ECD ELECTRO-CHEMICAL DEVICES

Case Study: Chlorination of Reclaimed Water

Water Plant Improves Accuracy of Chlorine Analyzers and Reduces Maintenance Costs at the Same Time

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In the current economic climate with tight municipal water treatment budgets, the cost of maintaining chlorine analyzers that operate accurately and reliably is a constant concern. The expense of analyzer consumable supplies and their replacement by technicians drains dollars and staff time away from other critical tasks. Responding to these issues, one analyzer manufacturer has developed an innovative approach that improves measurement accuracy while at the same time reducing the cost of maintenance and supplies.

The Problem

Water is an invaluable resource in most of the southern and western United States. Many communities are reclaiming wastewater to supplement their water supply. A large scale wastewater treatment plant of a major US city processing up to 30 million gallons of wastewater per day diverts some of the wastewater entering the plant to produce *reclaimed water*. The wastewater undergoes a series of treatments that include sedimentation, aeration, clarification and chlorination in order to purify and disinfect it. Following the secondary clarification, some of the water undergoes tertiary filtration, demineralization and disinfection. After chlorination the reclaimed water is mixed with the demineralized water to lower the salinity and is then distributed for irrigation, landscaping and industrial use supplementing the region's water supply.

Residual chlorine is measured in the wetwell following the chlorine contact tanks just prior to the pumping and distribution of the reclaimed water. Iron and manganese precipitate out of the water coating all of the wetted surfaces of the chlorine analyzers. This coating decreases the signal from the chlorine sensor which must be periodically cleaned to restore proper function. Grab samples are analyzed daily with a handheld DPD based meter to verify the performance of the online analyzers. The existing reagent based chlorine analyzers show a marked deviation from the grab sample readings after a few days which required the analyzers to be shut down, cleaned and calibrated.

The Solution

In order to eliminate the reagent requirement, minimize the maintenance time and improve the accuracy of the residual chlorine measurement the municipal water plant agreed to evaluate the ECD TCA-22 Total Chlorine analyzer to solve their problems. The TCA-22 is a reagent-less, panel mounted measurement system that includes a constant head flow controller, an amperometric chlorine sensor with flow cell, a pH sensor with flow cell and a Model C22 two channel controller. Each TCA-22 system is started up, run for 24 hours and calibrated at the factory before shipment. In most cases, this factory calibration allows the system to be started up by the customer without a need for further calibration.

The ECD TCA-22 chlorine analyzer replaced the high maintenance analyzer and was mounted on the existing rack. Connections to the ¼ inch NPT sample line and ¾ inch NPT drain line were made, the 4-20 mA output was connected to the DCS and the analyzer was powered up with 110 VAC. After a 2 hour on line stabilization time, the amperometric chlorine sensor was ready for a calibration check. The initial readings from the analyzer were close to the grab sample values so the analyzer was allowed to run the recommended 24 hours before calibration. The calibration was checked the next day and still found to be within tolerances. Verifications were run daily to determine whether the iron and manganese deposits would affect the sensor performance. The deposits did cause the chlorine sensor to drift to lower values just like the existing system. The performance was restored by simply wiping the front end of the sensor with a soft cloth. To eliminate this cleaning requirement an automatic spray cleaning option was suggested to and accepted by staff.

All ECD Chlorine systems offer a spray cleaning option. A periodic timer in the C22 analyzer triggers a relay that actuates a solenoid valve for 30 seconds to flush the sensor tip with high pressure water. The turbulent water cleans the sensor and flushes the deposits down the drain line. The C22 analyzer holds the outputs at the last value during the cleaning cycle and returns them to normal function 1 minute after the cleaning cycle ends. The TCA-22 system was retrofitted with a new flow cell tapped for the spray cleaner, a solenoid valve was added and the timer and hold functions were implemented in the C22 controller. The system was reinstalled and the evaluation period was restarted.

The automated water spray cleaner both eliminated the drift problem and minimized the maintenance requirements of the system. Once the spray cleaner was installed on the TCA-22, the system maintained a reading within 10 % of the grab sample DPD measurement for several weeks at a time. The typical readings over the 90 day period were between 2.0 ppm and 10.0 ppm total residual chlorine. The TCA-22 readings were found to be more stable and accurate than the readings from the existing online reagent based chlorine analyzers when judged versus the grab sampled DPD measurement over the 90 day trial. After the successful evaluation, the municipal water plant has been replacing their total chlorine analyzers with the ECD Model TCA-22.

Conclusions

The ECD TCA-22 Total Chlorine Analyzer System, which features a reagent-less design elimates the reagent costs and associated labor common to many chlorine analyzers. In addition, the TCA's self cleaning spray module improves accuracy while reducing inspections and maintenance by technicians. The supply and labor cost-savings can be directed toward more critical plant needs or upgrade projects.