Demonstration of Power Generating Sludge Incineration for Greenhouse Gas Reduction (B-DASH)

(Research for FY 2017-2018)

1. Purpose

This study deals with "Power generating sludge incineration technology for greenhouse gas reduction," which tries to majorly reduce power consumption at sludge incineration facilities and greenhouse gas emissions. At the actual scale experimental facilities set up for the project, the performance, scope of application and adoption effects are demonstrated.

This research is selected as B-DASH project*1 2017 of MLIT*2. The joint research group of JFE Engineering Corporation, Japan Sewage Works Agency (JS), and Kawasaki 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. Overview of the demonstration technology

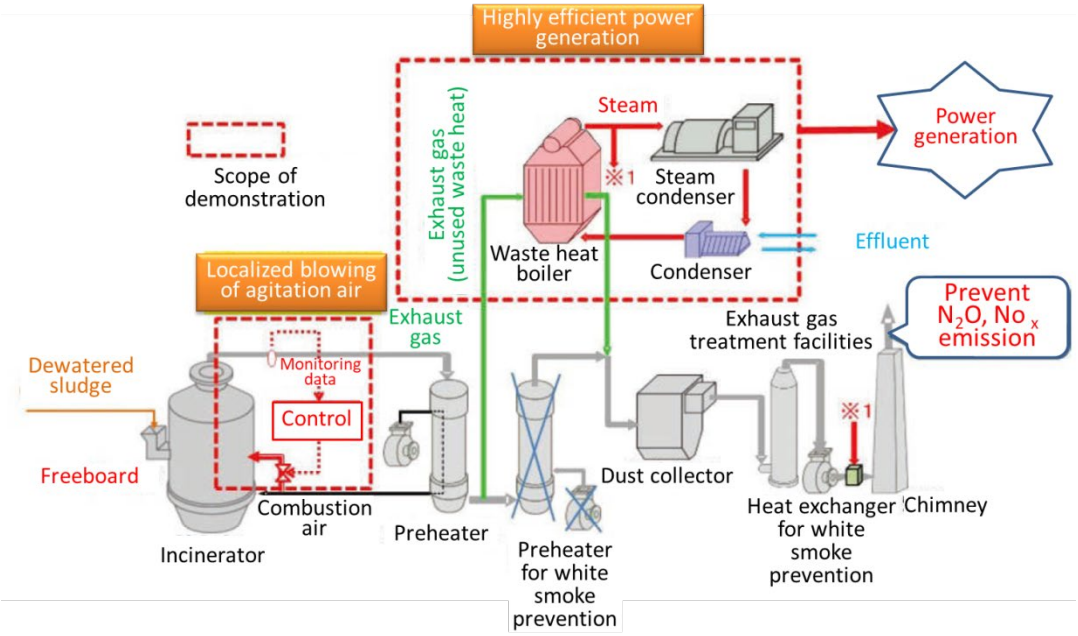

Figure1: Summary of demonstration

The demonstration technology is combined "Highly efficient power generation technology" with "Localized blowing of agitation air technology" (Figure 1.)

"Highly efficient power generation technology" makes power generation utilizing unused waste heat generated at sludge incineration facilities.

The system generates steam from unused waste heat inside a waste heat boiler and uses this steam for running a water-cooling steam condenser utilizing treated wastewater as cooling water to make a highly efficient power generation.

"Localized blowing of agitation air technology" is the two-stage combustion of fluidized bed incinerator.

It supplies combustion air from two parts of a furnace while an ordinary furnace supplies it only from its bottom. Additional localized combustion

air from a freeboard area promotes the efficient sludge incineration and the reduction of dinitrogen oxids (N_2O) and nitrogen oxides (NO_x) emissions.

3. Outcomes of this year

The demonstration facilities were set up at the existing three trains of incineration facilities with 40ds-t (150wet-t) per day in Iriezaki sewage sludge center (Kawasaki City, Kanagawa Prefecture). Feasibility study was carried out for the performance verification of the demonstration technology and the conventional technology.

The research results were as follows:

(1) It was verified that the highly efficient power generation technology achieved the target value through the year. The target value formula: power generation (kWh) = 59H-574, H: supplied calorific value (GJ/h)

(2) Data of localized blowing of agitation air and without localized blowing were compared. It was verified that the former could reduce N_2O by 50% (100% of incineration load) in winter and reduce NOx by 50% (87% of incineration load) through the year.

(3) The feasibility study proved that the demonstration technology achieved the target that more than 70% reduction of greenhouse gas emissions and 100% reduction of energy consumption by the feasibility study.

The feasibility study has the following conditions.

- The capacity of the existing facilities with no localized agitation is 150wet-t/day and water content rate of 74%.
- For mixed raw sludge, water content rate should be less than 72%, or demonstration facilities should be installed at two incinerators with a capacity of 150wet-t/day.
- For digested sludge, digestion gas should be used as supplemental fuel.

4. Future issues

In future, the joint research independently continues. It aims to verify the reduction effect of N2O emissions, improve more power generation efficiency and cost reduction.

Keywords: ***Waste heat power generation, N2O reduction, NOx reduction, Highly efficient power generation, Afterward installation available***