Water Technologies & Solutions
case study

chemical feed automation and InSight* save customer 41% chemical costs

challenge

A food manufacturing plant in the United States pre-treated its wastewater with pH neutralization followed by dissolved air flotation (DAF), prior to discharge to a municipal water reclamation plant. With limited operator time available, the company had commissioned a new wastewater treatment plant, with a chemical feed system incorporating a SUEZ coagulant and flocculant under flow-paced automatic control. This was done knowing that the wastewater was highly variable in flow. However, it gradually became apparent that the suspended solids (TSS) and biological oxygen demand (BOD_5) loadings were independently variable as well, and so chemical demand varied independent of flow.

The variation made chemical control difficult and although effluent quality remained within agreed discharge limits, chemical costs had risen significantly. This mainly occurred because the operator, who was only assigned part-time to the wastewater plant, found it more effective to set the dosage for the higher influent turbidities expected each day and leave it at that setting for extended periods. Thus, overdosing was common. SUEZ was asked to suggest improvements to reduce chemical treatment costs.

solution

SUEZ and plant engineering personnel decided to evaluate the use of TSS/Turbidity real-time monitoring and use of that information for coagulant dosage control. This has been used before in feedback mode for trimming dosages, but suffers from the disadvantage of potentially being slightly behind the demand, due to the equipment retention time lag. It was decided to evaluate a new Turbidity/TSS meter installed in the neutralization tank before the DAF, in feed-forward control mode. All data was integrated into SUEZ's InSight monitoring system for near real-time visibility to plant and SUEZ personnel.

The SUEZ account manager conducted a series of field jar tests to develop the relationship between influent turbidity and KlarAid* coagulant demand. This data was converted into the control algorithm that was programmed into the SUEZ PaceSetter* Platinum controller.

The system was implemented in late 2012 and put into automatic control mode in June 2013.

results

The Figure on the next page displays KlarAid Coagulant usage during 2013. The automated dosage control system was implemented on June 12, 2013. The dotted green lines show the average usage rate for the two periods: January 11 to June 12 (before feed-forward turbidity control), and from June 12 to October 21 (after). Note that the Pacesetter controller also continuously adjusted feed rate for variations in flow, aiming to maintain the PPM dosage target set by the influent turbidity (from earlier jar testing).

The data shows that average usage before automation was 36 gpd, while afterwards it was 21 gpd. This represents a 41.6% reduction in usage, and thus treatment costs.

A conclusion on success or otherwise of the chemical control system cannot be made without reference to the treated water quality. It could be

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counter-productive to just turn down the chemical dosage, if the effluent quality suffers and becomes unacceptable. Therefore, data was also collected on effluent quality before and after automation.

The main parameter of interest to the plant was effluent BOD. The agreement with the receiving POTW was a limit on pounds/day of BOD and an agreed surcharge related to amount. SUEZ tracked effluent COD routinely as an indicator of BOD. A previous relationship between BOD and COD had been determined and this was used to calculate BOD. To compensate for changes in flow, the BOD ppm data was converted into pounds/day. Comparing the same periods in 2013 as above, the average BOD discharge did not change significantly (0.1% difference). Thus, the conclusion was that the reduced coagulant usage had no deleterious impact on effluent quality and thus BOD surcharges.

conclusions

SUEZ implemented a comprehensive automation solution involving a complete engineering audit and implementation of:

- Chemical demand vs turbidity measurements via field jar testing
- On-line turbidity monitoring of influent wastewater
- SUEZ PaceSetter control with 2 inputs (flow and turbidity), and 2 control outputs (coagulant and flocculant feed)
- SUEZ InSight data monitoring and analysis in near real-time for plant and SUEZ personnel

This comprehensive solution resulted in a 41% chemical savings, without sacrificing effluent quality.