The Tale of Two Sensors: Finding a Reliable Suspended Solids Sensor for a MBR Application

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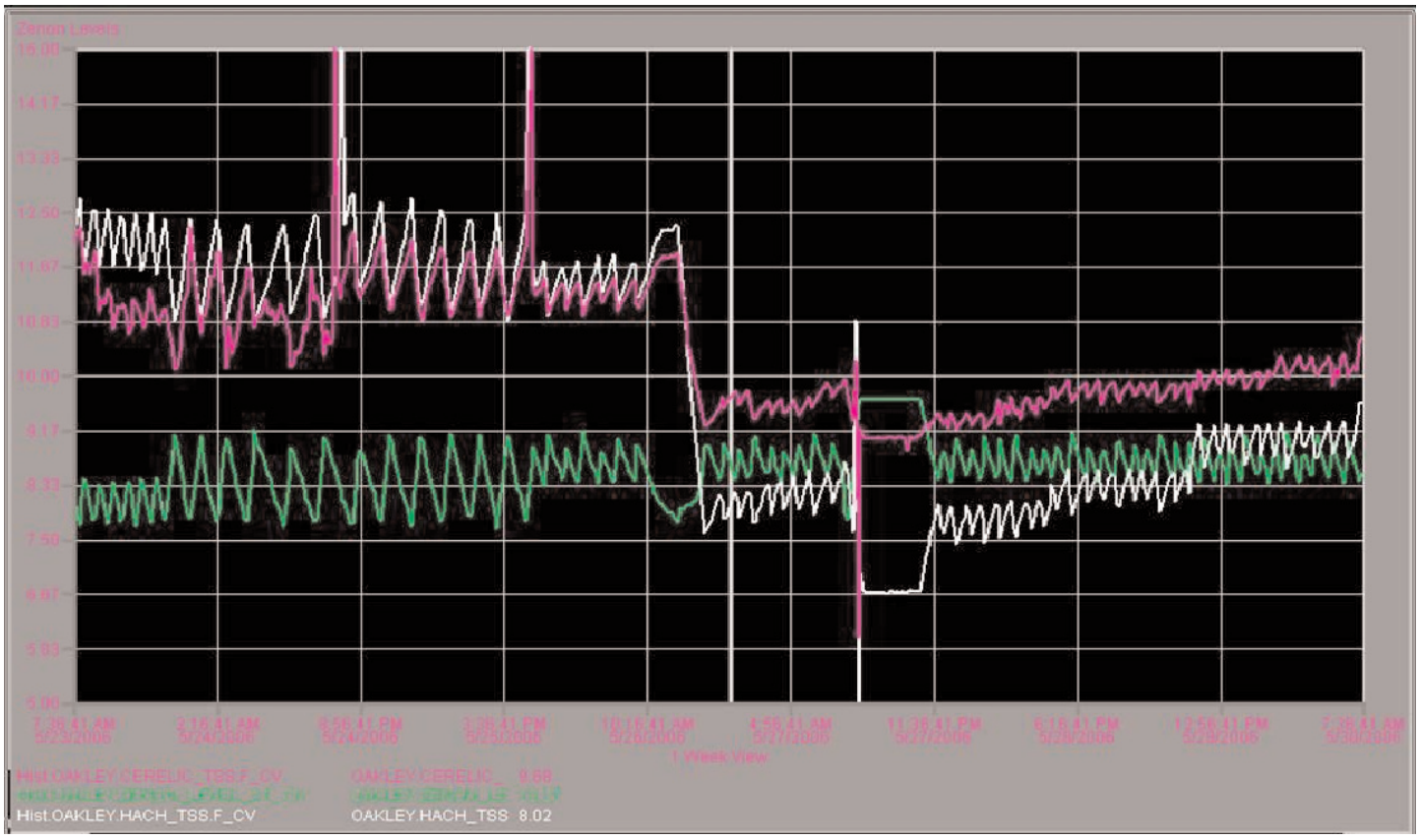
Benefits:

- *Ensure proper MLSS concentration for nitrification and organics removal*
- *Efficiently control wasting operations*
- *Reduce fouling and increase life of the membranes*
- *Dynamic response to real time conditions*

Suspended solids concentration is a critical parameter in the operation of a membrane bioreactor (MBR) wastewater treatment system. Mixed liquor concentrations of up to 15,000 mg/L are the norm for MBR systems; an in some cases even reach as high as 20,000 mg/L. Both nitrification and the removal of organics can be inhibited if the mixed liquor suspended solids concentration is not optimal. In addition, incorrect suspended solids concentrations can lead to fouling of the membranes, which can restrict permeate flow, increase wear on the vacuum pumps, and render the MBR's cleaning system useless—ultimately shortening the life of the membranes. Having an accurate, precise, and reliable suspended solids analyzer is critical to the optimum performance of a membrane bioreactor system.



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The core of any MBR system is a large aerated tank that contains a high concentration of activated sludge and in which a number of tubular membranes are immersed. After pretreatment, the wastewater flows into the aerated tank where organics are removed and ammonia is typically converted to nitrate. Vacuum pumps create a negative pressure inside the tubular membranes, pulling water through them. The membrane pore sizes range from 0.02 to 0.40 microns in size, causing the solids to be filtered from the water and creating a very clean effluent stream. This filtered water is then disinfected and discharged.

Two suspended solids analyzers were installed into an MBR system in Utah on a trial basis to determine which would give the more reliable and precise data. One was the Cerlic ITX sensor, and the other was the Hach Solitax TS-Line sensor. In the above graph, the purple line represents the Cerlic sensor, the white line represents the Solitax sensor, and the green line is the tank level of the MBR system.

Both sensors were initially calibrated shortly after installation, by comparison to a gravimetric lab test. Operators noticed that the Cerlic sensor would read high shortly after the calibration, while the Solitax remained precise. After two weeks of recalibrating and adjusting the wayward Cerlic sensor, it was decided to simply calibrate it to the value the Solitax was measuring. This seemed to fix the issue of the Cerlic reading high, as it then trended appropriately with the Solitax, except for the low readings on May 23rd.

On May 26th the operator, following standard operating procedures, wasted sludge from the MBR (evidenced by the drop in tank level, and drop in suspended solids concentration). After the wasting was complete, there was a significant difference between the two measurements, on the order of 1500 mg/L. Which analyzer was telling the true story?

On the 27th the operations crew set out to again determine which sensor was reading correctly. After performing simple gravimetric verification tests and inspecting each sensor, it was again determined that the Hach Solitax TS-Line sensor was reading the suspended solids concentration correctly. They determined that the Cerlic ITX sensor was not able to remain accurate and precise over time, and also unable track a significant change in suspended solids over a short duration. The sensors told their tale.

While suspended solids concentration is one critical parameter for proper operation and crucial for the long-term life of an MBR system, other parameters such as dissolved oxygen and pH are equally critical. For MBR systems that perform denitrification with an anoxic basin, nitrate, ammonia, and ORP are other important parameters to consider. MBR systems that are constructed to perform biological nutrient removal with both anaerobic and anoxic basins should consider the addition of phosphate analysis along with the parameters used in denitrification. Hach Company offers all of these reliable solutions on one common controller plantform to help the MBR operator “Be Right”.

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