

# Online Total Organic Carbon Analyzers for Industrial Wastewater: A Performance Evaluation



## Overview of the ITA Test Report

Five online total organic carbon (TOC) analyzers 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 (MGD) and treats industrial waste from approximately 65 customers, predominantly in the petrochemical industry.

## The Test Site

The field test report states that TOC analysis, as an alternative to biological oxygen demand (BOD<sub>5</sub>), chemical oxygen demand (COD), and total oxygen demand (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 volatile organic compounds (VOCs) or high total suspended solids (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 analyzers by the GCWDA was due to its "... 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."

*Note: We would encourage you to obtain and read a copy of the full ITA report for more in-depth information: [www.instrument.org](http://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 analyzer 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 analyzer in industrial applications.

The TOC analyzers experienced situations such as power outages, personnel changes, and severe weather conditions. These circumstances allowed the facility to observe and note how each analyzer held up to real-life application.

### The Result

The ITA did not state conclusively which analyzer 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 analyzer installed at this facility.*



## Performance Overview

The 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 five online analyzers.

### 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 analyzers 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 buildup of sludge in the site that would occasionally cause the external sample pipe to clog and cut off the sample flows to all analyzers. When this occurred, the Biotector B7000 detected it and logged it in the data file. Therefore, the analyzer 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), 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 analyzers and accuracy can, therefore, be diluted.

### 2. Instrument Conformance

**The Biotector B7000 performed best in the group for this category also. 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, as a Hach Biotector analyzer requires only one routine service every six months.**

*Four of the seven 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 three weeks. Since this test in 2011, our analyzers have been further enhanced to require lower reagent use.

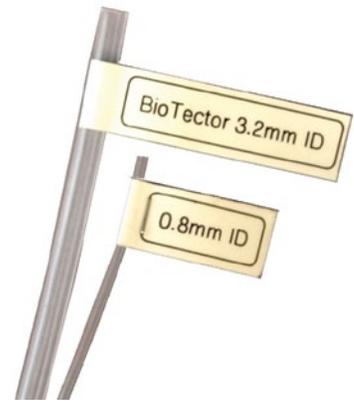
*The remaining three maintenance events related to replacing the sample tube in the sample pump.*

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 five-minute exercise and removed 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 six-month interval.

Biotector B7000 maintenance events relate to consumables rather than actual system failures. The full ITA report details issues encountered by the other four analyzers including clogging, leaks, calibrations, and in one case, changing the failed CO<sub>2</sub> analyzer.

*This overview is just a sample of the rigorous four-month testing process conducted at the Bayport facility. We would strongly recommend reading the full ITA Report in order to gather the detailed observations of ITA and GCWDA during this field test: [www.instrument.org](http://www.instrument.org)*

**Bioreactor technology allows for larger sample tubing than other TOC analyzers.**



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

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