

Reliable Monitoring of Fluoride Addition in Finished Drinking Water

Problem

Frustrating and unreliable grab sample testing and existing online instrumentation made setting chemical feed rates accurately a challenge for facility operators, disrupting operations and requiring too much maintenance effort.

Solution

After reviewing the EZ Series solution and online measurement alternatives provided by the Hach team, the utility purchased the EZ3507 fluoride analyzer with standard addition measurement method. This model was chosen to provide very accurate measurement, rigorous uptime, and automatic replenishment of the electrode filling solution.

Benefits

Robust instrument performance and streamlined preventative maintenance routines have significantly reduced the frequency of maintenance interventions. The Kerr Lake WTP staff also anticipates that fluorosilicic acid usage and purchasing cost will be reduced by eliminating the overdosing that was previously caused by inaccurate fluoride concentration measurements.

Background

The Kerr Lake Regional Water System (KLRWS) is located in the City of Henderson, NC and provides water to approximately 50,000 customers. The Kerr Lake Regional Water Treatment Plant (WTP) is a 10-mgd facility with capacity for 15 MGD and average daily production of 7.0 MGD. The water source for the treatment plant is Kerr Lake. The facility is a conventional treatment system, consisting of coagulation, flocculation, sedimentation, and filtration processes. Aluminum sulfate is the primary coagulant with polymer used as an aid, and liquid hypochlorite is used for disinfection.

To promote public health, fluoride is added to finished water at a residual concentration of 0.7 mg/L F⁻. Both online and lab measurement of fluoride is utilized to ensure consistent results. Measurements with both methods must compare within 0.1 mg/L of each other. Operators use a manually adjusted peristaltic pump to dose fluoride (fluorosilicic acid) at a feed rate that is based on raw water flow. Future plans at the facility include a new dosing mechanism that can adjust based on measured fluoride concentration.

The facility's monitoring approach was robust, but limitations with current measurement technology created problems for the staff:

- Unreliable grab sample testing in the laboratory made setting the chemical feed rate accurately a challenge
- Frequent calibration, maintenance issues and downtime with the existing CA610 analyzer required significant staff time to maintain and troubleshoot, often times without resolution
- Existing instrumentation required multiple analyzer replacements causing additional frustration and disruption to operations

Additionally, the treatment plant staff wanted to increase their margin of safety by identifying and installing a reliable online analyzer that helps to avoid over-dosing of fluoride, causing excursions and potential regulatory violations.

Fluoride Addition in Finished Drinking Water

Solution Details

The customer followed the installation and commissioning recommendations from Hach which lead to a successful startup and high-performing analyzer with the following specifications:

- Single stream instrument to monitor finished drinking water leaving the plant
- Analyzer range of 0.25 to 5 mg/L Fluoride covering the normal range (and higher if needed) of fluoride dosing typically seen in North America
- Analog communication with 4-20 mA output for SCADA integration
- Installed just outside the control room above the clear well, which is the source of sample being measured

Conclusion

The Hach® EZ3507 Fluoride Analyzer provides valuable uptime and accurate online measurement making plant operation more efficient. Following startup and commissioning, the EZ3507 fluoride analyzer was so accurate when compared to the laboratory results that the staff thought that the online analyzer was initially not functioning properly. However, after investigating and validating each method they determined that the EZ Series analyzer was much more accurate, reliable, and stable due to the automated validation and measurement steps. In fact, this side by side testing helped uncover performance issues with the lab method and electrode. The plant staff have also realized these additional benefits:

- Reduction of time required to collect frequent grab samples and to climb stairs to adjust the dosing pump.
- The facility is also saving money by reducing the number of service visits and spare parts purchased that were required to keep old instrument technology running in the plant. The Hach Service Agreement on the new EZ3507 analyzer provides a fixed budget line item expense because repair and replacement part costs are capped, and service visits are already paid for (both are included in the Warranty Plus service agreement).

The EZ3507 Fluoride Analyzer has been a very accurate, reliable instrument that has enabled the Kerr Lake Water Treatment plant to achieve its operations and maintenance goals. Receiving around the clock fluoride concentration data while requiring minimal maintenance makes the analyzer a valuable process management tool for the plant staff.



EZ3507 Analyzer installed to monitor fluoride concentration in finished drinking water.

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