

Establishment of Total Optimization Procedure for WWTP

(Research of FY 2018-2021)

1. PURPOSE

This study aims to establish the total optimization procedure for WWTP ("Total Optimization Manner"), which defines achievable levels for minimizing energy consumption and greenhouse gas emissions (GHG) and maximizing resource utilization of the whole WWTP. Specifically, the "Total Optimization Study Tool" (the "Study Tool") will be developed. The study tool enables a schematic study of wastewater/sludge treatment systems that realize total optimization by simply estimating the impact on the entire wastewater treatment plant, such as energy consumption reduction volume and changes in the balance of the solid, by superior energy-saving new technologies ("element technologies"), either individually or in combination.

2. Outcomes of This Year

The study tool is developed according to the following implementation items.

- ① Typification of wastewater/sludge treatment systems: Typing typical wastewater and sludge treatment processes can simplify the calculation of solids and energy balance. At the same time, solids and energy balance calculation manner will be studied to evaluate the implementation benefits of element technologies.
- ② Systematize of elemental technologies: Targeted elemental technologies are extracted to organize for the estimation with the study tool, including energy consumption, adaption requirements, etc.

- ③ Study of implementation benefits evaluation manner by elemental technologies: The evaluation manner uses the estimation results, including energy consumption before and after implementation of elemental technologies.
- ④ Establishment of the study tool: Based on the study results of 1 to 3, the study tool is established to evaluate the implementation benefits of the elemental technologies.

Last year, various data were organized and studied, required to establish the study tool, including developing the balance calculation sheet and managing elemental technologies. This year, the above 2 and 4 were reviewed for the last year's outcomes.

(1) Systematic organization of elemental technologies

The construction and O&M costs of elemental technologies were investigated to develop the cost function for the study tool.

(2) Study of the implementation benefits evaluation manner of elemental technologies

Each typified pattern organized combinations of implementable elemental technologies. Besides, the study estimated the reduction volume of energy consumption and GHG emission as implementation benefits of elemental technologies, including their combinations, and construction and O&M costs as implementation costs to set as an evaluation manner.

(3) Establishment of the study tool

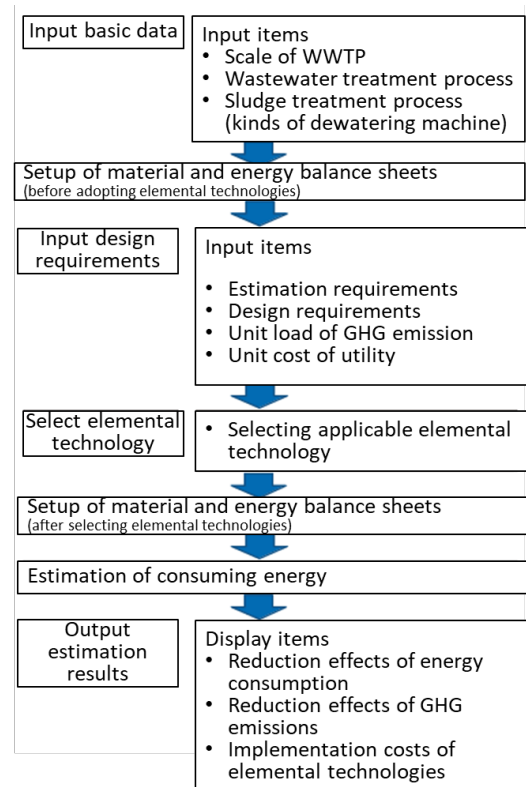


Figure 1 Operation procedure of study tool

Figure 1 describes an operation procedure of the study tool based on studying input manners of primary data and design requirements for balance calculation and output manner of estimation results. Here, the reduction contributing ratio of each elemental technology can be evaluated as its contribution degree to the total optimization of WWTP.

3. Future Schedule

The research will improve the study tool by adding energy-creation technologies like digestion gas generation. Besides, the study tool will be used as an overview study tool of wastewater/sludge treatment systems, totally optimizing WWTPs.

Keywords: **Total optimization, Energy saving, Greenhouse gas emissions**