

Mixed Liquor Suspended Solids in Wastewater

Introduction

Mixed liquor is a mixture of raw or settled wastewater and activated sludge contained in an aeration basin in the activated sludge process. Mixed liquor suspended solids (MLSS) is the concentration of suspended solids in mixed liquor, usually expressed in milligrams per liter (mg/l).

Maintaining the targeted MLSS load level in the aeration basins – by optimizing the RAS (return activated sludge) – is important for overall plant efficiency; see *Figure 1*.

Critical factors

Within the aeration basin, dissolved oxygen (DO), pH, active biological mass, mixing, rate of oxygen utilization, temperature, MLSS concentration, and retention time are critical factors that must be closely monitored.

Influent

Effluent from a primary clarifier and return activated sludge from a secondary clarifier are mixed together and pumped to an aeration basin. The MLSS concentration is typically 2.5 g/l (2500 mg/l) suspended solids but can range up to 5 g/l (0-5000 mg/l). In the basin, aerobic microbes decompose organic matter in the mixed liquor.

Retention time

Depending on the temperature, type of sludge, size of tank, and other variables, the retention time of mixed liquor in an aeration tank ranges from 10 to 20 days. The process operates on either a batch or a continuous basis.

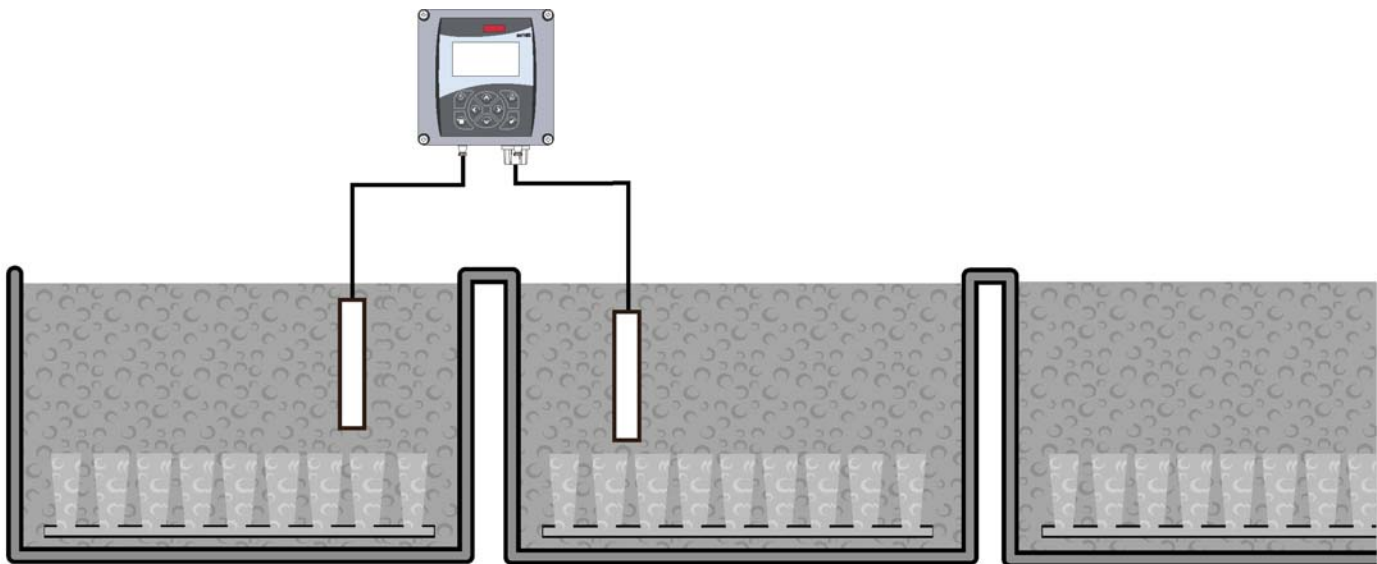


Figure 1 – Two SOLITAX™ ts-line sc sensors and one sc100™ Controller monitor the concentration of MLSS in an aeration basin.

In some operations the aeration system is shut down for one to two hours to allow the sludge to settle and a clear supernatant (surface water) to form. The supernatant is then drawn off to allow the addition of more sludge.

Effluent

Due to settling and supernatant pump-out, MLSS concentration in the effluent (activated sludge) is typically double that of the influent MLSS concentration. Part of the mixed liquor is returned to the secondary clarifier.

The rest is “wasted,” that is, diverted from the return loop and pumped to the thickening/digesting stage for further processing. Removing the waste activated sludge maintains the MLSS loading level in the aeration basin.



Product Application

Monitoring the MLSS concentration is an effective means of controlling the microbial activity in an aeration basin because of the direct correlation between the suspended solids concentration and the size of the microbe population. The longer the process has been in the tank, the greater the microbe population.

For this application, use a SOLITAX™ ts-line sc sensor and a sc100™ Controller. Since the controller is dual-channel, operators can use two ts-line sc sensors with one sc100 controller to obtain measurement in two aeration basins.

The sensor should be suspended in the media at the end of a PVC pipe that is fastened to the basin railing. The sc100 Controller transmits a 0/4-20 mA signal, proportional to the solids concentration, to remote control equipment. The controller uses this data to maintain the MLSS level.

This application solution is one of several Hach documents describing wastewater process control based on continuous suspended solids/turbidity measurement. For more detail, refer to:

“Belt Filter Press Monitoring/Control in Wastewater Treatment Plants,” Hach Application Solution AS-SS4

“Centrifuge Monitoring/Control in Wastewater Treatment Plants,” Hach Application Solution AS-SS5



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