Promotion of Water Treatment Technology Considering Risk Control in Energy Optimization

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1. Introduction

The Wastewater and Sludge Management Division of NILIM has been conducting researches and studies on drainage from sewage treatment facilities from various viewpoints, including water quality, energy, cost, and hygienic risk in order to respond to social demand expected for sewage service. Of these viewpoints, this paper introduces energy and hygienic risk.

2. Energy optimization in treatment process

Sewerage greatly contributes to maintenance of good water environment by processing / removing organic matter, nutrient salt, pathogenic microorganisms, etc. in sewage, while it is urgently required to reduce a large consumption of electricity used for sewerage. We therefore organized the concepts of calculating energy balance by combining energy creation processes, including power generation by digester gas and sewage sludge solid fuelization, with the method of calculating the power consumption in the sewage treatment process, which we have organized until last fiscal year. For multiple model cases where influent quantity, sewage sludge energy usage, etc. are combined, we calculated energy balance on a trial basis by organizing material balance in the process from wastewater inflow to use of sludge as energy or disposal. Fig.1 shows the amount of energy consumption and creation in each case of the conventional activated sludge process as an example of trial calculation results.

Based on these results, we are conducting a survey of actual energy consumption, etc. in sewage treatment facilities to make further comparison with trial calculation results.

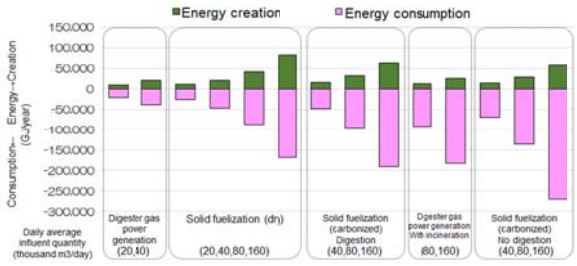

Fig. 1. Results of provisional calculation of the effect of power consumption reduction by introducing energy-saving equipment (conventional activated sludge process)

3. Evaluation of hygienic risk control technology for treated water

In accordance with the ongoing discussion about changing an item of the environmental water-quality standard from the coliform group count to coliform count, it is necessary to discuss change from the coliform group count to coliform count for the items of technical standards for effluent from sewerage. In addition, since an international standard for recycling of sewage treatment water is under consideration, it is necessary to discuss domestic applicability of such standard and assessment method of sewage treatment facilities considering hygienic risk.

Therefore, we examined the annual behavior of the number of coliforms in sewage treatment facilities (Fig. 2) and verified the ratio of coliforms to the number of coliform groups and differences according to measurement methods. We are also studying the behaviors and removal rate of microorganisms, which can be an indicator of hygienic risk control in sewage treatment facilities, and examining an assessment method considering cost and energy by setting the combination of sewage treatment facilities with which the rate of virus elimination can be achieved according to various water applications by regarding infection by norovirus as a hygienic risk.

We intend to conduct a research required in order to study revision of standards for the number of coliform groups and continue to research and study hygienic risk assessment methods considering the trend of the international standardization of recycled water usage.

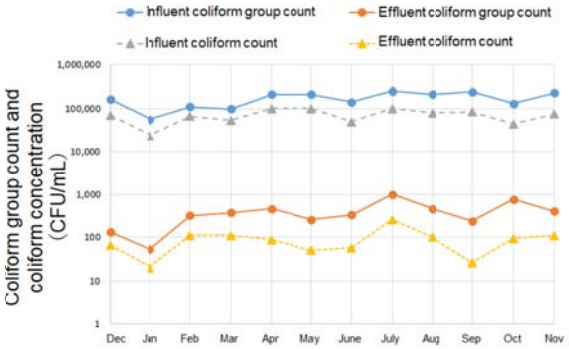

Fig. 2. Annual variation of the concentration of coliform etc.