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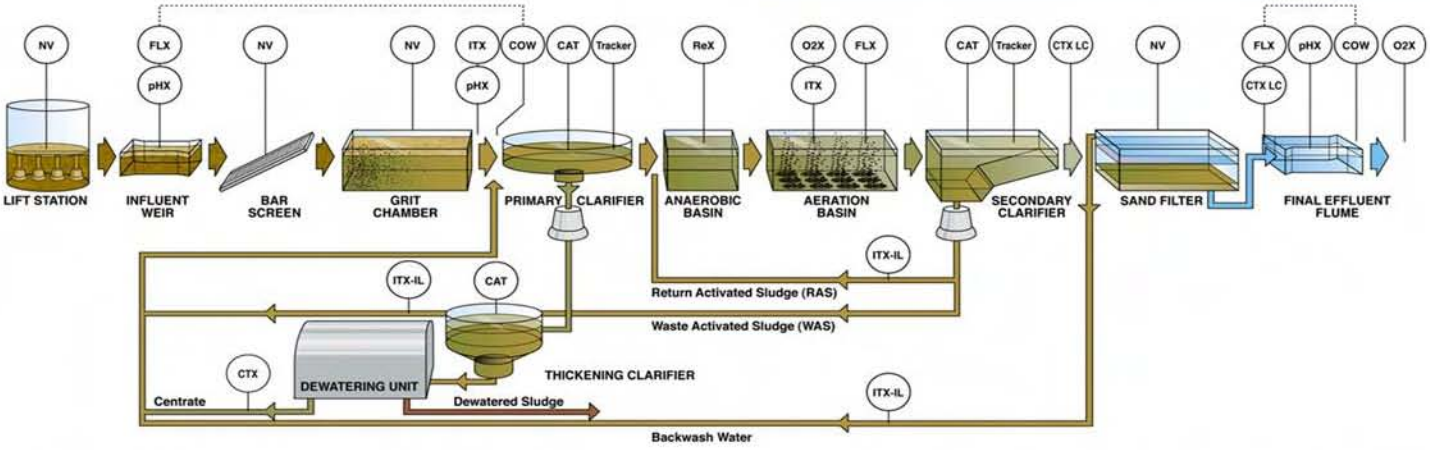

Automating Suspended Solids Control Helps Maintain Constant Nutrient Removal

In the past, the conventional method of controlling solids inventory in an activated sludge system normally consists of:

- Collecting a grab sample of mixed liquor
- Analyzing for mixed liquor suspended solids (MLSS) concentration
- Making appropriate calculations such as solids retention time (SRT)
- Correcting wasting rates usually with valve adjustments

Current plants with advanced activated sludge facilities with nitrification/denitrification and biological phosphorus removal have developed formulas from which staff would calculate what the new wasting rate should be and then make appropriate changes in the Waste Activated Sludge valve position through the Supervisory Control and Date Acquisition (SCADA) system.

Many operations have inconsistent performance of the BNR due to difficulties in achieving and maintaining target liquors. It has been determined that substantial variation results in a better method of monitoring MLSS and sub sequentially establishing waste flow rates. The use of online suspended solids probes meters and transmitters is found to greatly enhance process control in activated sludge system and improve the reliability of stability of BNR processes.

The cost of probe installation, operation and maintenance is far less than manual collection of samples, lab analyses and subsequent calculations and manual equipment adjustment.

In co-ordinations with modern SCADA systems, a computerized control for the wasting process is easily justified. Additionally the risk of human error in making critical calculations and manually actuating the wasting valve positions through the SCADA system is eliminated.

Finally the addition of probe monitoring or the return activated sludge (RAS) creates the opportunity for constant SRT control, reducing operational costs, and less attended facilities which all support competitive strategy goals

Opportunity for Automation

A BNR plant in Nevada developed the ability to achieve biological phosphorus (bio-P) removal in the aeration basins by simply shutting off the mixed liquor recycle into the anoxic zones which had been provided for de-nitrification primarily to restore alkalinity, The cost savings from reduced chemical usage and sludge production of its tertiary facilities were substantial at approximately $57/mg as long as the bio-P process was stable.

Excited by the development of the bio-P process and its cost savings, staff began evaluating process control techniques for maintaining reliable bio-P. A comprehensive sampling and laboratory analyses monitoring protocol was soon established to track orthophosphate removals to help staff evaluate the status of the bio-P process.

As with any activated sludge process, maintaining mixed liquors through diurnal flow patterns is a key performance parameter. Wasting flow rates control the MLSS.

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Opportunity For Automation using CERLIC MLSS Sensors

Staff took grab samples and analyzed suspended solids content in the process control lab. They had to rely on daily grab samples to obtain the data to make calculations to determine wasting flow rate changes. Target MLSS was established primarily by trial and error. The fine tuning and searching for the MLSS resulted in the best treatment results.

Once a target had been established, operations staff would chose a simple algorithm to calculate the new wasting rates:

New Q_{was}= Previous Q_{was} x [Actual MLSS (grab sample) ÷ Target MLSS] $^{0.5}$

The Waste Activated Sludge (WAS) is that portion of RAS that is wasted out of the activated sludge for disposal "Q_{was}" is the flow rate of the WAS.

The square root is taken to more uniformly adjust wasting, as it tends to smooth out this multiplication factor & dampen the shock of the change on the biological system. Using this formula, staff would determine what the new wasting rate should be and then would make the appropriate changes in the valve position through the computer.

Inconsistent phosphorus & ammonia removals through the modified activated sludge process puzzled operations staff. To identify the cause, diurnal sampling of MLSS and RAS suspended solids were conducted hourly for a two week period. The results reflected a substantial range of MLSS and RAS throughout the day & night. Operations staff normally had been grabbing samples from 6 am to 9 am. Seven day averages on these grab samples were calculated to obtain the "Actual MLSS" to use in determining wasting rates for that day. Compared to the real average based on a grab sample, then, potentially was a cause for performance inconsistencies.

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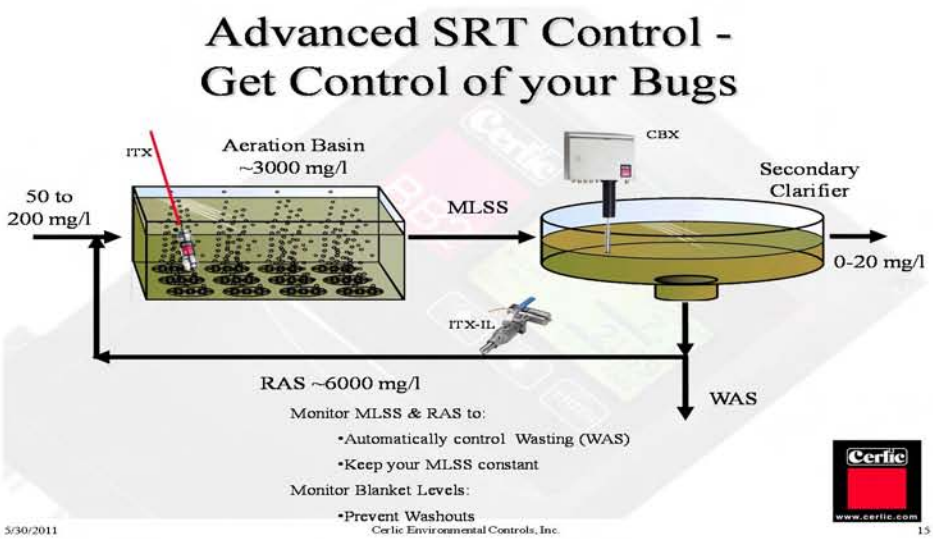
MLSS seen in the basins, the grab sample taken anytime in this 3 hour span could be +/- 15%. The variation in RAS was 40%. Adjusting wasting rates Manually adjusting mixed liquors through WAS flows have always been somewhat of an art and a time-delay reactive procedure; Therefore utilizing an instrument that could provide real time MLSS data to automatically control mixed liquors was the reliable and repeatable installation for MLSS measurements with improved efficiencies and reduced costs.



CERLIC SUSPENDED SOLIDS FAMILY

ITX– Suspended Solids Meter

Enables Advanced SRT Control

- Application
  - MLSS,RASS CSO, influent, Lab
- Low Maintenance
  - Wide 3/4" Gap between lenses
  - Automatic flushing
- Ease of use
  - Zero calibration in water
  - Up to 5 point calibration
  - Annual Calibration

ITX– IL In-line TSS Meter

- Application
  - Return Activated Sludge RAS, Filter Backwash
- Features
  - In-Line installation
  - Up to 90 psi
  - Blow out resistance design
  - Automatic Flushing
  - 15mm gap
  - Wide measuring range
- Ease of use
  - Zero calibration in water
  - Simple Calibration from lab test

CTX– Suspended Solids Meter

- Application
  - Final Effluent
  - Secondary Clarifier
- Low Maintenance
  - Self Cleaning Brush System
- Ease of use
  - One point calibration from Lab

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Professional Services

Hydroflo Controls Ltd has been in business in Canada for over 25 years. We have the technical experience to assist in technical design and calibration and commissioning.
Additionally we can assist in service and repair of all our installations.

CONCLUSION

- The use of on-line suspended solids probes can greatly enhance process control in activated sludge systems.
- On-line MLSS improves reliability and stability of processes.
- Cost of probe installation operation & maintenance is far less than manual collection of samples. Lab analyses, and subsequent calculations and manual equipment adjustments.
- MLSS control will give immediate payback by reducing process variability.

WHY INVEST IN CERLIC?

- Cerlic has been developing, manufacturing and implementing measuring and control instrumentation since 1977.
- Their instruments for on-line measurement and control are characterized by high degrees of quality, functionality and user-friendliness to provide information you can trust.
- Cerlic has contributed to improved process control, reduced production costs and increased productivity in the waste water treatment process, pulp and paper as well as other industries in domestic and international markets.

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