Expansion of Anaerobic Digestion and Biogas Utilization

(Research of FY 2017-2021)

1. Purpose

Recently, people have advocated the active utilization of biomass resources, which is renewable energy, including sewage sludge.

This study aims to expand anaerobic digestion/biomass utilization. Researchers investigate the effects of aggregated treatment of local biomass, the mass balance of wastewater treatment plants, and the actual situation of steel digestion tanks.

2. Outcomes of This Year

Table 1. Domestic adoption achievement of actual scale steel digestion tanks

WWTP	Adopted technology	Tank volume (m^3/unit)	Number of units	Start of operation
1	Package-type steel digestion tank	5,800	1	2016
2	Not registered on the JS New Tech Program	5,000	2	2017
3	Package-type steel digestion tank	5,000	3	2019
4	Package-type steel digestion tank	3,200	1	2019
5	Corn-bottomed steel digestion tank	9,000	4	2021

This report describes the results of the investigation conducted in 2020 for the installed steel digestion tanks.
The conventional concrete digestion tank has issues such as high construction costs with a long work period. On the other hand, a steel digestion tank solving these problems is increasing its adoption achievement recently (Figure 1.) This study aims to investigate a steel digestion tank

for its digesting performance, energy consumption, etc., to verify its ability even on the actual scale and promote its further implementation. This year's investigation targeted the packaged steel digestion tank that has been running for over a year at #1 WWTP. The results are as follows.

① **Digestion performance**

Digestion gas yield per supplied organic matter and digestion rate was 500Nm3/t-VS and 50%. Both were within the "The Sewerage Planning and Design Guidelines." Since it had no fluctuation of gas generation and digestion rate by aging, we considered the packaged steel digestion tank had the equivalent digestion performance with the conventional digestion tanks.

② **Sediments control**

A packaged steel digestion tank accumulates its sediments using flow power to the center of a tank at the mixer's reverse rotation. Accumulated sediments are forcibly pulled out from the bottom's drawn pipe, and this function controls sediments in the tank. While there has been no sediment discharge operation since the operation started, researchers found few deposits at the tank bottom.

③ **Agitation power reduction and MLIT energy performance guidelines satisfaction**

Continuous measurement of the agitation power of the impeller agitator resulted in supplied power density below 1w/m3, showing its low power operation. The power consumption of a whole digestion tank was 120kWh/t-VS per decomposed VS, which satisfied MLIT energy performance guidelines in 2017 of 280kWh/t-VS.

④ **Reduction of construction period**

The construction period of a steel digestion tank was 8.5 months, while that of a similar-sized concrete digestion tank (egg shape) was 20 months. The investigation verified a significant reduction in the construction period.

3. Future Schedule

In 2021, the survey for a steel digestion tank will continue with a study on the effects of local biomass-intensive treatment, a methane fermentation test targeting local biomass, and a mass balance research and water quality analysis of anaerobic digestion adoption.

Keywords: **Anaerobic digestion, Steel digestion tank, Energy performance guidelines, Construction period reduction**