APPLICATION NOTE

Water & Wastewater

Measuring sedimentation in raw water treatment

- Monitoring of flocculation and sedimentation process in the flocculation tank of a water works
- Dynamic tracking of sludge blanket and monitoring of floc loss
- Improved safety in the treatment of drinking water

1. Background

A public utility company operates a water treatment plant in north west Germany. The raw water, which is extracted from well fields, is treated at the water works using the sedimentation flocculation process with upstream ventilation followed by filtration to produce drinking water. The water treatment plant can treat 650 m³ / 171,711 US gal per hour. At full capacity, the plant can treat 15,600 m³ / 4,121,083 US gal of water per day. The raw water treatment plant has over six flocculation tanks, in which iron and manganese flocs form when chemicals are added. Most of the substances to be removed are agglutinated in these solid particles. The flocs settle at the bottom during the treatment process. The sludge is extracted from the tank at specified intervals via six hoses in the flocculation tank.

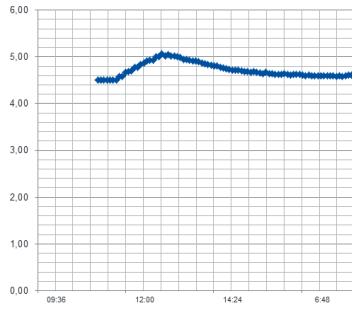
2. Measurement requirements

The utility company currently just uses turbidity sensors to monitor the sedimentation of precipitate. The sensors only control the maximum and minimum sludge levels using preset limit values. The problem with this static measurement, however, is that if the composition of the precipitation zone changes or fluff ends up in the filters, this is identified too late. If unsettled floc gets into the filtration plants, this reduces the processing capacity, and could even bring the plant to a standstill. The risk of floc loss into the filtration plants is much higher when more water is abstracted in the summer months, as the sludge blanket no longer moves between the two turbidity sensors, but is rather sometimes just a few centimetres below the water table. In order to improve monitoring of the current operating method and significantly minimise the safety risks associated with rising sludge blanket and floc loss, the utility company decided to try a sludge level measuring system. Initially this was to continuously measure the sludge level in one of the flocculation tanks while taking into account the
raw water feed and the sludge extraction.

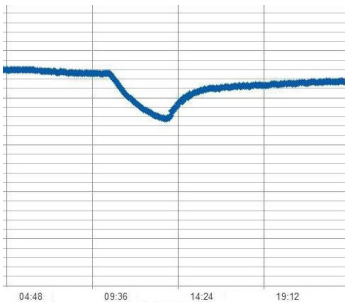
KROHNE

3. KROHNE solution

The company chose the OPTISYS SLM 2100 optical sludge level measuring system for the trial. The optical sensor of the KROHNE system can measure the concentration of the solids content in all layers of the flocculation tank. This enables dynamic monitoring of the sludge level with the flocculation tank under varying loads, the addition of chemicals and sludge extraction.



Sludge level progression (height/time) when flow rate decreases from 44 to 20 m³/h (11,624 to 5283 US gal/h)

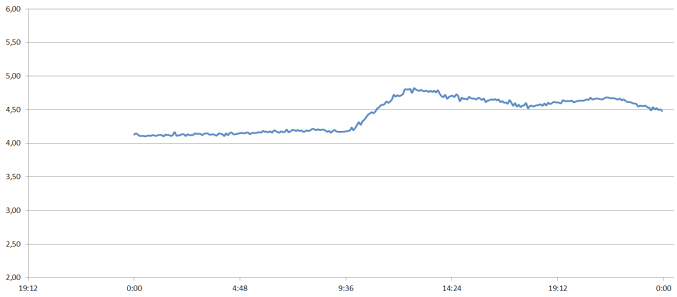


Sludge level progression (height/time) when flow rate increases from 44 to 68 m³/h (11,624 to 17,964 US gal/h)

The system can pinpoint the transition from the clear phase to the sludge phase. The zone tracking function continuously monitors the defined concentration (suspended solids content) of 1g/l - thus a specific "zone" - so as to control the sludge extraction intervals. In particular, the OPTISYS SLM 2100 can always determine the sludge blanket, even at different flow rates, as the measurements in the flocculation tank show (see diagrams).

4. Customer benefits

The OPTISYS SLM 2100 allows the utility company to continuously monitor the sludge level and control the extraction of sludge accordingly. Both failure to add important chemicals (see diagram right) and a costly overdose can be identified early on thanks to the dynamic measurement. The sludge level measuring system also significantly improves safety. Any floc loss into the downstream process stage can be identified early on, thus effectively preventing clogging of the filters. The customer can respond to changes in the sludge composition sooner, especially at times of heavy utilisation and the respective associated flow rate. This means that a reduction in processing capacity due to clogged filters can be averted beforehand, thereby improving the security of supply with the sludge level measuring system. The customer is very satisfied with the KROHNE system.



Change in sludge level of flocculation tank when polymer is omitted (simulation)

5. Product used

OPTISYS SLM 2100

- Optical measuring system for the measurement of sedimentation profiles, sludge blankets and fluff level
- Continuous tracking of sludge blanket (zone tracking)
- Direct measurement by an optical sensor
- Measuring range: 0...10 m / 32.8 ft; 0...30 g/l
- Built-in heater, 2 x rake guard switch
- 2 x 4...20 mA current outputs / 2x relays (limit value or status)

Contact

Would you like further information about these or other applications?
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