

Online Total Organic Carbon (TOC) Analysers for Industrial Wastewater: A Performance Evaluation



Overview of the ITA Test Report

5 Online TOC (Total Organic Carbon) Analysers were field tested at an industrial wastewater treatment plant: Gulf Coast Waste Disposal Authority (GCWDA), Bayport Facility. This facility has a capacity of 30 million gallons per day and treats industrial waste from approximately 65 customers, predominantly petrochemical.

The Test Site

The Field Test report states that TOC analysis, as an alternative to BOD₅, COD and TOD, is a more cost-effective, accurate and timely test with less interferences and the ability to provide process control and real-time monitoring.

Due to the diversity of customers that discharge to this plant, TOC concentrations can experience a large variation over a very short time. Concentrations range from 490 mg/L to 1,020 mg/L and occasionally a sample could contain high VOCs or high TSSs.

GCWDA conducts approximately 66 TOC analyses in their laboratory per day and use TOC measurements for two main reasons:

1. To monitor influent, conduct process control and detect waste loading upsets
2. To monitor wastewater characteristics of each customer

The evaluation of Online TOC Analysers by the GCWDA was due to their "... keen interest in the ability to continuously monitor TOC concentration in an industrial wastewater treatment application to benefit from having more timely information for enhanced process control and a reduction in labor requirements."

We would encourage any reader to obtain and read a copy of the full ITA report for more in-depth information: www.instrument.org



Accreditation

Biotector TOC analysis complies with the following standards:

- DIN-EN1484
- US EPA 415.1
- ASTM D5173: 97(2007) Standard Test Method for On-Line Monitoring of Carbon Compounds in Water by Chemical Oxidation, by UV Light Oxidation, by both, or by High Temperature Combustion followed by Gas Phase NDIR or by Electrolytic Conductivity.
- DIN 38409-H3
- ISO 8245



Test Background

Field tests were conducted from April to July 2011, a total of 17 weeks. The two main categories of evaluation were:

1. Laboratory Conformance

Measurements were used once each day to compare with online analyser measurements thereby demonstrating the overall ability and accuracy of the instrument when subjected to many fluctuating and challenging sample variations – as experienced in real-time monitoring conditions.

2. Instrument Performance

Test results also provide information regarding instrument design features, instrument support systems including sampling, conditioning and cleaning systems that play an important role in the performance, reliability and maintenance requirements of an analyser in industrial applications.

The TOC analysers experienced situations including power outages, personnel changes and severe weather conditions which allowed the test to observe and note how each analyser held up to real-life application.

The Result

The ITA did not state conclusively which analyser had shown greatest accuracy and reliability after the test, stating that the report "... does not conclude or select one instrument over the other since each treatment facility's circumstances will determine the selection of the best instrument for their application".

However, two months after completion of the test, GCWDA placed an order for the Hach® Biotector B7000 at their Bayport facility. Biotector is the only Online TOC Analyser installed at this facility.



Performance Overview

Hach Biotector B7000 was clearly the best performer in both categories of evaluation attaining both the highest laboratory conformance and lowest maintenance requirements in the group of 5 online analysers.

1. Laboratory Conformance

The Hach Biotector B7000 performed best in the group for this category – 21.2 percentage points above the group average.

However, our accuracy levels would typically be much higher. Our analysers give a consistently high performance in harsh applications with the unparalleled combination of 99.86 % MCERTS certified uptime and typical accuracy and repeatability of better than $\pm 3\%$ of reading. Factors affecting accuracy levels during this test were:

Blockage At the Bayport facility

There was a build-up of sludge in the site that would occasionally cause the external sample pipe to clog and cut off the sample flows to all analysers. When this occurred, the Hach Biotector B7000 analyser detected it and logged it in the data file. Therefore the analyser gave some low readings due to insufficient sample volumes.

Filtration

The outliers above the upper control limit are potentially due to the fact that, with large bore tubing of 3.2 mm (where many others typically use 0.5 mm to 0.8 mm), the Hach Biotector B7000 can include particulates in the measurement therefore making it a more representative result. Many laboratory measurements use filters to prevent these particulates from blocking their analysers and accuracy can, therefore, be diluted.

2. Instrument Conformance

Hach Biotector B7000 performed best in the group for this category also. Our maintenance requirements were the lowest in the group – 62 % lower than the group average. We would typically experience even less maintenance events on our client sites where a Hach Biotector Analyser requires only one routine service every 6 months.

4 of the 7 maintenance events recorded were to change the Reagents

Due to the regularly high TOC levels in this sample stream, the Bayport team changed Reagents every 3 weeks. Since this test in 2011, our analysers have been further enhanced to require lower Reagent use.

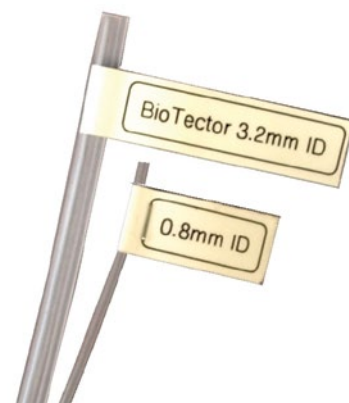
The remaining 3 maintenance events related to replacing the sample tube in the sample pump

As the full report details, the site sample was quite difficult and contained high levels of volatiles. So, as a precaution, the engineer replaced this tube once each month. It was best to be cautious, changing the tube once a month was a simple 5 minute exercise and overcame the possibility of a tube splitting due to unusually harsh samples. It is extremely rare to require a tube change more frequently than our recommended 6 month interval.

Hach Biotector B7000 maintenance events relate to consumables rather than actual system failures. The full ITA report details issues encountered by the other 4 analysers including clogging, leaks, calibrations and, in one case, changing their failed CO₂ analyser.

This overview is just a snapshot of the rigorous four-month testing process conducted at the Bayport Facility. We would strongly recommend reading the full ITA Report in order to benefit from the detailed observations of the ITA and GCWDA during this field test: www.instrument.org

Biotector technology allows for larger sample tubing than other TOC analysers.



Winner of the Frost & Sullivan “Product Leadership Award USA 2012” in water and wastewater analytical instrumentation.

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