

Research Trends and Results

Global warming countermeasure in sewage works

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1. Introduction

Sewage works emit greenhouse gasses directly from wastewater treatment plants and consume much energy, and it is being a main emission source of greenhouse gasses that comes from office operation of the local government. Global warming countermeasures in sewage works need multifaceted efforts such as energy use efficiency along with reduction of greenhouse gas generation. In our department, investigation research has been done from every point of view.

2. Nitrous oxide emission control from wastewater treatment processes

Nitrous oxide (N_2O) that has 310 times the greenhouse effect of carbon dioxide, is emitted from wastewater treatment processes. However the emission situation at actual plants is not understood, and specific emission control countermeasures have not yet been established, because the generating mechanism has a lot of unclear points.

Therefore, regarding N_2O that is emitted during wastewater treatment processing, we investigated the N_2O -generation situation in actual plants with different treatment methods (picture). As a result, there was a lot of emission in standard activated sludge process that has short sludge retention time, and it becomes suppressed in membrane separation activated sludge process. Therefore it was assumed that N_2O emission becomes suppressed if nitrification is progressed well. In the future, establishment of emission control technology will be determined by the proceeding clarification of N_2O generating mechanism along with paying attention to microbial community structures in reaction tanks.

3. Global warming countermeasure by use of reclaimed wastewater

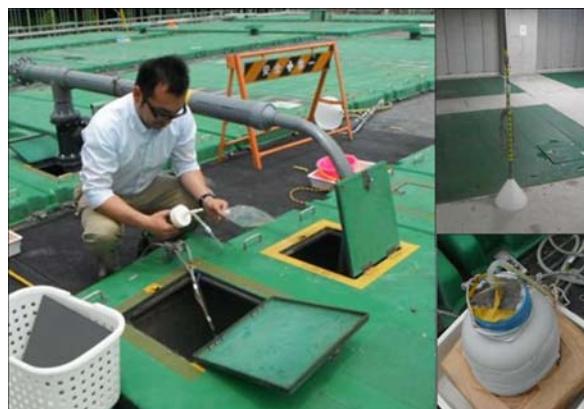
Global water resource shortage is a cause for concern and use of reclaimed wastewater has caught attention. In this situation, the assessment of the effect of the use of reclaimed wastewater has also been needed from the point of view of global warming. The department has proceeded to develop an assessment measure of greenhouse gas reduction effect by using reclaimed wastewater, and the following results were obtained by 2013.

According to the result of an investigation of carbon dioxide generation by life cycle assessment measure

(LC-CO₂), it is suggested that LC-CO₂ of area-wide circulation of reclaimed wastewater is lower compared to on-site circulation within a building, and the water-saving effect from area-wide circulation is high. Also, by comparison by type of wastewater treatment technology, a possibility of energy saving is indicated by using membrane bio reactors as pretreatment. It is planned to continuously consider the structural analysis of energy consumption and assessment measures of new technology.

4. Improvement of energy efficiency by cooperation with other businesses

To further improve energy efficiency and the reduction of greenhouse gasses in sewage works, cooperation with other energy consumers and suppliers is expected along with using countermeasures of their facilities. With that, a cooperation measure in terms of technology and business along with city planning that relates closely to sewage works has been considered, and the results were summarized. A diagnostic tool has been created that can easily calculate prospect of profit of the project by developing project feasibility study methods of collaborative technology along with developing the latest technology menu that can be applicable to sewage works and other business and arranging check items. These achievements are planned to be published, and it is expected to be used for consideration or assessment of collaborative project.



Picture: Research of N_2O that is emitted from the wastewater treatment process.