Empirical Study and Guideline Formulation on the B-DASH Project Concerning Energy Saving / Creation Technologies in Wastewater / Sludge Treatment (Research period: FY 2019 -)

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key words: global warming, AI, effective use of sewerage resources, effective use of existing stock, carbonization, wide-area implementation

1. Introduction

As a response to global warming in the sewerage field, it is important both to implement energy-saving measures and to utilize the potential of other available resources, beginning with the energy utilization of sewage sludge. At just this time, Prime Minister Suga declared in his general policy speech in October 2020 that Japan will aim to achieve carbon neutrality in 2050.

While the development of new technologies based on these social needs is continuing, the record of practical use is small, and many sewerage service providers have taken a cautious stance toward introduction. To address this problem, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) began the "Breakthrough by Dynamic Approach in Sewage High Technology (B-DASH) Project" in FY 2011, with the Water Quality Control Department of NILIM acting as the steering agency for B-DASH projects. The purpose of this effort is to demonstrate outstanding innovative technologies and then formulate guidelines for technology introduction to encourage widespread adoption with the aims of reducing the cost of sewerage service and creating renewable energy. This article presents 3 projects: 1) newly-formulated guideline for technology introduction that were completed during fiscal 2020, 2) the results of a feasibility study completed during the year, and 3) newly-started test project.

2. Outline of demonstration technologies

Based on the results of empirical research and the views of local governments, guidelines were formulated for each technology and evaluated by experts. The structure of the guidelines is shown in **Table-1**.

Table-1 Structure of proposed guidelines

Chapter 1 General Provisions	Objective, scope, definitions of terms
Chapter 2 Outline of the Technology	Characteristics of the technology, conditions of application, evaluation results
Chapter 3 Consideration of Introduction	Method for considering introduction, examples of consideration of the effects of introduction
Chapter 4 Planning and Design	Introduction planning, design
Chapter 5 Management	Inspection items, frequency, etc.
Data	Demonstration results, case studies, etc.

Next, each of the technologies will be introduced.

(1) Advanced treatment technology by ICT and AI control of single-chamber nitrification and denitrification process (formulation of guidelines through actual-scale demonstration)

The demonstration of this technology was conducted at the Naruse Clean Center, Machida City. The aims of the technology are to achieve water treatment quality equivalent to advanced treatment by using AI to control the air volume in response to fluctuations in the reaction tank inflow load, and to reduce electric power consumption by automatic calculation and control of the blower discharge pressure coupled to the air volume. As a result of the demonstration test, blower power consumption was reduced by more than 10 % in comparison with a constant pressure control system. Compared to the advanced treatment process, introduction of this technology is expected to reduce construction costs, achieve energy savings and promote advanced treatment (**Fig.-1**).

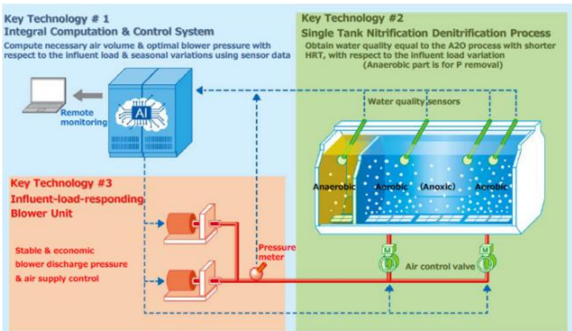

Fig.-1 Outline of technology

(2) Carbonization system with high project profitability combining high value-added utilization of sludge and energy saving and energy creation (feasibility study completed)

A feasibility study (FS) of a technology that enables carbonization of sludge with lower fuel consumption and higher temperature carbonization than the conventional technology by efficiently utilizing the heat of the drying and carbonization processes was carried out using a pilot plant, etc. to investigate performance of the technology, including the fuel consumption reduction effect and effectiveness of the carbonized sludge as a deodorizing material, etc., and the profitability of the project. The establishment of this technology is expected to lead to use of the carbonized sludge produced by the low fuel consumption carbonizing process in value-added products such as deodorizers, etc. (**Fig.-2**).

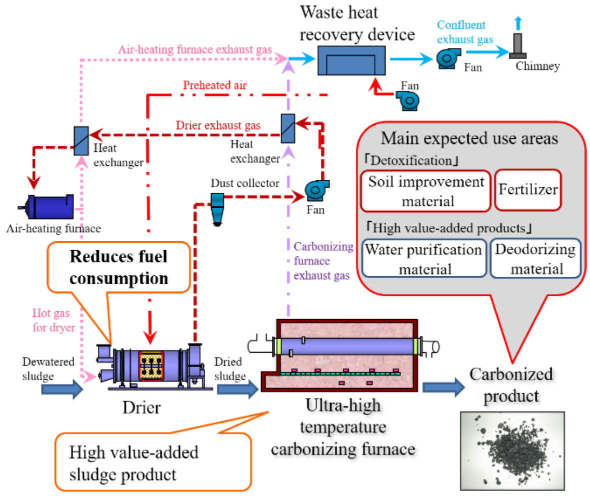

Fig.-2 Outline of technology

(3) Low-cost sludge volume reduction technology by biomass boiler contributing to wide-area coverage by medium- and small-scale treatment plants (new actual-scale demonstration)

To realize wide-area sludge treatment by medium- and small-scale treatment plants, a demonstration test of sludge volume reduction by consolidation, drying and incineration and reduction of the cost of sludge treatment by utilizing the waste heat of incineration is currently being conducted with a technology that combines a dehydration and drying system and a biomass boiler. In comparison with external landfill disposal of dewatered sludge, the introduction of this technology is expected to reduce both greenhouse gases (GHG) and the cost of sludge treatment. Regarding wide-area sludge treatment, the economic advantage of consolidating the treatment of the sludge generated by medium- and small-scale treatment plants at a large-scale treatment facility has been demonstrated with the conventional technology, but the introduction of this technology is expected to promote wide-area treatment because it will also be possible to consolidate sludge treatment on a medium-scale facility (**Fig.-3**).

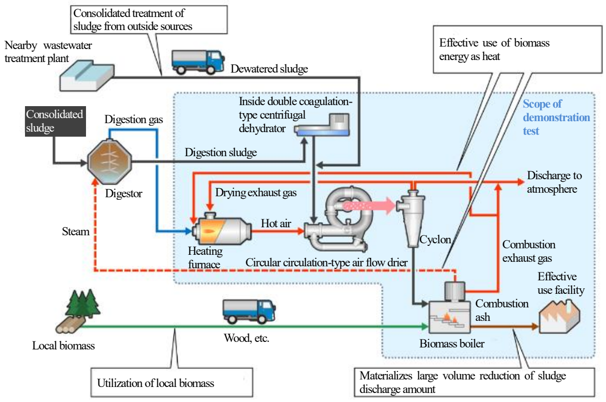

Fig.-3 Outline of technology

4. Utilization of findings and future development

Based on the results of feasibility studies, etc., NILIM conducts actual-scale demonstration tests, prepares guidelines based on the test results and works to disseminate and develop technologies through explanatory meetings, etc. Until^ June 2020, a total of 48 technologies had been adopted as actual-scale test projects, 28 guidelines had been released, and 10 B-DASH technologies had been introduced in 113 cases.

In cooperation with the MLIT Sewerage Department, NILIM is making various efforts for further dissemination and development, including “Setting of energy performance indexes based on B-DASH technologies and adoption as grant projects,” “Improvement of guidelines through follow-up on voluntary research after demonstration test study,” “Creation of cost calculation tools,” etc., and will also continue to carry out empirical studies of new technologies and make efforts for technology dissemination and development in the future.

☞ For more information:

【Reference】 For various guidelines

http://www.nilim.go.jp/lab/ecg/bdash/bdash.htm

【Reference】For list of B-DASH technologies, etc.

https://www.mlit.go.jp/mizukokudo/sewerage/mizukokudo_sewerage_tk_000450.html