymer dosage in RTC by lowering the pound per ton dose set-point in RTC. They only make those setting changes once per shift. It has reduced the amount of polymer and made everyone more aware of how solids change. It saves you money, but also gives operators knowledge of how often solids change."

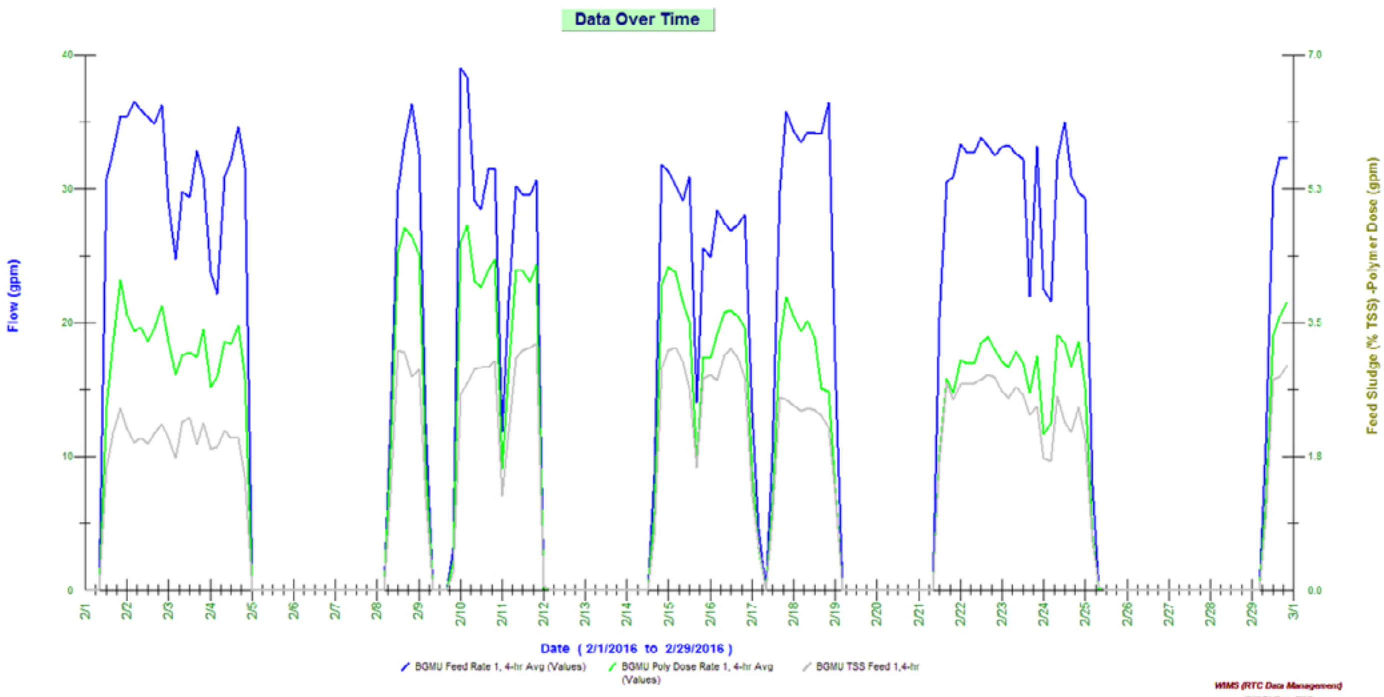

Figure 2: RTC-SD readings averaged into 4-hour increments

Conclusion

With real-time, continuous monitoring of TSS concentrations from RTC-SD, BGMU gained greater insight and clarity into its sludge concentration, flow, and polymer needs. This leads to greater process control and efficiency. Specifically, BGMU reports that RTC-SD helped reduce manual centrifuge operation for sludge treatment by 70%. This allowed operators to focus on other critical plant operations, and optimizations from RTC-SD (along with other changes such as a shift in polymer) contributed to BGMU reducing its polymer consumption by 58% while RTC-SD is running (see Figure 3).

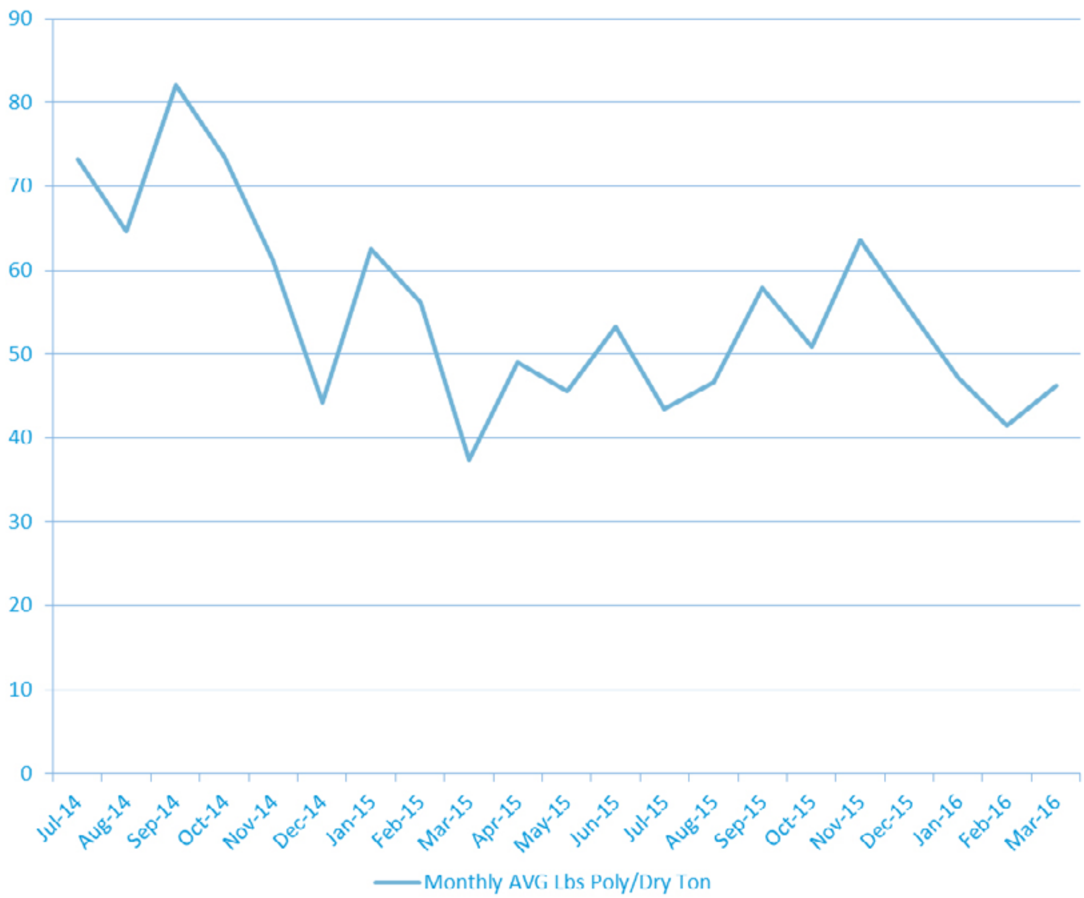

Figure 3: BGMU introduced RTC-SD in October 2014, leading to optimizedpolymer consumption

DOC043.53.30393.Apr17

HACH World Headquarters: Loveland, Colorado USA

United States:	800-227-4224 tel	970-669-2932 fax	orders@hach.com
Outside United States:	970-669-3050 tel	970-461-3939 fax	int@hach.com

hach.com

Be Right™