SHIMADZU
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Application News

No.O53

Total Organic Carbon Analysis

TOC Monitoring Upstream of Paper Mill Wastewater Treatment Facility Using Online TOC Analyzer

At wastewater treatment facilities of various types of manufacturing plants, pollution load monitoring (upstream monitoring) is becoming increasingly important to ensure appropriate and stable operation and water pollution accident prevention. Activated sludge treatment methods widely used in wastewater treatment rely on such operational conditions as pollution load, MLSS, and amount of ventilation, etc., but among these, pollution load varies depending on the operating status of the plant, so continuous monitoring is essential.
Continuous and stable measurement of TOC in high-pollution samples such as the influent water in wastewater treatment facilities is not easy. In particular, paper mill wastewater, in addition to containing large amounts of pulp residue, provides an environment that facilitates microorganism proliferation. This leads to such problems as obstructed flow lines and the formation of biofilms at surfaces that are exposed to direct contact with these organisms, such as at water sampling points.
Here, using the online TOC-4200, we introduce an example of continuous measurement of paper mill wastewater having such characteristics.

Analytical Method

Paper mill wastewater flowing into an activated sludge treatment tank was continuously pumped at about 5 L/min into the single stream suspended solid sampling unit of the TOC-4200. The TOC-4200 was configured to operate continuously using the measurement conditions listed below. During the course of continuous TOC measurement, samples were collected at appropriate intervals and subjected to BOD measurement to monitor the ongoing relationship between TOC and BOD.

<Measurement Conditions>

Analyzer	:Online TOC-4200 (with single stream suspended solid sampling unit)
Catalyst	:Standard catalyst
Measurement items	:TOC (= TOC due to acidification and sparging)
Calibration curve	:1-point calibration curve generated using 1,000 mgC/L potassium hydrogen phthalate solution
Sample	:Paper mill wastewater flowing into activated sludge treatment tank
Measurement interval	:10 min
Sample dilution	:Both standard solution and sample solution measured following 10-fold automated dilution
Other	:Washing of water sampling tube using automatic backwash feature with dilute hydrochloric acid

Results

The industrial wastewater continuous measurement results are shown in Fig. 1, and the TOC and BOD measurement results are shown in Table 1 and Fig. 2.
Fig. 1 charts the transitions of TOC, and as is clearly recorded, there are sudden rises in pollution load (November 9 and November 14) and a temporary cessation of factory operation (November 13).
Also, as can be seen from Table 1 and Fig. 2, there is clearly a good relationship between the TOC and BOD of the plant effluent, with a correlation coefficient of R = 0.96.

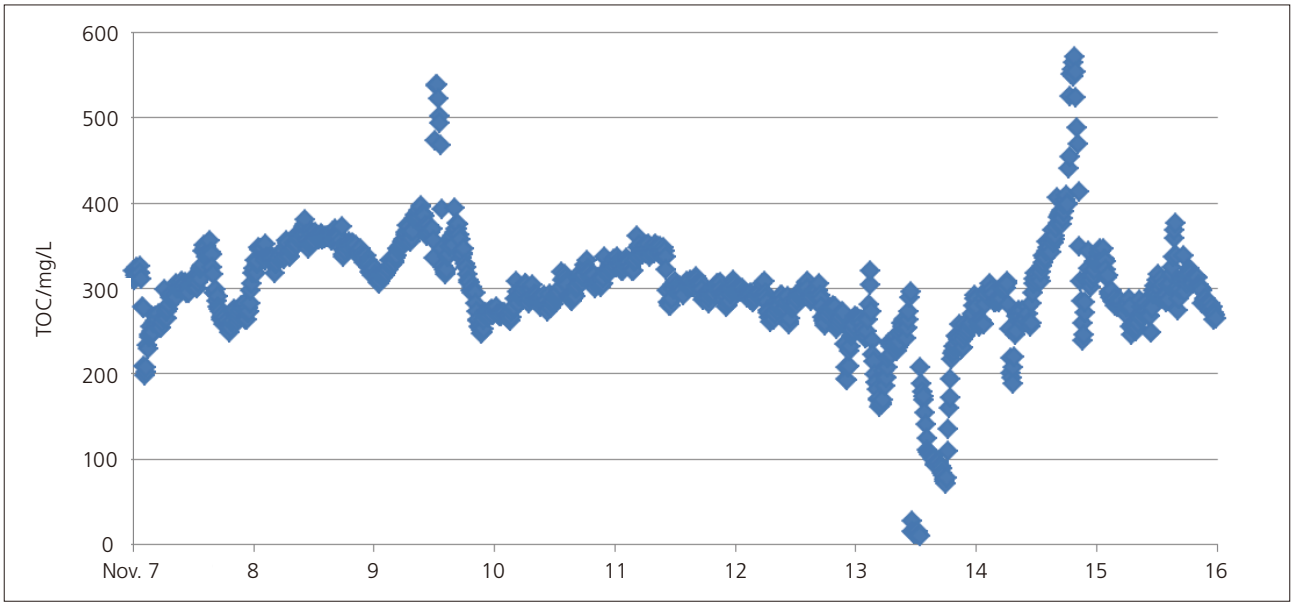

Fig. 1 TOC Measurement Results

Table 1 TOC and BOD Measurement Results

Measurement Date	TOC Measurement Value [mg/L]	BOD Measurement Value [mg/L]	BOD / TOC
November 7	306	569	1.86
November 10	283	552	1.95
November 11	337	676	2.01
November 12	296	624	2.11
November 13	255	528	2.07
	207	404	1.95
November 14	274	543	1.98

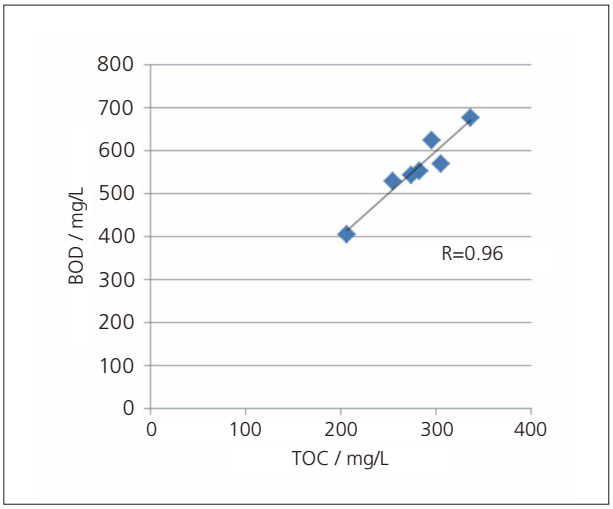

Fig. 2 Relationship Between TOC and BOD

SHIMADZU TOC-4200 Online TOC Analyzer

An online TOC analyzer, in addition to measurement performance itself, requires robustness, low maintenance, low cost, as well as extensive I/O functionality. In particular, robustness and low maintenance are considered to be the most important factors for conducting continuous measurements.

By equipping the TOC-4200 with a sample pretreatment unit designed to accommodate the sample characteristics, high robustness and low maintenance are achieved by minimizing sample flow line obstruction and reducing biofilm occurrence as well as carryover.

The TOC-4200 incorporates functionality for calculating load in response to signals from the flow meter, permitting its use also for water quality total volume control applications.

The TOC-4200 can be used for a wide variety of applications, including the following.

- Influent wastewater treatment, effluent water management
- Management of various types of plant water (washing water, cooling water, collected water, etc.)
- Management of boiler water and condensation water
- Advanced treatment management of water and sewage (raw water and treated water)
- Water quality total volume control applications (Organic pollution load management)

Fig. 3 SHIMADZU TOC-4200 Online TOC Analyzer with Single Stream Suspended Solids Sampling Unit

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