Strategic Role of the Shimadzu TOC-4110 and 4110C in the Coming On-line Analyzer Market

EPA begins to regulate ambient water

The EPA has recently proposed to redefine “navigable waters of the United States” to include tributaries and wetlands (Proposed Rule – Federal Register / Volume 79 No. 76 Monday April 21, 2014, pp 22188). The EPA is also requiring that states establish ambient water maximum contaminant levels for nutrients and other pollutants. (http://cfpub.epa.gov/wqsits/nncc-development)

- The EPA currently regulates point sources

The USEPA issues NPDES permits to regulate point sources that discharge pollutants into “waters of the United States”. Point sources are pipes or man-made ditches that convey industrial or municipal wastewater directly into “navigable” surface waters. Unlike pollution from industry or municipalities, non-point source pollution is caused by rainfall or snowmelt moving across or through the ground. As the water moves, it carries with it man-made or natural pollutants and deposits them into “navigable waters of the United States”.

In a recent EPA unpublished report, the EPA connects the influence of intermittent and/or perennial tributaries on the physical, chemical, and biological properties of “navigable” waters. The report also notes the role wetlands play in the removal of excess nutrients, as a breeding ground for aquatic life, and as a sink for the accumulation of sediment, nutrients, and environmental pollutants. These smaller tributaries function as nutrient sources. While nutrients are essential to support life, excess nutrients lead to eutrophication and dead zones. Thus, the role of the tributary nutrient loading has a significant impact downstream.

- Regulation of point sources did not lower nutrients or prevent dead zones

EPA has determined that revised water quality standards are necessary to help control the nutrient load of US waters. These new standards will establish maximum allowed nutrient concentrations for various water bodies based on type and designated use. After 40 years of regulation at the end of a pipe, the nutrient concentrations in streams, rivers, and lakes are still high and the size of dead zones in the Chesapeake Bay and Gulf of Mexico are increasing. EPA will eventually require States to establish and meet numeric ambient water quality criteria regulating the concentration of nutrients and other contaminants.

- On-line analysis is needed to reduce nutrients in ambient streams

Current EPA Clean Water Act (CWA) regulations require that chemical analysis for compliance monitoring be done using methods published at Code of Federal Regulations (CFR) Title 40 Part 136. These are laboratory methods that define sample collection, preservation, storage, extraction/digestion, analysis, and quality control measures that must be taken. Laboratory methods require that samples be collected and transported to laboratories for analysis and are biased low because sample collection occurs during good weather and nutrient loading onto streams mostly occurs during storm events; to accurately quantify and properly model nutrient loading, on-line (or in situ) analyzers are needed. (http://water.epa.gov/type/watersheds/monitoring/monintr.cfm)
Shimadzu 4110 and 4110C On-line Total Nitrogen, Total Phosphorus, and Total Organic Carbon Analyzers

Perfectly suited to fill EPA’s need to collect real-time ambient water nutrient concentrations.

- Unlike other on-line analyzers, the Shimadzu analyzers are capable of automatic multiple point calibrations and automatic analysis of quality control samples, making them fully compliant with EPA methods and CWA requirements for quality control.

- The 4110 is a complete system capable of pretreating, digesting, and analyzing the sample automatically; as a result, it saves time and labor, and eliminates errors associated with sample preparation.

- While the Shimadzu high-temperature oxidation with chemiluminescence detection method for total nitrogen is not yet EPA approved, we expect approval within the next five years.

- The TNPC-4110 measures total phosphorous by heated or UV persulfate oxidation followed by molybdenum blue absorptiometry. This technique is consistent with Standard Methods 4500-P E, an EPA approved method.

- The TNPC-4110 measures total organic carbon by the EPA approved high-temperature oxidation method SM 5310B.

Examples of current ambient water quality monitoring programs