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TOC·TN APPLICATION NEWS No.11

Waste water management in accordance with ISO 14001 using the Shimadzu On-Line Total Organic Carbon Analyzer

In recent years, to avoid environmental risks and to promote continuous improvement to the environment, an increasing number of enterprises have been acquiring ISO 14001 accreditation. One of the activities for acquiring ISO14001 accreditation is the reinforcement of the controls on waste water for the reduction of harmful effect on the environment.
With respect to waste water from working facilities, each enterprise carries out measurements of regulated items in order to comply with the waste water standards. For example, organic pollution is the most general type of pollution produced not only by manufacturing process but also by normal day-to-day life. If large amounts of organic substances are discharged into public water systems such as rivers, lakes, reservoirs and seas, this can cause social problems such as water bloom, red tide and lack of oxygen, as well as unpleasant effect on the taste and smell of drinking water. This organic pollution can be easily measured by the TOC analyzer. Normally COD or BOD measurements are made, but these are time consuming manual analyses, and difficult to perform as continuous monitoring.
There is an example of using the Shimadzu On-Line TOC Analyzer for continuous monitoring of harmful organic pollution concentration in waste water to enforce environmental protection under the accreditation.

1 Application of TOC in waste water management for ISO14001

The following is as example of the application of the Shimadzu TOC analyzer for reinforcement of the environmental protection management (see Fig. 1).

1.1 Management of discharged water (Point 1 in Fig. 1)

Continuous monitoring of the treated water (specified discharged water) from the treatment facility to ensure that it falls within self-restricted values.

1.2 Management of the influent to the treatment facility (Point 2 in Fig. 1)

To discharge cleaner water (water with less environmental impact), it is necessary to reinforce controls and management of waste water treatment. In particular, when several sources of waste water (plants and manufacturing processes) exist, the following merits are expected by continuous monitoring of the TOC from each source:

(1) Work load of the treatment facility can be always kept at the optimum level.
(2) When there is a sudden increase in the pollutant concentration due to an accident, immediate reaction, such as stopping water supply to the treatment facility, can be taken to prevent environmental pollution.
(3) Countermeasures against reoccurrence can be taken by specifying the source of the accident.
(4) Reduction of waste water treatment agents.
(5) Deterioration time of adsorbents such as chelate resin and activated carbon can be specified.

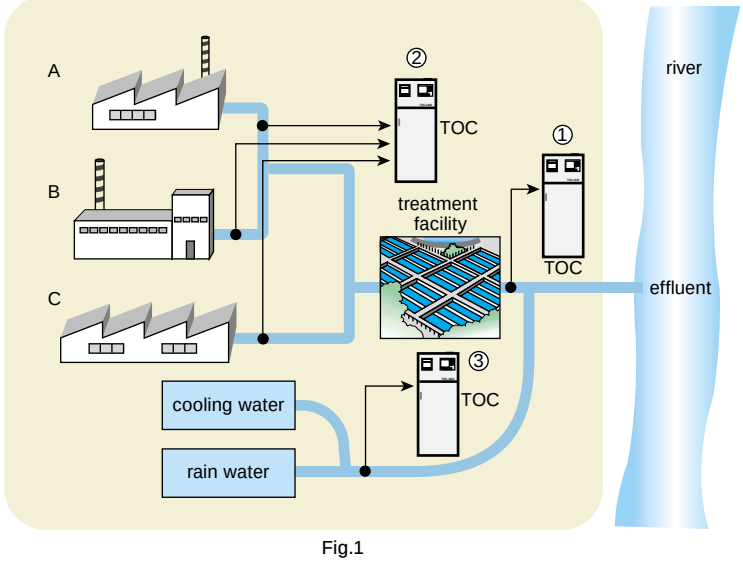

Fig.1

1.3. Management of rain water and cooling water (Point 3 in Fig. 1)
Rain water and cooling water are primarily assumed not to be soiled and is often discharged untreated into public water systems. However, it may be polluted by passing through pumps with organic solvents or oils, by leakage from pipes or reservoir tanks, or by careless operators or mistaken procedure, thus polluting the environment when it is discharged containing high concentrations of organics.
By continuously monitoring the waste water drains, such accidents can be detected early and treated.
Now, when the Shimadzu TOC-4100 multiple flow path switcher is added, up to six streams can be automatically switched and analyzed, so just one device can be used for all three applications - effluent, influent, and rain and cooling water.

In the Shimadzu On-Line Water Quality Analyzer 4100 series, there are, in addition to the TOC-4100 for measuring TOC, the TN-4100 for TN (Total Nitrogen) measurement in waste water and the TOCN-4100 for simultaneous measurement of TOC and TN, so you can choose the analyzer best suited for your needs.

2 Continued improvement of environmental performance (results of actions)

ISO14001 requires yearly enhancement of the environmental performance by improving each element of the management system (PDCA).
The Shimadzu On-Line TOC Analyzer has an abundance of options and can be used in a wide range of applications to satisfy this requirement, helping to acquire high evaluation in external auditing.

For example, the expandability of the TOC-4100 is utilized as follows; Installation of the TOC-4100→Adding the TN measurement function→Adding the multiple sample switching unit to continuously monitor the effluent sources→Increasing measurement points.

Please discuss with us any other potential applications.

3 Management of discharged water at a plant

Here we present an example of the Shimadzu On-Line TOC Analyzer being used to measure TOC concentrations in the influent (source water), effluent and at other points in a pharmaceutical manufacturer's waste water processing facility (Fig. 2).

Comparisons with Conventional Methods

Using conventional methods, the COD and BOD of the effluent were manually measured, but it was not very effective because the process was complicated and time consuming, and could only be performed a few times a day maximum. Using the Shimadzu On-Line TOC Analyzer, the measurements can be performed in a minimum of 4 minutes, so the continual monitoring of the effluent be carried out quickly and easily.

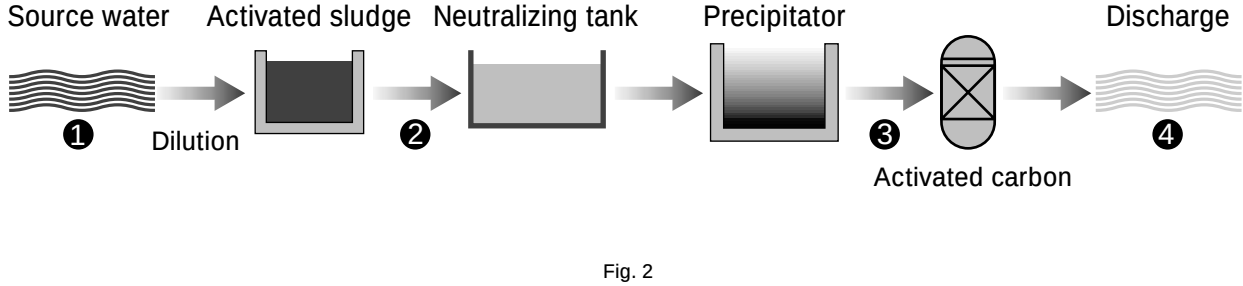

Fig. 2

Measuring Conditions

Sample : ❶ Influent (source water), ❷ Inlet to neutralizing tank, ❸ Inlet to activated carbon adsorption tower, ❹ Effluent (Sampling points ① - ④ in Fig. 2)
Used analyzer : TOC-4100
Item to be measured : TOC (acidification - sparging)

Results

The measurement results are shown in Fig. 3.

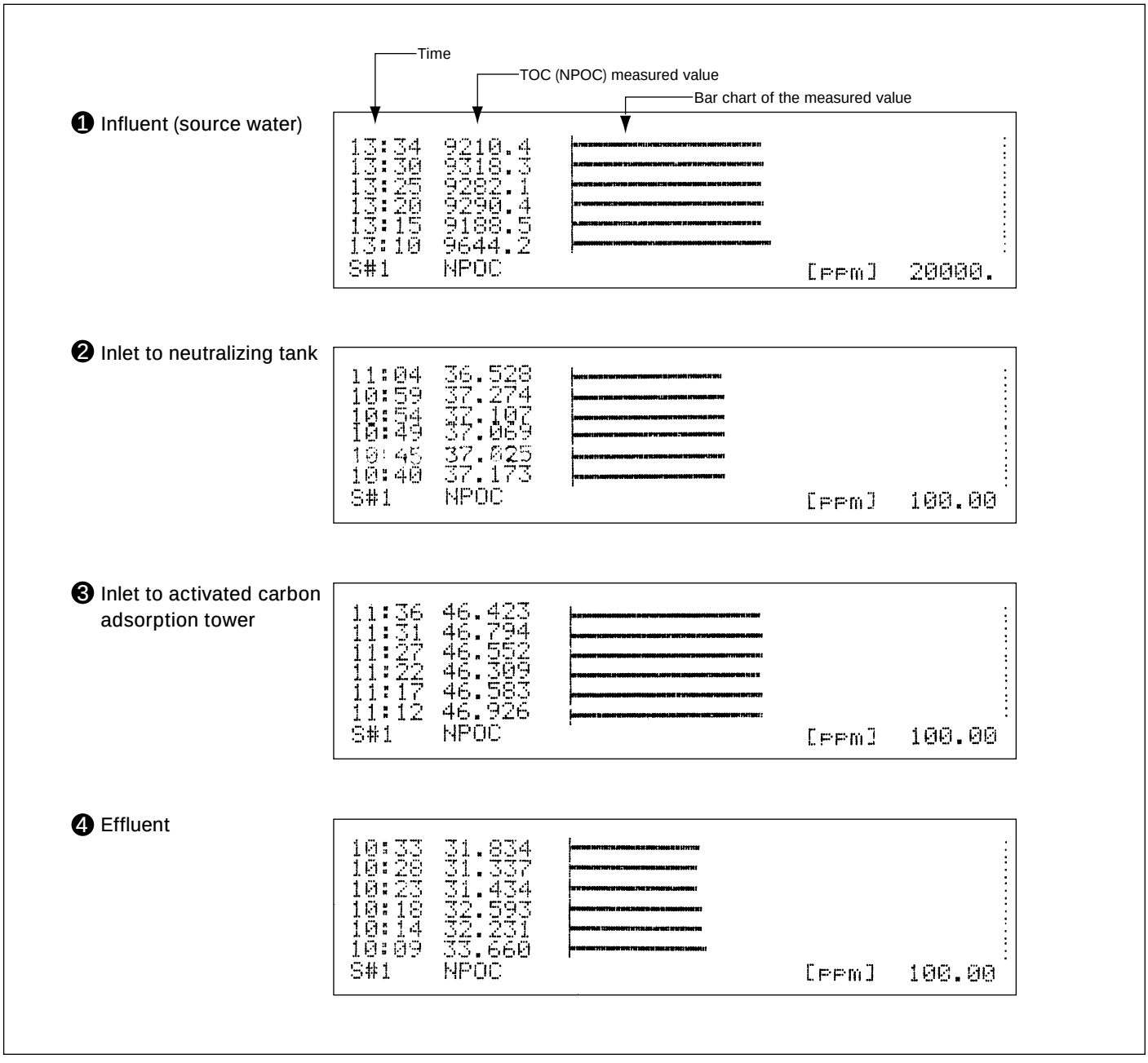

Fig. 3 Measurement data

Features of the Shimadzu On-Line Water Quality Analyzer 4100 series

- ¥ Continuous measurements of TOC and TN are possible.
- ¥ A single device can be used to analyze multiple streams.
- ¥ POC (purgeable TOC) can be measured (optional).
- ¥ Measurement schedules, including automatic calibration and catalyst regeneration, can be freely set.
- ¥ By using compressor air or instrumentation air, gas cylinders are no longer required, thus removing the need for laborious cylinder changes as well as lowering running costs.
- ¥ A variety of input/output functions are provided, such as remote operation and transmission of measurement data.

Rapid and accurate measurement of total organics and total nitrogen in water

Shimadzu On-Line Water Quality Analyzer

4100 series

TN-4100
TN measurement

TOCN-4100
TOC & TN measurement

TOC-4100
TOC measurement

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