4-2-1 Sewerage Plan for the Prevention of Global Warming in Tokyo ～Earth Plan-2010～

Kinji YAMADA, Yukio NIHEI, Hajime TAKAHASHI, Kazuma KATOU
Bureau of Sewerage, Tokyo metropolitan Government

Abstract: *In September 2004, prior to the Kyoto protocol, the Bureau of Sewerage Tokyo Metropolitan Government formed the "Earth Plan 2004". The goal of the plan was to reduce the emissions of greenhouse gases (GHGs) by 6% from FY1990 levels by FY2009. The actual reduction was around 16%. As a next step, The Bureau formed "Earth Plan 2010" with a target reduction of more than 25% from FY2000 levels by FY2020. In this poster, we explain the outline and key technologies of the plan.*

Keywords: *greenhouse gas emission; fluidized bed incinerator of new technology; nutrient removal; activated sludge process; restricted-aeration A2/O process*

1. Greenhouse gas emissions by sewerage service in Tokyo

An entire GHGs emission in Tokyo is about 56,650,000 [t-CO_2/year]. Among them, sewerage service accounts for about 1.5% (859,000 [t-CO_2/year]). Therefore, The Bureau is obligated for GHGs reduction as a member of public sector. On the other hand, the projects are underway to upgrade the sewerage system for renewal of sludge incinerators, nutrient removal from effluent, and so on. The conventional methods lead to increase of GHGs inevitably. Under this circumstance, we are working on the development of new technologies to achieve GHGs reduction while upgrading the system.

The intermediate target is a reduction of 18% by FY2014 leading to 25% by FY2020 from the FY2000. So far, we made a success of reducing N_2O from sludge incineration and CO_2 from the supplemental incineration fuel. However, we have been unable to contain the CO_2 from electricity used for sludge incineration and the N_2O and CO_2 from wastewater treatment. We are working on these challenges.

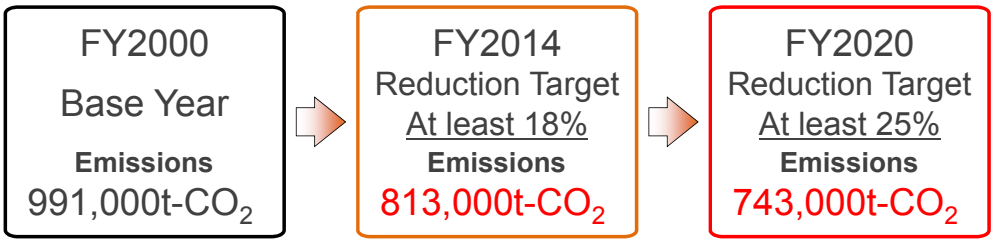


Figure.1 Target of GHGs reduction in the Bureau

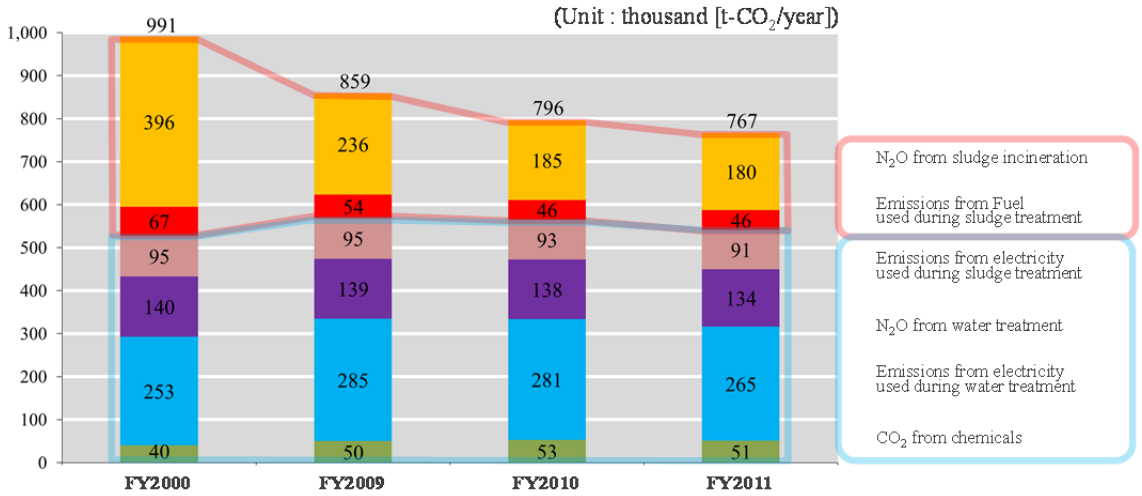


Figure.2 Changes of GHGs emission

2. New measures

2.1 Introduction of New Combustion Systems for Sludge Incineration

-Multilayer Fluidized Bed Incinerator-

By having two additional air vents at high and low positions, the new incinerator has achieved high efficiency with a wide area of high temperature, leading to breakdown of N_2O and reduction of supplemental fuel use.

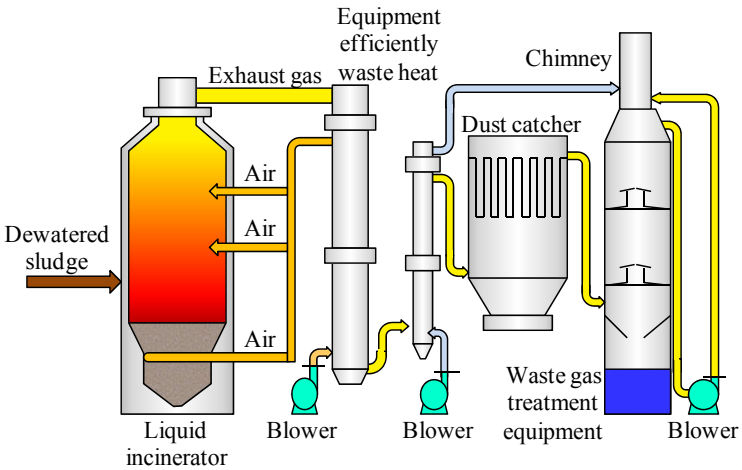


Figure.3 Scheme of Multilayer Fluidized Bed Incinerator

-Fluidized Bed Incinerator with Turbo Charger-

Waste heat is recovered from the dust controller and sent to the turbo charger. Then, pressurized air is injected to the high pressurized incinerator leading to enhanced combustion speed and higher incineration temperature. Higher temperature incineration breaks down more N_2O. This new incinerator system removes part of blowers leading to a reduction in electricity use.

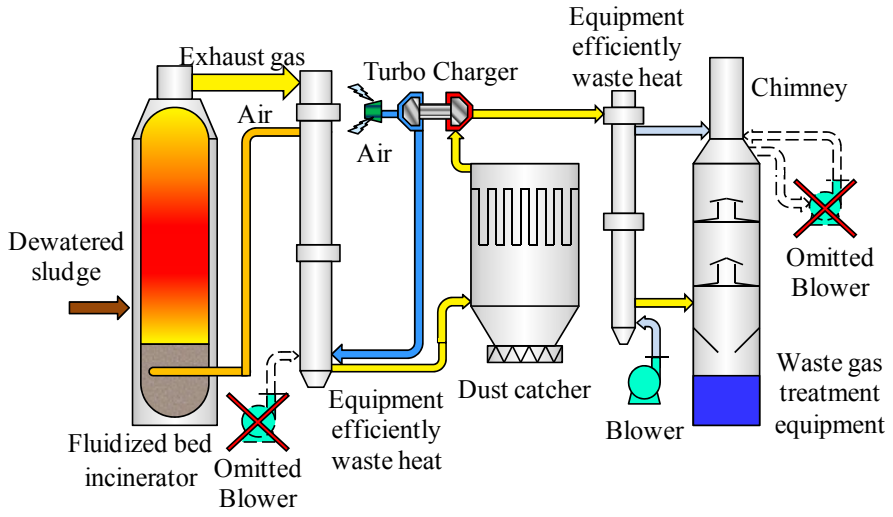
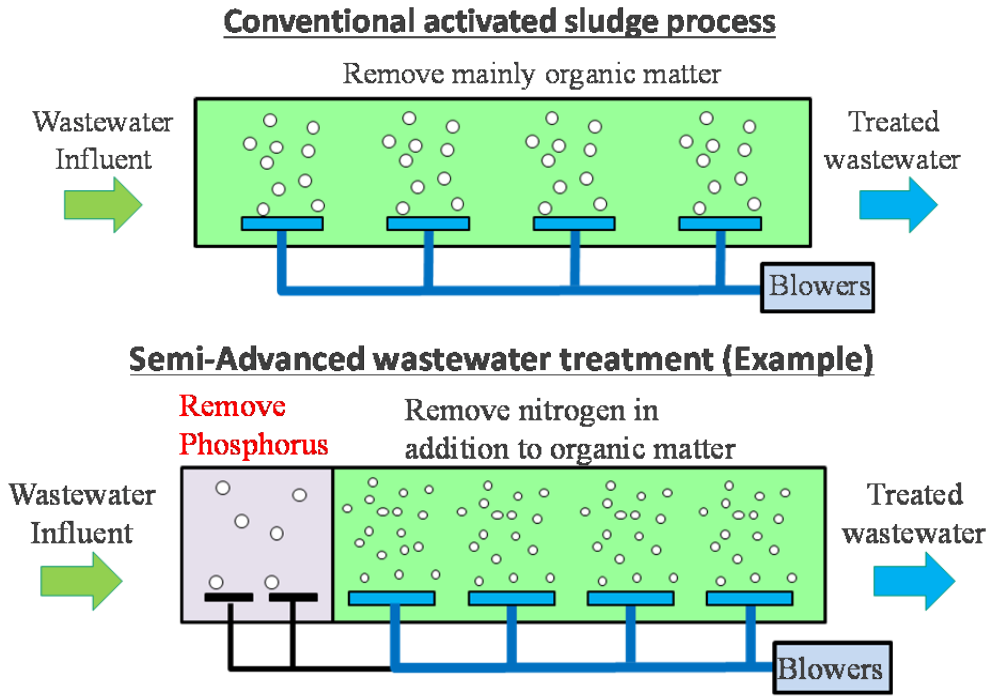


Figure.4 Scheme of Fluidized Bed Incinerator with Turbo Charger

2.2 Nutrient Removal with Same Energy Use as Conventional Process

Nutrient removal is necessary to meet the effluent permit. The Bureau has converted conventional activated sludge system to advanced wastewater treatment (A2/O) process gradually. However, the A2/O process consumes more electricity with more tank space. We successfully developed a new operation method to meet the requirement for effluent quality while keeping GHGs emission at the same level as the conventional activated sludge process.



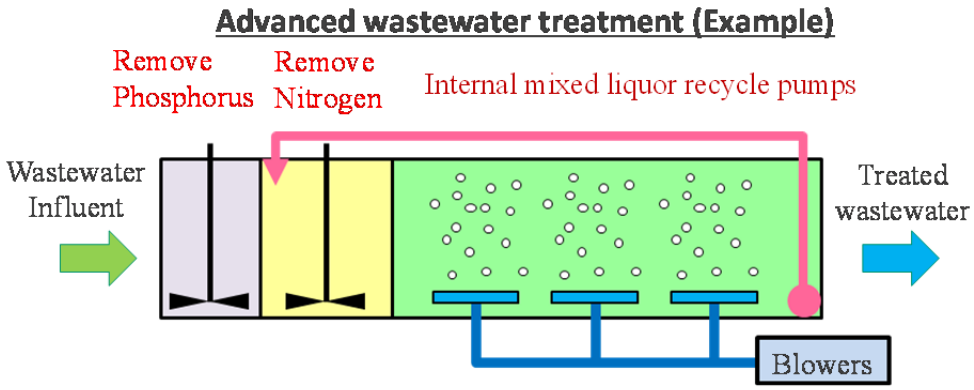


Figure.5 Scheme of 3 types activated sludge process

Table.1 Comparison of the wastewater treatment method

	Effluent water quality	Electricity consumption	Treatment capacity
Conventional activated sludge process	Nitrogen : 100% Phosphorus : 100%	100%	100%
Semi-Advanced wastewater treatment	Nitrogen : 85% Phosphorus : 50%	100%	100%
Advanced wastewater treatment process	Nitrogen : 65% Phosphorus : 40%	130%	63%

※ The data are expressed as relative values, with Conventional activated sludge process being 100 percent.

3 Conclusions

We are committed to continue to expand our new approaches to our sewerage system so that we can achieve the goal of a 25% reduction of GHGs in FY2020 from FY2000. We are confident that the new technologies we developed can make a positive contribution to the world wastewater operators for their control of GHGs and energy use.