

Promotion of Global Warming Countermeasures in Sewerage

(Research period: FY2017 to FY2019)

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1. Introduction

As global warming countermeasures in sewerage, the NILIM has been examining the emissions of nitrous oxide (N_2O), one of the greenhouse gases ("GHG"), and studying on reduction of emissions.

2. Survey of N_2O emissions in sewage treatment facilities

It is known that N_2O , a strong greenhouse gas, is generated as by-product or intermediate product when household effluent is biologically treated in sewage treatment facilities. We have surveyed N_2O generation in some sewage treatment facilities which operate in different treatment methods, and accumulated data. As a result, it was found that N_2O generation from the treatment facilities that adopted advanced wastewater treatment focused on nitrogen removal was very small as compared with other treatment methods. On the other hand, in the conventional activated sludge process ("conventional process"), high N_2O emissions were observed in the aerobic tank as compared with other treatment methods. It was also found in the last year's survey that N_2O generation tends to be less in the sewage treatment facilities that have adopted any device for operation management (staged advanced treatment operation) aiming at improvement of water quality in nitrogen etc. while using the facility structure of existing conventional process, as compared with facilities only using the conventional process. However, the number of data is still not enough for identification of causal factors and even proposal of operation under N_2O control, and it is necessary to conduct surveys in different treatment facilities.

For the current fiscal year, in the treatment facilities conducting the staged advanced treatment operation, we surveyed N_2O generation for 4 hours in the autumn and winter seasons, respectively, considering seasonal variation. From the survey results, it was confirmed that N_2O generation was smaller as compared with the conventional process. It was also found that N_2O generation varies greatly according to time zones in the same treatment facilities, and the result that suggests seasonal variation was also obtained, which is considered to indicate the possibility of multiple N_2O causal factors.

3. Study of N_2O emission factors in the conventional process

Particularly for the conventional process, which comes with high N_2O emissions, we conducted a test using the bench scale reactors under different operating conditions in order to clarify N_2O emission factors. From the experiment results, decrease in nitrous acid and nitric acid by the denitrification process was confirmed in the final settling tank installed after the 6th tank. Since it was also confirmed that N_2O was highly dissolved in the return, N_2O contained in the return sludge, as well as the oxidation process in the aerobic tank, is suggested to have also contributed to generation. It is therefore necessary to study an operating method considering not only aerobic tank but measures against N_2O contained in the return sludge.

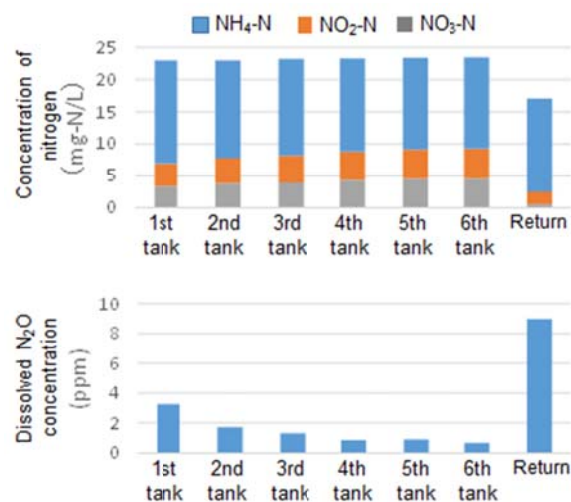


Fig.: Nitrogen concentration in each tank

4. Future challenges

We are going to continue data collection in sewage treatment facilities for identification of N_2O causal factors. Further, we work for analysis in combination of relevant N_2O generation process and the microorganisms and environmental factors that underlie the process.