

Promotion of Global Warming Countermeasures in Sewerage

(Study period: FY2017 to FY2019)

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1. Introduction

As global warming countermeasures, the NILIM has been studying actual emissions and the grasp of emission factors concerning nitrous oxide (N₂O), one of the greenhouse gases ("GHG") emitted from sewerage. This paper describes the results of survey on actual emissions.

2. Survey of N₂O emissions in sewage treatment facilities

It is known that N₂O, a strong greenhouse gas, is generated as by-product or intermediate product in the biological treatment process of sewage treatment facilities. We have surveyed N₂O generation in various sewage treatment facilities and accumulated data. As the result, it was observed that N₂O emissions greatly differ according to treatment methods and that N₂O emissions are larger than other treatment methods in the aerobic tank of conventional activated sludge process.¹⁾ In the survey of last fiscal year, N₂O emissions were examined every 4 hours in the autumn and winter with regard to the pseudo-anaerobic-aerobic activated sludge process. As a result, the difference of N₂O emissions in the autumn and winter was confirmed.²⁾ For this fiscal year, sampling surveys were conducted in the spring and summer in the same treatment facility as in the last fiscal year in consideration of the results of last year.

The Figures show the results of measurement of each form of nitrogen concentration and dissolved organic concentration (DOC) at the time of sampling. Removal of the dissolved organic is achieved throughout the year. Meanwhile, in the nitrification process of "ammonia → nitrous acid → nitric acid," there was residual ammonia in the winter and ammonia form was mostly seen in the spring. In the summer, oxidation of ammonia proceeded, but incompletely, and accumulation of nitrous acid was observed.

From the results of N₂O concentration measurement conducted at the time of sampling, N₂O generation per treatment quantity in the autumn, winter, spring, and summer was 54, 38, 101 and 11977 mg-N₂O/m³, respectively. Accumulation of nitrous acid in the summer is one of the factors of the increase in N₂O generation and the cause of nitrous acid accumulation would be attributable to the failure of reaching the microbial flora

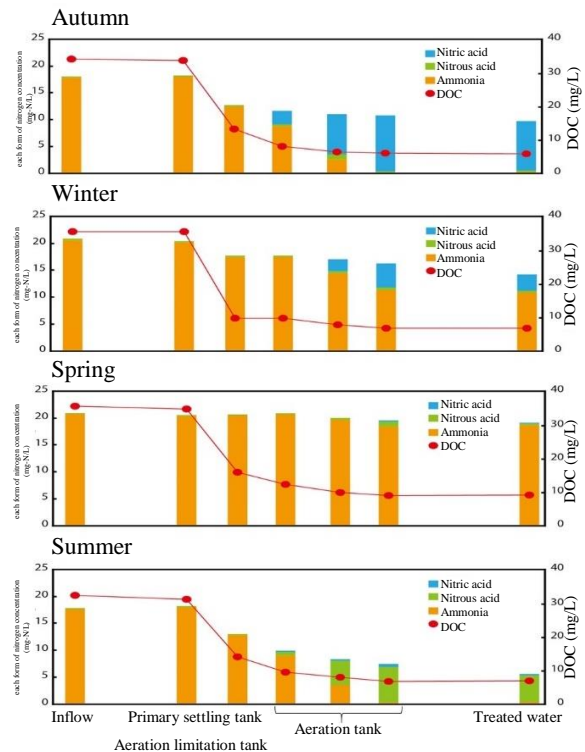


Figure: Each form of nitrogen concentration and dissolved organic concentration

appropriate for nitrification at the beginning of nitrification.

3. Future development

We intend to verify the reproducibility of the cycle of annual changes in microbial flora by obtaining further data, clarify the conditions for retaining microbial flora appropriate for N₂O generation control from the relationship between the microbe involved in nitrification in the reaction tank and the amount of N₂O generation, and thereby propose an operating method with N₂O generation control.

☞ Reference material is here.

- 1) NILIM Report 2018
- 2) NILIM Report 2019

<http://www.nilim.go.jp/lab/bcg/siryou/report.html>