SOLITAX FOR DRINKING WATER SLUDGE CONTROL

In a recent project with Northumbrian Water Ltd, a Hach Solitax solids measurement probe was used to monitor and control the sludge recirculation flow rate to maintain a solids setpoint via SCADA on two Lamella clarifiers.

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The site, Wear Valley WTW, suffered from flow restrictions during peak demand periods due to clarifier performance even with large increases in coagulant use. Recently the site has seen the raw water quality deteriorate due to extreme weather events. Raw water in Burnhope reservoir supplying the site is challenging to treat with a combination of very low conductivity and alkalinity and long periods of very high colour/organic content.

The change in raw water quality has increased pressure on the coagulant and lime systems, increasing chemical consumption and reducing output. This has required other higher cost sites to maintain customer demand. Wear Valley is a gravity fed works, and higher production here reduces the overall company carbon footprint.

Previous work with Hach at a wastewater treatment site showed that controlling the solids flow rate of a sludge with varying thickness improves process efficiency. It was hypothesised that this work could be reapplied to a Lamella clarifier drinking water plant to improve the quantity and quality of supplied water.

Wear Valley uses two Lamella clarifiers in parallel. The trial allowed one Lamella to be used as a reference throughout the process for comparison. The Solitax data was used to evaluate a varying sludge thickness which was known to cause treatment issues. While this was not being monitored, it was difficult to draw trends and understand the process completely.

Figure 1: Graph to show the improvement gained in settled iron against flow requirement as a result of Solitax installation.
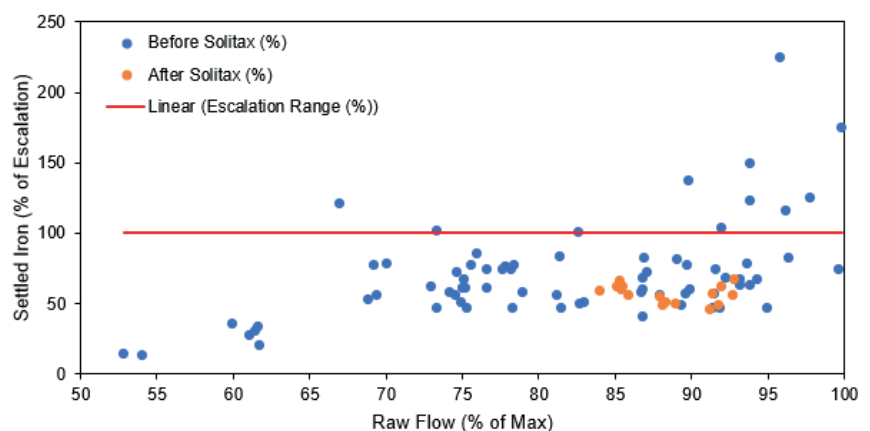
After creating a calculator using the Solitax data and flow data, sludge was recirculated to maintain a constant solids dose by manually altering the pump speed. Settled water quality was compared to the uncontrolled Lamella 2. As a result of the significant improvement in quality from Lamella 1, the process was adopted across the whole plant and implemented into SCADA for automatic control.

Although there have been large increases in the quantity of water produced by Wear Valley, it was the internal water quality specifications that limited throughput. This graph shows clarified iron concentrations at various flows and the introduction of the Solitax instrumentation has maintained lower settled iron concentrations than seen previously.

Key Improvements demonstrated include;
1. Following the PLC control system installation, ferric dose has been reduced by approximately 15% during high colour raw water conditions.
2. During poor raw water periods, the site is now maintaining almost maximum flows, circa 10-15% higher than previously.

Daily production improvements during winter of up to 4ML/d equates to an expected £40,000/year reduction in production costs. During high colour periods a 15% reduction in ferric equates to circa £9,000/year. This added to an expected 5% reduction during the rest of the year would equate to a ferric cost reduction of £15-£20,000 per annum.
3. As well as the improved clarifier performance, sludge draw-off from clarifiers is more constant. Improvements have been seen on press and centrifuge performance as the site does not have a clarifier sludge thickener.
4. The reduction in sludge volume has reduced the probability of emergency tankering and associated costs.

Northumbrian Water Ltd will continue to work to optimise sludge recirculation set points. Data analysis during Winter 2021/22 will allow deeper understanding of the process efficiencies needed as the water quality changes with the seasons. Further improvements are expected by altering the solids loading set point depending on real time conditions and flows through the works will be compared to previous years.