Maintenance of Good Water Environments by Wastewater Treatment and Evaluation of Sustainable Wastewater Treatment Methods

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Keywords: coliform count, coliform group count, energy consumption, nitrogen removal, reclaimed wastewater

1. Introduction

Sewage systems greatly contribute to the maintenance of a good water environment, and for that purpose, the removal of harmful microorganisms, organic matter and nutrient salts in sewage is important. Moreover, efforts to reduce energy consumption related to wastewater treatment are important for achieving a sustainable environment. This division is conducting research and studies from various viewpoints into the maintenance of a good water environment by wastewater treatment.

2. Study on introducing new hygienic indexes to wastewater treatment facilities

"Coliform group count" has been used as an environmental standard for water quality and as a hygienic index for final effluent from wastewater treatment facilities since it allows for easy and cost-saving measurement. However, its validity as an index of fecal contamination is pointed out to be low mainly because of contained bacteria of soil origin. At present, surveys and studies on reference values are proceeding in order to change the index used in the environmental standard for water quality from a rough coliform count to measurable E.coli count." Therefore, the need is growing for studies into changing the index to E.coli count also for effluent

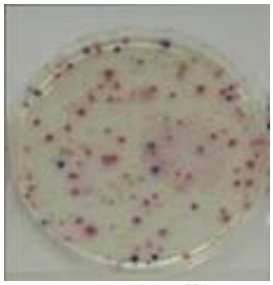

Photo: Appearance of Coliform Colonies (Blue: E.coli count, Red: Coliform group count (except E.coli))

The NILIM is conducting a survey to grasp the E.coli count in effluent, variations thereof by season and time of day, the effect on measurement values due to the difference among multiple measurement methods, etc. The survey has so far revealed variations in the measured E.coli count according to the measuring method used for final effluent. Variations according to seasons or time of day were not clearly seen. These results are to be utilized to study the methods for measuring E.coli count.

3. Study on reduction of energy consumption related to nitrogen removal

Since energy efficiency in nitrogen removal is low in small-scale wastewater treatment facilities, we studied whether energy consumption could be reduced in the whole drainage basin by integrating the pollution load removal and associated energy consumption of multiple wastewater treatment facilities in the same basin into a large-scale wastewater treatment facilities. Using the Sewage Statistics in Japan (note), we organized the relationship between energy consumption (kL/day), obtained by converting into quantity of heavy oil from electric power used in wastewater treatment facilities for water treatment, and the nitrogen removal load (tN/day). And we developed formula showing the relationship between the nitrogen removal load (tN/day) and the energy consumption (kL/tN) per unit removal amount, since energy efficiency changes according to the scale of the facilities. With this formula, we calculated energy consumption in five small and large treatment facilities in the model drainage basin, and studied whether it is possible to reduce energy consumption while ensuring the amount of removal by concentrating nitrogen treatment in a large facility. As the result, it was estimated possible to reduce 16% of the energy consumption required for water treatment in the whole drainage basin.

4. Evaluation of energy consumption related to reclaimed wastewater supply

Reclaimed wastewater from sewage is a valuable water resource available even in times of drought. Since the utilization of reclaimed wastewater needs to consider energy consumption, we are studying reclaimed wastewater processes that minimize energy consumption. So far, we have found that, when a large amount of energy is consumed to convey reclaimed wastewater, there is room to reduce consumption by screening supply areas. We are proceeding to evaluate energy consumption and life cycle CO_2 assessment related to reclaimed wastewater supply.

[Reference]

"2009 Sewage Statistics in Japan", Japan Sewage Works Association, June 2011