January 18, 2017

Demonstration Facility for B-DASH Project Starts Running:
"Demonstration of Flow Fluctuation Tracking Type Wastewater Treatment Technology Using DHS System"- Improves Wastewater Service in the Population Decline Society

"Demonstration of Flow Fluctuation Tracking Type Wastewater Treatment Technology using DHS[*1] *System*(DHS System)" is adopted as B-DASH Project*[2] 2017. Japan Sewage Works Agency (JS) has been joining the demonstration as one of the collaborators.

The project of DHS system started with the construction of demonstration facilities in July 2016, in Susaki City of Kochi Prefecture. The construction of facilities has been completed in January 2017.

The demonstration will start very soon with data collection by running the facilities.

**1: In DHS(Down-flow Hanging Sponge) system, wastewater travels from top to the bottom of a device filled with water-retentive sponge carriers that keep highly concentrated sludge for biological treatment.*

**2: B-DASH Project (Breakthrough by Dynamic Approach in Sewage High Technology Project) has been conducted by Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) of Japan. The Project aims to accelerate R&D of new technologies and their practical applications, enhance costs reduction in sewage works and the production of renewable energy, and facilitate the global presence of Japanese companies in their water business. In B-DASH Project, all demonstrations are carried out as a contract research of National Institute for Land and Infrastructure Management (NILIM.)*

1.The demonstration research overview

Name of demonstration:	*Flow Fluctuation Tracking Type Wastewater Treatment Technology using DHS System*
Joint research group:	• Sanki Engineering Co., Ltd • Tohoku University • National Institute of Technology Kagawa College • JS • Susaki City
Demonstration field	Susaki WWTP in Susaki City, Kochi Prefecture Demonstration facility has a treatment capacity of 500 m^3/day.
Purpose of project	• Deal with the population decline • Reduce LCC • In case of reduction of inflow, reduce wastewater treatment costs • Easy O&M • Stable treatment performance

2.Demonstration technology overview

As figure 1 shows, DHS System, the alternative wastewater treatment technology of the Conventional Activated Sludge (CAS) Process, is the combination of *DHS*[*2] filter bed filled with sponge carriers* and *moving bed biological filtration tank.*
Wastewater getting through a primary settling tank is given a biological treatment at "*DHS filter bed*" and then, treated again at a biological filtration tank to effectively remove organic matter.
The features of the technology are as follows.

1. Reduction of LCC by downsizing[*3]
   - The DHS system can reduce electric power consumption in response to inflow reduction.
   - Enable cost reduction of sludge treatment and disposal in response to reduction of sludge generation

- Flexible to the change of treatment capacity because of inflow reduction by adjusting the numbers of unit for retrofitting

2. Enable energy saving and effluent quality

   The combination of DHS filter bed and biological filtration tank is more energy saving than CAS Process and produces effluent with equivalent quality to CAS Process.

3. Easy O&M
   - Few numbers of maintenance items
   - Few numbers of equipment

4. Utilize existing facilities

   A DHS filter bed and a biological filtration tank can be installed inside the existing reactor.

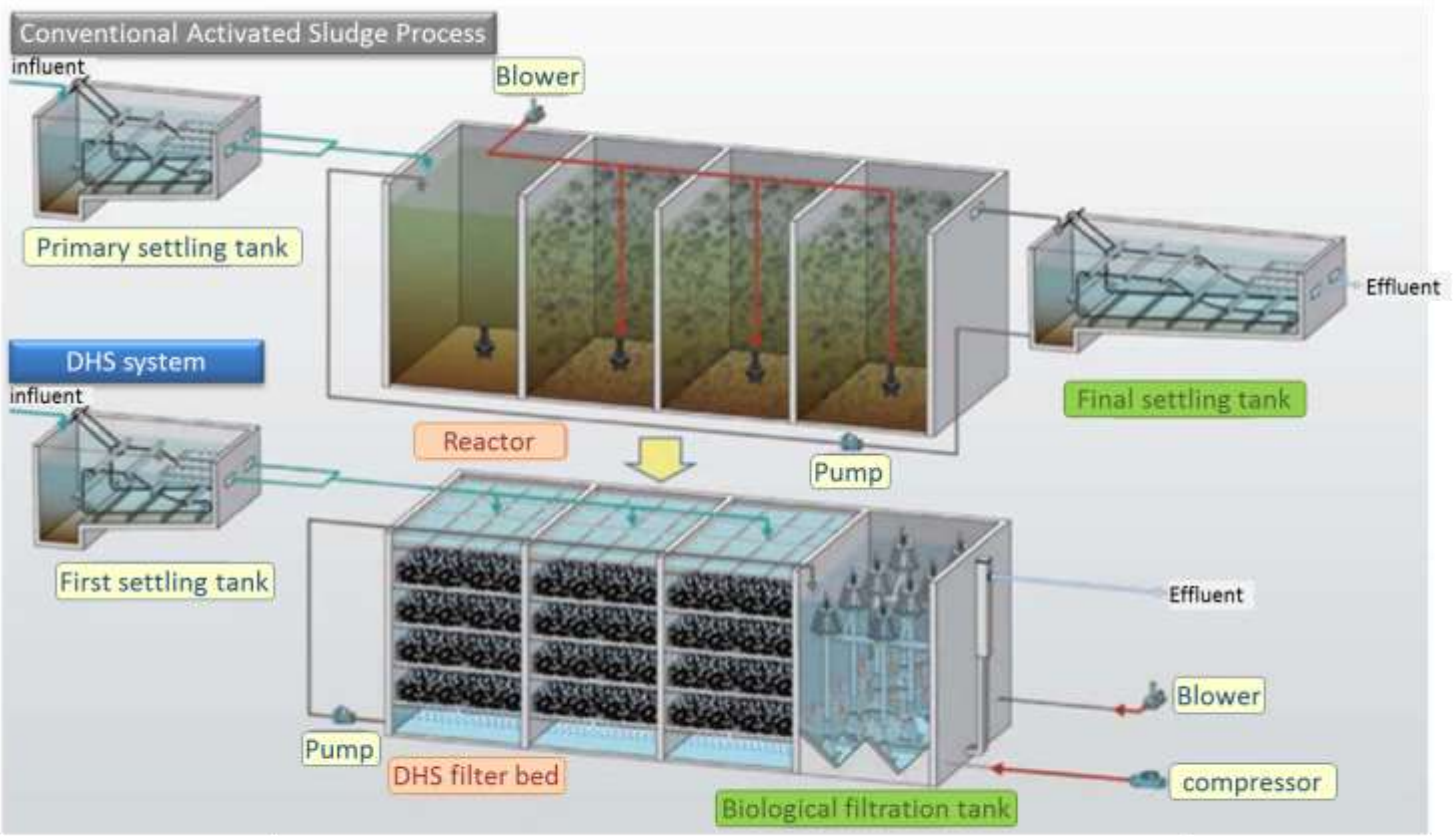
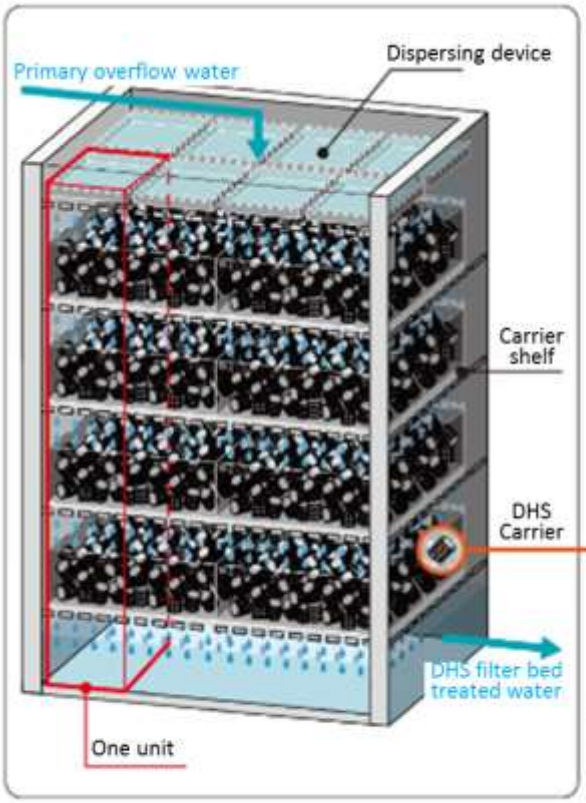


Figure 1. Comparison between DHS System and CAS Process

**3: Downsizing is to reduce the capacity of treatment facilities.*

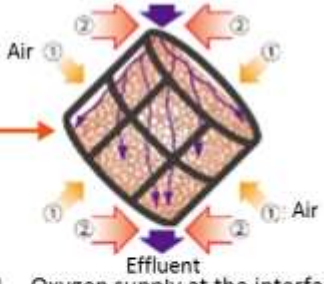
Figure 2 and 3 speciffically describes DHS filter bed and biological filtration tank.



1. Carriers hold highly concentrated sludge inside sponge → **Reduce sludge generation**
2. Unitize DHS filtration bed → **Flexible to the change of treatment capacity**
3. No aeration is required → **Energy saving**
4. Water-retentive sponge carrier → **Stable treatment performance, improvement of effluent quality at decrease of inflow**
5. Few management items → **Easy O&M**

Oxygen supply condition of a carrier

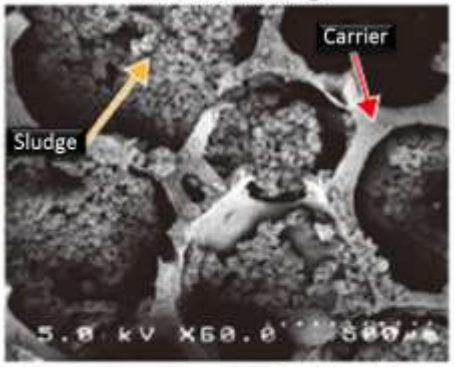
Gas-liquid contact encourages oxygen supply from atmosphere



1. Oxygen supply at the interface of air and DHS carriers
2. Oxygen supply in the surface of water drop travelling between DHS carriers

Sludge containing condition of DHS carriers

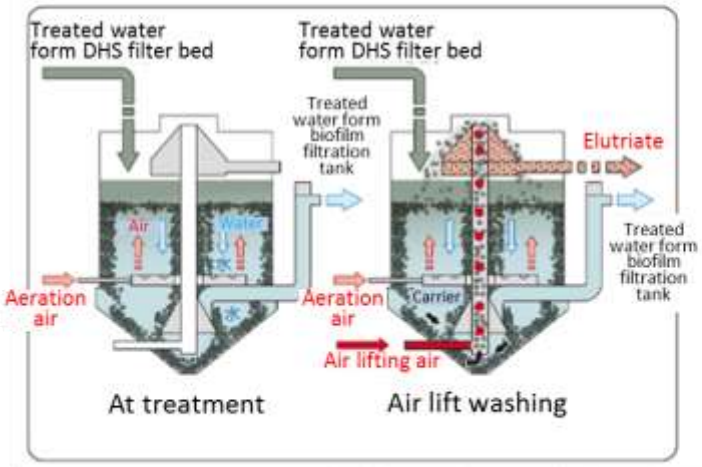
An inside sponge retains high-concentrated sludge



(Tandukar et al.2006)

Figure 2. Detail drawing of DHS filter bed

1. Biological treatment layer: Biological treatment made by highly concentrated microorganisms adhering to carrier surface → **Stable BOD removal**
2. Filtration layer: Filtration by filter media → **Stable SS removal**
3. Making biological treatment and filtration at the same time → **Space saving**
4. Washing layer: Carrier washing with no back wash → **Enables continuous treatment**



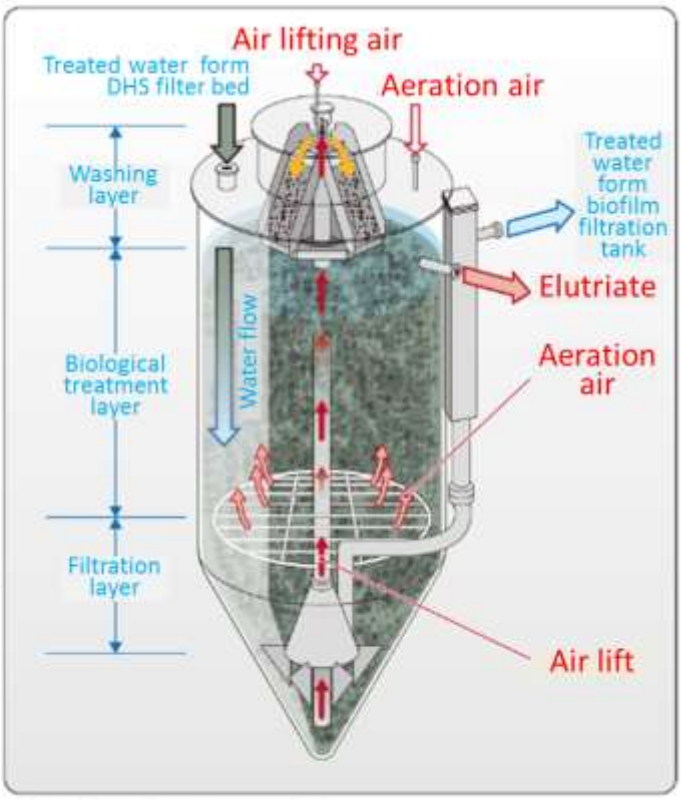


Figure 3. Detail drawing of biofilm filtration tank

3. Demonstration site overview

Table 1 describes facility summary of Susaki City WWTP that is demonstration site. Figure 4 shows the location of Susaki City.

Table 1. Facility Summary of Susaki City WWTP

Wastewater treatment method	Conventional Activated Sludge Process
Design treatment capacity	1,800m^3/day (maximum daily)
Actual inflow	500m^3/day (maximum daily)
Start operation	October 1995

Figure 4. Location of Susaki WWTP

4. Summary of demonstration facilities

The construction work for the demonstration facilities started in July 2016. The trial operation had been completed in December 2016, and the initial operation started in January 2017.

Table 2, Figure 5, and Photo 1-3 depicts the summary, the location, and appearance of demonstration facilities, respectively.

Table 2. The summary of demonstration facilities

	Specification	Number of unit
DHS filter bed	Area of filter bed: 40 m^2	1
Biofilm filtration tank	Area of filtration: 6.0 m^2	2

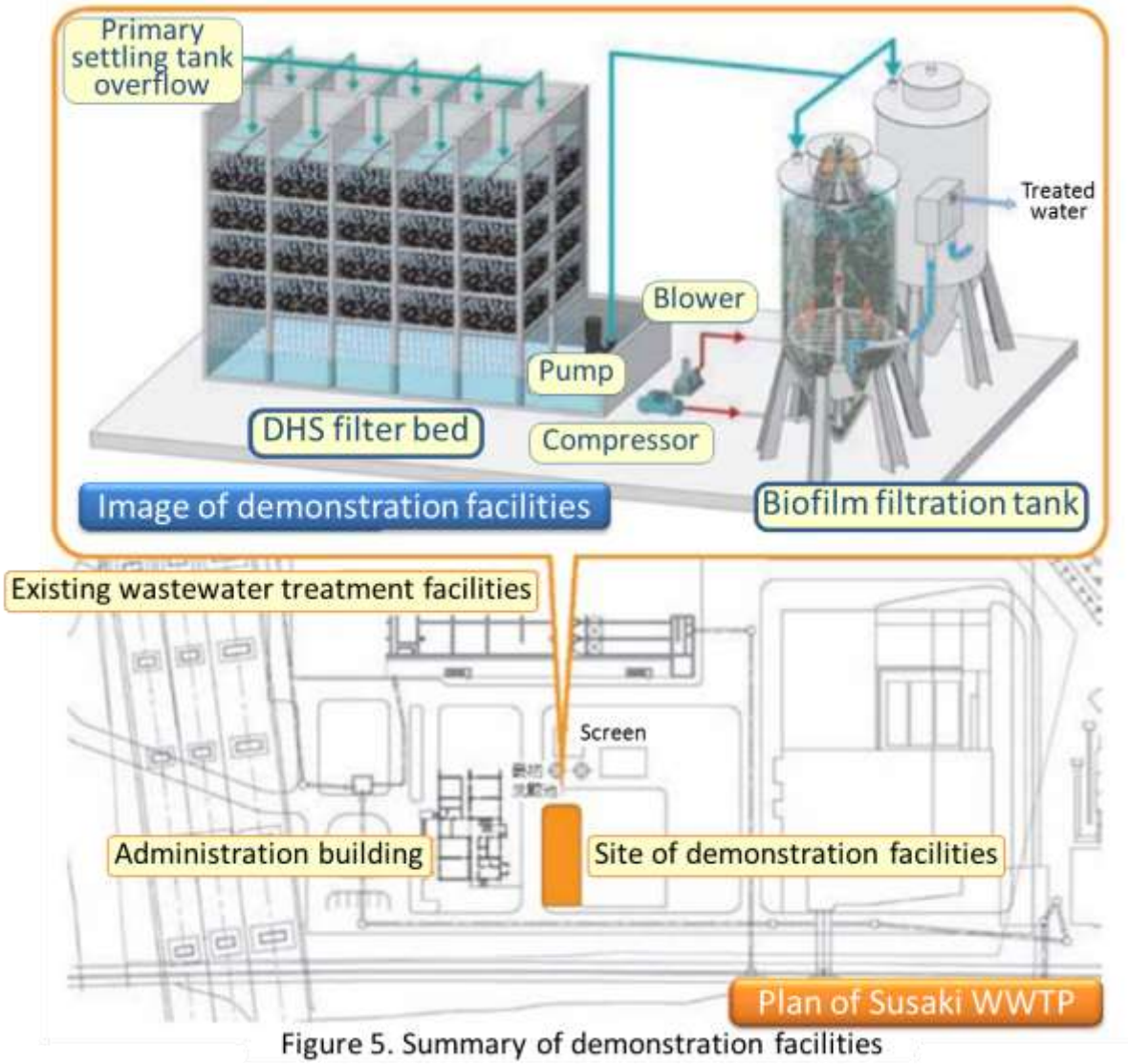


Figure 5. Summary of demonstration facilities

Photo 1: Appearance of demonstration facilities (left:DHS filter bed, right:biofilm filtration tank)

Photo 2: Inside of DHS filter bed filled with carrier

Photo 3: Inside of biofilm fitration tank filled with carrier