

July 26, 2024

**Our Energy-Supply (Carbon-Negative) Incinerator Technology  
Has Been Evaluated as Practical Technology  
by Bureau of Sewerage Tokyo Metropolitan Government**

~ Toward the use of stoker incinerators in the field of sewage sludge incineration ~

Hitachi Zosen Corporation (hereinafter "Hitachi Zosen") has completed a joint research project on the development of the Energy-Supply (Carbon-Negative) incinerator together with Bureau of Sewerage Tokyo Metropolitan Government (hereinafter "Bureau of Sewerage") starting in 2023 and the technology has evaluated by Bureau of Sewerage as a practical technology.

When sewage sludge is incinerated at temperatures below 850°C, a large amount of dinitrogen monoxide (N<sub>2</sub>O) is generated. The global warming potential<sup>(※1)</sup> of N<sub>2</sub>O is 265 times higher than that of carbon dioxide, and in addition to its reduction, CO<sub>2</sub> emissions from auxiliary fuel and electricity consumption must also be reduced.

The approved technology is based on a stoker incinerator, which our group has delivered to more than 1,500 customers in the waste incineration field and can achieve high-temperature incineration at 900°C or higher and virtually zero N<sub>2</sub>O emissions.

The features of stoker sewage sludge incineration power generation system are as follows.

1. High-temperature combustion at 900°C or higher reduces N<sub>2</sub>O emissions to almost zero.
2. Since the amount of electricity generated exceeds the amount needed to operate the incinerator, surplus electricity can be used to reduce electricity consumption at the sewage treatment plant.
3. Sludge drying using heat recovered from the boiler allows the sludge to burn itself, eliminating the need for auxiliary fuel.
4. Compared to a fluidized bed furnace, the exhaust gas duct is less likely to be blocked by phosphorus, preventing unplanned shutdowns and excessive cleaning.

Sewage treatment plants are essential infrastructure facilities in people's daily lives, but in the sewage sector, greenhouse gas (GHG) emissions in FY2020 amounted to approximately 5.16 million t-CO<sub>2</sub>, of which 16.9% (approximately 870,000 t-CO<sub>2</sub>) was from N<sub>2</sub>O emissions generated by sewage sludge incinerators.

We already received approval for the "Energy-Independent"<sup>(※2)</sup> incinerator, and now the "Energy-Supply (Carbon-Negative)"<sup>(※3)</sup> incinerator, which further improves the efficiency of power generation, has been evaluated as one that should be put into practical use, having achieved all six R&D targets, including those related to GHG emissions. By introducing stoker incinerators, which emit almost no N<sub>2</sub>O, to sewage sludge incineration, we will actively contribute to the reduction of greenhouse gas emissions, thereby contributing to the achievement of the SDGs and the realization of a sustainable society.

- (※1) Global Warming Potential : Degree of greenhouse effect based on carbon dioxide
- (※2) Energy-Independent : The amount of electricity generated exceeds the amount of electricity used for sludge incineration on an annual basis and does not require auxiliary fuel.
- (※3) Energy-Supply : A type of incinerator that uses waste heat from incineration to generate more electricity than it consumes, and achieves a net reduction in GHG emissions as the decrease from power generation exceeds the emissions generated by the incinerator.

【Results of Joint Research with Bureau of Sewerage】

R&D Subject	Development of Energy-Supply (Carbon-Negative) Incinerator	
Period	March 27, 2023 ~ August 31, 2023	
R&D Objective	To promote the carbon-negative measures, reduce GHG emissions from incinerators and develop an incinerator that achieves carbon-negative by generating power from waste heat while utilizing the energy in the sludge.	
R&D Target	【Target① : Development target】 GHG reductions from waste heat generation exceed GHG emissions from incinerators	【Result①】 Achievement confirmed
	【Target② : Development target】 N <sub>2</sub> O emissions less than 0.2 kg-N <sub>2</sub> O/t-DS	【Result②】 Achievement confirmed
	【Target③ : Development target】 Annual average of surplus electricity generated minus electricity used is 850 kWh per hour or more (In the case of 300t/d)	【Result③】 Achievement confirmed
	【Target④ : Development target】 Unit cost of electricity generation is not significantly higher than that of energy independent incinerators	【Result④】 Achievement confirmed
	【Target⑤ : Development target】 No auxiliary fuel required	【Result⑤】 Achievement confirmed
	【Target⑥ : Development target】 Waste heat recovery rate More than 40%	【Result⑥】 Achievement confirmed
Results of Research	Achieved all of the above R&D targets.	
Results of Deliberations	As all R&D targets have been achieved, it has been evaluated as a practical technology as the Energy-Supply (Carbon-Negative) incinerator. (150 t/d~300 t/d)	

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