

# Empirical Study on B-DASH Project (CO<sub>2</sub> recovery, gas collection, use of recycling water, sludge dewatering / drying, downsizing water treatment)

(Study period: Fiscal 2015 and 2016)

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## 1. Introduction

Sewerage is essential social capital for the life of citizens, and as response to the global warming and tight supply of resources / energy, effective use of sewage resource is sought as well as measures for greenhouse gas reduction. For the effective use of a sewage resource, sewage sludge is introduced in the Productivity Revolution Project as "Japan's original resource that can be used variously, such as biogas and sludge fuel due mainly to the recent technical progress, although it had been disposed of as waste to be used for landfill, etc."

To respond to such social request and administrative needs, new technologies are being developed but are less used in practice because many sewerage service providers are cautious about introduction. For this reason, the Sewerage and Waste Water Management Department of the Ministry of Land, Infrastructure, Transport and Tourism ("MLIT") launched the "Breakthrough by Dynamic Approach in Sewage High Technology" (B-DASH) project in fiscal 2011, and the Water Quality Control Department of NILIM serves as an executing agency of this empirical project. The objective of B-DASH is to realize cost reduction in sewerage projects and creation of renewable energy through the demonstration and dissemination of excellent innovative technologies.

## 2. Outline of B-DASH Project

Under B-DASH Project, NILIM contracts out studies on innovative technologies, which are solicited to the public and adopted by expert review, to research organizations (contractors), which construct a full-scale plant in their sewerage treatment facilities to verify stability of treatment, applicability of the technologies, cost reduction / energy saving effect resulting from introduction of the technologies, etc. Based on the results of such verification, NILIM formulates guidelines for introduction of the technologies. For study results, formulation of

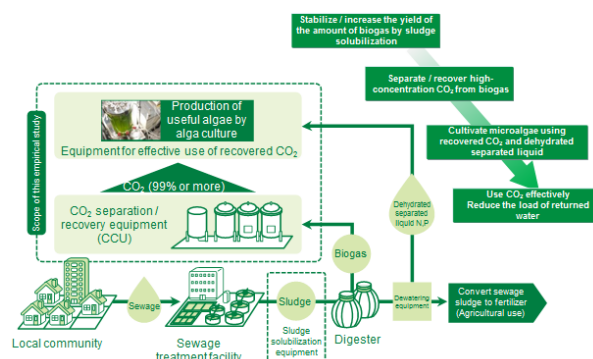
guidelines, etc., advice and evaluation are obtained from experts.

This paper introduces the outlines of the empirical study (on 3 technologies) that was adopted in fiscal 2015 and has been continuing demonstration, and the empirical study (on 4 technologies) that was adopted and started demonstration in fiscal 2016.

## 3. Outline of the technologies adopted in fiscal 2015 and being demonstrated

### (i) Empirical study on the technology for separation / recovery of CO<sub>2</sub> in biogas and application to microalgae culture (Joint Research Organization of Toshiba Corp. Euglena Co., Ltd., Nikkan Tokushu K.K., Nissuicon K.K., Japan Sewage Works Agency, and Saga City)

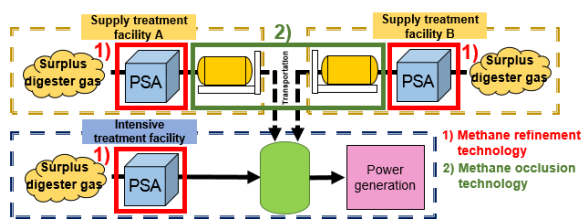
This study is demonstrating the performance of CO<sub>2</sub> separation / recovery, performance of producing euglena, performance of removing nitrogen and phosphorus in dehydrated separated liquid, business potential of the entire system, etc. by separating / recovering CO<sub>2</sub> from biogas and culturing euglena using the recovered CO<sub>2</sub> and dehydrated separated liquid, etc. (Fig. 1)



**Figure 1: Technologies for CO<sub>2</sub> separation / recovery and application to culture of euglena**

**(ii) Empirical study on the technology for efficient collection of biogas from multiple sewage treatment facilities and utilization (Joint Research Organization of JNC Engineering Co., Ltd., Adsorption Technology Industries Ltd., Kyudenko Corp., Sinko Co., Ltd., Yamaga City Gas Co., Ltd., Prefectural University of Kumamoto, Yamaga City, Otsu Town, and Mashiki Town)**

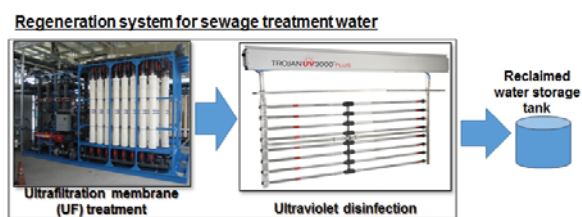
This study is demonstrating the effect of cost reduction, energy production, etc. from power generation at a single location using surplus biogas in small-scale sewage treatment facilities at three locations, which are refined and kept in storage vessels and conveyed by vehicle to one location. (Fig. 2)



**Figure 2: Outline of the technology to collect / utilize biogas**

**(iii) Empirical study on the regeneration system for sewage treatment water (Joint Research Organization of Nishihara Environment Co., Ltd., Tokyo Engineering Consultants Co., Ltd., Kyoto University, and Itoman City)**

This study is demonstrating the technology for utilizing safe, energy-saving, and economical reclaimed water by combining UF film (filtration film with the pore diameter of 0.01 μm), and ultraviolet disinfection.



**Figure 3: Flow of the recycling system**

**4. Outline of the technologies adopted in fiscal 2016 and being demonstrated**

**(1) Technologies for effective use of sewage sludge for small-and-medium-sized treatment facilities**

**(i) Empirical study on the technology to convert sewage sludge to fertilizers / fuels with the dewatering drying system (Joint Research Organization of Tsukishima Kikai Co., Ltd., Sun Eco Thermal Co., Ltd., Japan Sewage Works Agency, Kanuma Agricultural Public Corporation, and Kanuma City)**

This study aims to demonstrate the adaptability of dry sludge, which is produced by the integrated system of

dehydrator and dryer, to various effective applications including fertilizers and fuels, performance of equipment, life cycle cost reduction, etc.

**(ii) Project to demonstrate the highly efficient sewage sludge drying technology with self-heat recuperative heat pump (Joint Research Organization of Okawara Mfg. Co., Ltd., Kansai Electric Power Co., Inc., and Hadano City)**

This project aims to save energy and cost in sludge drying by recovering and utilizing the vapor latent heat in the sludge drying exhaust gas, and demonstrate the reduction of the amount of sludge treatment, diversification of effective use including fertilizers and fuels, reduction of running cost, etc.

**(2) Water treatment technology that enables downsizing**

**(i) Project to demonstrate the water treatment technology of the type following water amount variation using DHS system (Joint Research Organization of Sanki Engineering Co., Ltd., Tohoku University, National Institute of Technology - Kagawa College, National Institute of Technology - Kochi College, Japan Sewage Works Agency, and Susaki City)**

This project aims to demonstrate the effect of cost reduction, effect of power consumption reduction according to influent quantity for the water treatment technology that enables efficiency downsizing by combining "DHS bed filled up with the water holding sponge carrier (settlement site of the microorganisms that purify waste water)" and "moving-bed type biological membrane filtering tank."

**(ii) Project to demonstrate the excess sludge reduction type of water treatment technology using special fiber carrier (Joint Research Organization of IHI Enviro Corporation, Teijin, Ltd., Japan Sewage Works Agency, and Tatsuno-machi)**

This project aims to demonstrate the effect of sludge reduction, effect of life cycle cost reduction, etc. for the water treatment technology that enables downsizing of sludge treatment equipment by reducing the generation of waste sludge substantially using the multi-stage reaction tank and special fiber carrier.

**5. Future development**

NILIM is going to continue to lead empirical studies and formulate guidelines successively for considering introduction based on study results and promote the dissemination of the guidelines.

☞ See the following for details.

[Reference] Website introducing B-DASH  
<http://www.nilim.go.jp/lab/ecg/bdash/bdash.htm>