# Expansion of Resource Utilization by Converting Sewage Sludge to Fuel/Fertilizer

(Research of FY 2017-2021)

# 1. Purpose

The Sewage Law, amended in 2015, obligates wastewater administrators to make efforts to recycle sewage sludge as fuel or fertilizer.

This study aims to contribute to expanding the utilization of sewage sludge as a resource through technical development and a survey of its conversion to fuel/fertilizer.

### 2. Outcomes of the Past Years

- FY 2017-18: Conducted a fact-finding survey on the sewage sludge solid fuel conversion project
- FY 2019: Conducted fertilizer production tests using a small composting test apparatus
- FY2020: Developed a large-scale fertilizer conversion test equipment Conducted a hearing survey on the use of sewage sludge fertilizer

## 3. Outcomes of This Year

(1) Examination of operating conditions for sewage sludge compost fertilizer Operating conditions were examined using a large-scale fertilizer conversion test apparatus developed last year. The examination establishes a simple procedure for tentatively producing sewage sludge compost fertilizer of several tens to 100 kg. Approximately 70 to 80 kg of seed sludge and dewatered sludge (anaerobic digestion sludge, OD sludge) were fed into the system for four weeks, increasing the feed rate in steps from 5 to 25 kg/day. As a result, about 250 kg of



Photo1. large-scale fertilizer conversion test equipment (inside)

dewatered sludge could be easily converted into compost in about nine weeks, including the secondary fermentation period, without adding any fermentation accelerators or secondary materials.

The operating conditions enabling simple fertilizer production for test fertilization were established.

### (2) Feasibility study of the sewage sludge compost fertilizer

The feasibility of two types of sewage sludge composting systems, vertical, closed fermenter, and sedimentary fermenter systems, was verified on a scale of 5 to 50 tons/day of dewatered sludge.

On the scale of 50 tons of dewatered sludge, the project cost per ton of dewatered sludge was 19-31 thousand yen, even without considering subsidies, which might be lower than disposing of dewatered sludge in general. Therefore, the feasibility of the 50-ton scale dewatered sludge can be expected. On the other hand, since a 5-ton/day scale would cost 25-41 thousand yen/ton, even considering subsidies, the business feasibility is considered low.

(3) Survey on Value-Added Sewage Sludge Compost Fertilizer

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Based on the issues obtained from the hearing survey in previous years, we estimated the additional costs for value-added methods such as pelletizing, sifting, and bagging when conducting the project. If all three methods are used, the extra fee for processing per ton of dewatered sludge on a scale of 5 to 50 tons/day will increase by 3.3 to 11.1 thousand yen without considering the subsidy. Sifting and bagging are relatively inexpensive and considered high-value-added methods that are easy to introduce.

## 4. Conclusion/Future Issues

The resource utilization of sewage sludge as fuel or fertilizer requires initial costs, and small and medium-scale wastewater treatment plants have limited merits. Therefore, small and medium-scale facilities are expected to try productive methods such as centralized treatment systems.

When considering the conversion to fuel or fertilizer, it is desirable to study the feasibility in advance by investigating the needs of expected consumers, etc., while seeking to add value to the manufactured products.

> Keywords: Sewage sludge solid fuel, Sewage sludge compost fertilizer, Feasibility, Valueadded activities