

# Expanding the Utilization of Anaerobic Digestion and Biogas

(Research of FY 2017-2021)

## 1. Purpose

Considering taking measures against global warming and the establishing recycling society, people are highly concerned about the positive utilization of waste such as sewage sludge and garbage, and unused biomass resources. The Ministry of Land, Infrastructure, Transportation, and Tourism (MLIT) of Japan sets a goal to integrate, make self-sufficient, and supply water, resources, and energy into WWTPs.

This study aims to efficiently integrate local biomass including sewage sludge and develop/evaluate anaerobic digestion technology, and promote expanding the utilization of anaerobic digestion and biogas.

## 2. Outcomes of This Year

This year, at collecting local biomass into municipal WWTPs for utilization, the benefits of the aggregation and functional impacts on the facilities were investigated. As figure 1 describes, each local biomass was examined its basic property of methane fermentation. Then, the cases accepting different biomass was simulated to study the impact on the treatment functions.

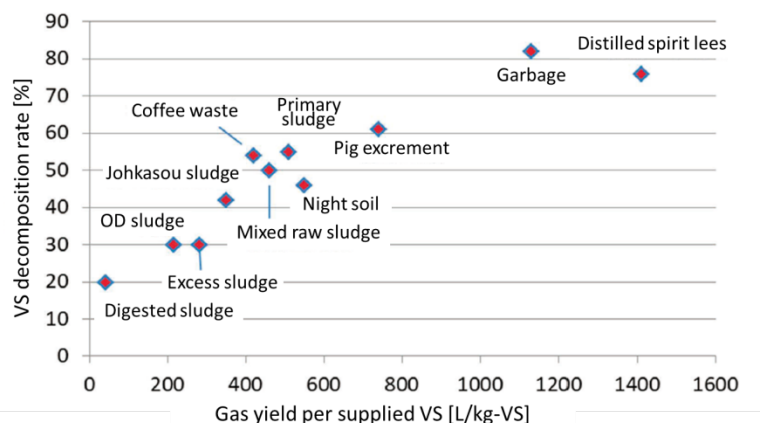


Figure 1: Comparison of methane fermentation among local biomass

- (1) Sewage sludge

Sewage sludge has very different methane fermentability such as gas generation and VS decomposition rates depending on its kind. While primary sludge has high methane fermentability, excess sludge has a low ability.

It is said that the methane fermentability of excess sludge varies depending on the BOD-SS load of a reactor of wastewater treatment. In this research, the methane fermentability of sludge from the OD process was quite low.

(2) Night soil and Johkasou sludge

Night soil and Johkasou sludge have a high concentration of soluble salt such as chloride ions. On the other hand, they have organic matter rates of 75% and a TS concentration of 1%, which both are very low. Considering the energy balance at methane fermentation, it is favorable to give them a thickening treatment before charging into a fermentation tank.

(3) Garbage

Garbage, or food waste, which has very high gas generation per supply VS and VS decomposition rate, is one of the most excellent materials for methane fermentation as same as distilled spirit lees. Because of its low content rates of nitrogen and phosphorus per solid, garbage relatively has a small load of returned water of nitrogen and phosphorus of the filtrate from digestion compared to other local biomass.

(4) Livestock or pig excrement

Livestock or pig excrement has equal to or greater methane fermentability than mixed raw sludge. On the other hand, it has the most organic acid, alkalinity, the concentrations of nitrogen and phosphorus among the examined local biomass. Besides, many cases of troubles have been reported including contamination by pig hair, pipe clogs by MAP, foaming, etc.

(5) Distilled spirit lees, coffee waste

Among the examined local biomass, distilled spirit lees had the most excellent methane fermentability. Though its nitrogen content rate in solids is 6-7%, which is the same level as sewage sludge, its phosphorus content rate is below 1%, which is weak. Coffee waste, whose solids are almost organic matter, has content rates of nitrogen and phosphorus against TS are both less than 2%, which is extremely low.

(6) Consideration by a simulator of the impact when accepting local biomass

A simulator shows a possibility that enables the consideration of the impact including the effect on increased digestion gas and sludge generation volume when accepting local biomass depending on the receiving condition.

### 3. Future Plans

More kinds of local biomass will be tested on their basic properties and methane fermentability. R&D and technology evaluation of the anaerobic digestion process which is suitable to the selected local biomass will be carried out to expand its utilization.

*Keywords: Local biomass, Garbage, Night soil, Simulation model, Methane fermentability*