

RELIABLE ON-LINE TOC ANALYSIS FOR DIFFICULT APPLICATIONS

Shell Pernis selects the BioTector B7000 TOC Analyzer after six-year search

Overview

After six years of searching, Shell Pernis, Rotterdam selected the BioTector B7000 TOC Analyzer for its difficult online application. The BioTector B7000 uses a unique oxidation method, based on hydroxyl radicals. Its proven ability to operate successfully, even in the most difficult applications, sets it apart from other TOC analyzers currently on the market.

The Project

The Shell project started in November 1993 and had as its directive the identification of a Total Organic Carbon (TOC) analyzer that would give reliable results in an application having both high calcium and high salts concentrations. Most of the instruments that were tested failed after only a few hours operation as a result of these conditions. In mid-1996, the BioTector was taken for testing and to Shell's surprise continued to run where all other analyzers failed. Further tests were carried out and the BioTector was approved in July 1999 as the only instrument that successfully met Shell's stringent requirements.

The tests were carried out at a Shell epichlorohydrin (ECH) processing facility. ECH is an intermediate product made from cracked oil – ECH strippers are used in the manufacturing process. Effluent from the strippers is monitored online by the BioTector TOC analyzer. The effluent contains a mix of particulate components, together with Cl-based chemical structures – a difficult combination for any TOC analyzer.

The standard procedure for TOC measurement has as its first step the removal of all inorganic carbons (IC), leaving only the organic carbons (OC) in the sample. This is normally achieved by lowering the pH in the sample and using a stripper gas to remove the CO₂ that is formed.

Normally, the BioTector uses sulphuric acid (H₂SO₄) to remove the IC. Sulphuric acid, however, reacts with calcium to form gypsum (CaSO₄), which builds up into a stone-hard sediment within the analyzer. To avoid this, for the Shell application the BioTector uses hydrochloric acid (HCl).



High concentrations of salts and the use of hydrochloric acid combine to create a highly aggressive environment. To avoid corrosion of the stainless steel reactor standard in the BioTector, a new reactor made of Teflon PFA (per fluor alkoxy) was specially developed for Shell and is now commercially available as an optional feature of the BioTector.

The BioTector was further fitted with an air purge system and certified for EExp Zone 2 use as it was to be installed in a hazardous area.



The Results

In July 1999, final tests on the BioTector's online operational reliability and accuracy were completed and the BioTector TOC analyzer was approved as the recommended system for Shell.

The testing and resultant modifications of the BioTector developed in co-operation with Shell took 3 years. The experience gained from the tests and the modifications introduced have resulted in a superior product to the benefit of all users of online TOC analyzers worldwide. The Shell project proves that it is possible to carry out reliable online TOC analysis even in the most difficult industrial environments.

More information on the BioTector B7000 can be found online at www.hach.com/B7000.

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