Demonstration for the Practical Application of Local Production/Consumption Energy Utilization System with a Highly Efficient Digestion System (B-DASH)

(Research for FY 2017-18)

1. Purpose

This study deals with combination technology that consists of a digester with the self-agitation system, highly efficient heating devices (solubilization devices), and solid oxide fuel cell (SOFC).

The study aims to demonstrate the technology performs highly efficient anaerobic digestion, recover and reuse energy, and reduce sludge generation to reduce sludge disposal cost. Besides, it aims to encourage municipal WWTPs to integrate local energy and resources, be independent, and function as a supply base regional hub.

This research is adopted as B-DASH project*1 2017 of MLIT*2. The consortium of Mitsubishi Kakoki Kaisha, Ltd; Kyushu University; Japan Sewage Works Agency (JS) and Karatsu City conducts the demonstration as an entrusted research project of NILIM*3.

*1.B-DASH Project: Breakthrough by Dynamic Approach in Sewage High Technology Project
*2.MLIT: Ministry of Land, Infrastructure, Transportation, and Tourism
*3.NILIM: National Institute for Land and Infrastructure Management

2. Summary of the demonstration technology

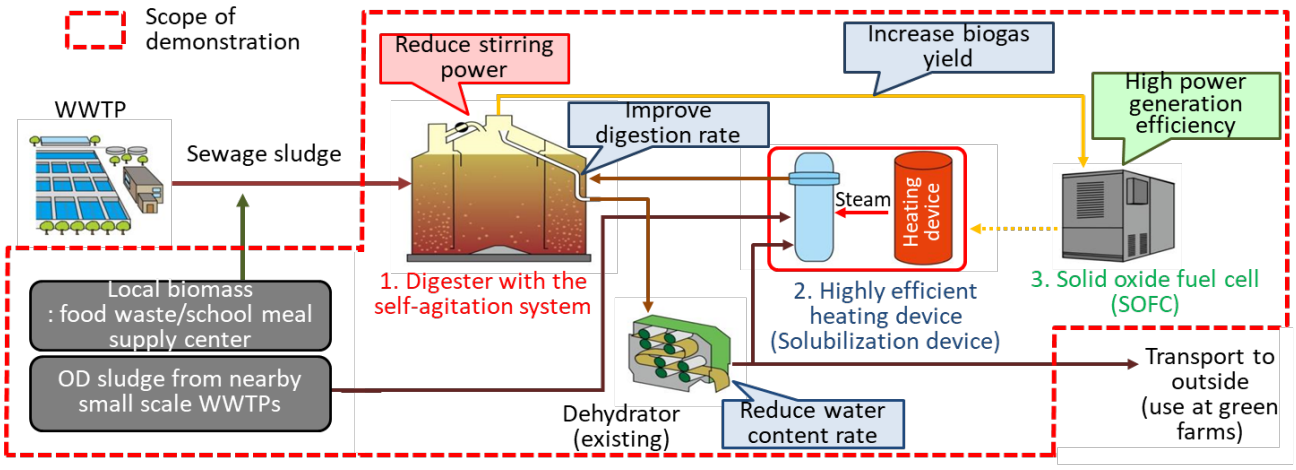

Figure 1.Flow diagram of the demonstration technology

The demonstration technology consists of:

- Digester with the self-agitation system that makes methane fermentation with no external motivity
- Highly efficient heating (solubilization) device that reduces sludge volume and heats the digester while increasing biogas yield by sludge solubilization
- SOFC that generates electricity using biogas

The demonstration establishes a facility accepting dewatered sludge (OD sludge) generated at nearby WWTPs adopting Oxidation Ditch process and a facility accepting food waste. The integrated treatment of local biomass is expected to reduce its disposal costs and increase biogas yield.

3. Progress of the past year

2017: set up demonstration facilities, start continuous operation, and make a performance verification test.

4. Outcomes of this year

This year, researchers carried out the following operations.

- Verified the digestion performance of the self-agitation digester with no external motivity and a highly efficient heating (solubilization) device
- Inspected the digestion efficiency when applying local biomass
- Evaluated the performance and stability of SOFC

Verified matters are as follows:

(1) The demonstration technology could reduce the power for stirring by 90% and over for the existing mesophilic digestion facilities.

(2) Highly efficient heating (solubilization) device and the acceptance of local biomass increased gas yield per supplied VS by 30% and more compared to the conventional technology.

(3) Demonstration technology reduced Water content rate of sludge. It also could reduce generated sludge by more than 40%.

(4) Power generation efficiency of SOFX assumed after 2,000 hours was 48% and over.

5. Conclusion

From now on, the demonstration facilities run stably through the year as independent research. Verification of dewaterability improvement will continue by using other dehydrator such as screw press.

Keywords: ***Anaerobic digestion, Solubilization, Digestion gas power generation, Local biomass***