

Measuring Total Organic Carbon (TOC) in Steam Cycle Water

Problem

Nishatur Rahman of NAES Corporation, needed a reliable onsite analyzer for low levels of total organic carbon (TOC) in order to ensure his boiler water chemistry met his TOC specification of < 100ppb.

Solution

Nishatur purchased a Hach QbD1200 TOC analyzer to measure low range grab samples for (TOC).

Benefits

The Hach QbD1200 measures TOC accurately throughout a range of 0.4 ppb -100 ppm. Having an on-site analyzer allowed Nishatur to get the results he needed without waiting for data from a contract lab.



Background

Organic Contamination

Organic contaminants may be introduced to the steam cycle through contaminated source water, condenser leaks, or via deliberate introduction as a form of chemical treatment. These compounds decompose in the boiler environment to form carbon dioxide and organic acids. Both of these species increase conductivity after cation exchange (CACE) measurements, confounding the utility of this measurement for monitoring sulfate and chloride. Organic acids can also lead to corrosion in the steam cycle. As a result, monitoring low levels of organic contamination via TOC analysis is an important aspect of maintaining high quality boiler water and minimizing corrosion.

Newark Energy Center

NAES Corporation provides operation service at the Newark Energy Center in Newark, New Jersey USA. The Newark Energy Center is a 655 MW gas-fired combined cycle plant. Waste heat is recovered from two gas turbines with two heat recovery steam generators (HRSGs), which in turn power a single steam turbine. Cooling water is treated effluent provided by the Passaic Valley Sewerage Commission.

Nishatur Rahman is the Auxiliary Operator/Water Treatment Operator for NAES Corporation at the Newark Energy Center. One of his responsibilities is ensuring that the boiler water chemistry meets the quality criteria. One of those criteria is that total organic carbon (TOC) must be less than 100 ppb in steam condensate and make-up water from the reverse osmosis (RO) system.

In the past, Nishatur had shipped samples offsite to a contract laboratory for TOC analysis. This process was time intensive. And it was a challenge to find a lab that had the capability to reliably measure at such a low concentration. He needed a sensitive and reliable TOC analyzer that he could operate on-site.

Solution

Hach QbD1200

From his previous experience, Nishatur knew that he wanted a TOC analyzer in his lab at Newark Energy Center. He specified the Hach QbD1200 TOC analyzer when the plant was commissioned in 2015. A history with Hach products convinced Nishatur that a Hach TOC analyzer was the right solution. Concerning his motivation for choosing the QbD1200 Nishatur said, "I have been using Hach instruments and chemicals over the past 20 years, and they are very accurate, reliable, and easy to use."

The QbD1200 TOC analyzer continues in that same Hach tradition, providing an accurate, reliable, and easy to use analysis for low range TOC samples. The QbD1200 incorporates an intuitive 10.4 inch touchscreen user interface for simple measurement setup and data analysis. Color coded reagent lines match directly to pre-made reagent solution bottles, minimizing mix-ups and spills. Calibration is automated to maximize analysis time, cutting calibration time to 90 minutes. Tubing and sampling design virtually eliminate carryover between samples.

The QbD1200 employs a powerful UV/persulfate digestion to convert organic carbon to carbon dioxide. First, the analyzer acidifies the sample, turning inorganic carbon to carbon dioxide. Carbon dioxide is sparged from the sample and measured via a nondispersive infrared detector (NDIR) as total inorganic carbon (TIC). Once the analyzer determines that all of the TIC has been removed from the sample, the organic carbon is oxidized to carbon dioxide with UV light and persulfate. This carbon dioxide is measured by NDIR as TOC.



Conclusion

Monitoring TOC

With a Hach QbD1200 TOC analyzer in his laboratory, Nishatur Rahman is easily able to monitor the organic content of his boiler water at Newark Energy Center. According to Nishatur, "It (QbD1200) helps to diagnose water chemistry problems in advance." Fast and accurate measurements throughout a broad range, including the specification of 100 ppb, give him the confidence that his process is under control.

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About the Customer

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