

Tokyo Metropolitan Government Bureau of Sewerage

Measures Against Global Warming, Aimed Towards Decarbonisation



Background and Reason for the Project

The Tokyo Metropolitan Government Bureau of Sewerage (hereinafter referred to as 'the Bureau') is responsible for public sewerage projects in Tokyo's wards such as sewage treatment and rainwater diversion, as well as basin sewerage projects that treat sewage flowing from municipal public sewers in the Tama region. In the wards and the Tama region, 20 water reclamation centres and 86 pumping stations operate 24 hours a day, 365 days a year without a break to ensure the functioning of the sewerage system.

The sewerage projects play an essential role in ensuring a safe and comfortable living environment and forming a well-functioning water cycle. However, sewage treatment requires a large amount of energy such as electricity and fuel, leading to the emission of carbon dioxide (CO₂). Additionally, the sewage treatment process generates nitrous oxide (N₂O), which has 298 times the greenhouse effect of CO₂, and methane (CH₄), which has 25 times the greenhouse effect of CO₂. As a result, the Bureau accounts for approximately 36% of the greenhouse gas emissions from the Tokyo Metropolitan Government, making it its largest emitter and placing a significant responsibility on it for preventing global warming.

Project Outline

The Bureau has been proactive in addressing global warming to pass on a comfortable global environment to future generations. Ahead of the Kyoto Protocol, in 2004, the Bureau initiated comprehensive measures to combat global warming by formulating the 'Earth Plan 2004', a plan aimed at preventing global warming in sewerage projects. Subsequently, the targets for reducing greenhouse gas emissions have been gradually raised, and efforts to combat global warming, such as energy conservation and the use of renewable energy, have been enhanced.

(1) Thorough Energy Conservation

In the water treatment process, the Bureau promotes the reduction of electricity usage in the blowers that supply air to the reactors that treat sewage using microorganisms. Specifically, by reducing the amount of air supplied through the use of fine bubble aeration, which makes the air into small bubbles that dissolve easily in water, the Bureau has introduced fine bubble aeration systems in approximately 70% of its reactors, which is expected to reduce electricity usage by about 20% compared to conventional aeration systems. In addition to updating the aeration system itself, the Bureau has optimized the aeration system by combining fine bubble aeration systems with high-efficiency blowers tailored to the pressure and air

volume of each system, further enhancing the effect.

In the sludge treatment process, the Bureau is working to reduce electricity usage in the sludge concentrators and dewatering equipment, which account for more than 30% of electricity usage. By switching from conventional centrifugal force-based sludge concentrators to energy-efficient gravity-based filtration concentrators, it is expected to reduce electricity usage by about 90%. Currently, energy-efficient concentrators have been introduced in approximately 40% of concentrators.

(2) Utilisation of Renewable Energy

The Bureau is promoting the introduction of solar power generation on the rooftops of buildings and in the upper spaces of treatment facilities, as well as small-scale hydroelectric power generation utilising the drop in elevation when discharging treated water. Additionally, it is working to expand the use of renewable energy by effectively utilising the energy of sewerage systems.

Specifically, the Bureau is conducting initiatives such as generating electricity by using the methane-rich digestion gas generated during the sewerage sludge treatment process as fuel, recovering and utilising the waste heat generated during the incineration of sewerage sludge for power generation, and producing carbonaceous materials from sewerage sludge for use as an alternative fuel to coal in thermal power plants.

Furthermore, it is utilising sewerage heat as a renewable energy source by using the temperature characteristics of sewerage, which is 'cold in summer and warm in winter', as a heat source for heating and cooling in water reclamation centres. In addition, sewerage heat is supplied to five office buildings, hotels, elderly care facilities, and other facilities in Tokyo. Moreover, initiatives are underway to recover sewerage heat by installing heat exchangers in sewerage pipes by private businesses, etc., and use the recovered heat as a part of the heat source for heating and cooling in office buildings.

(3) Introduction of Environmentally Friendly Incinerators

The Bureau is advancing the practical application and introduction of energy-efficient and energy self-sufficient incinerators, which can significantly reduce greenhouse gas emissions through joint research with private companies. By combining these incinerators with high-performance dewatering machines that reduce the moisture content of sludge, there is no need for fuel during operation. Additionally, by incinerating sludge at temperatures above 850°C, nitrous oxide (N₂O) emissions can be greatly reduced. Furthermore, energy-efficient incinerators significantly reduce electricity usage by utilising technologies such as turbochargers that use exhaust gases. Energy self-sufficient incinerators can generate electricity using waste heat after incineration, thus supplying the electricity required for operation. Currently, seven energy-efficient incinerators and one energy self-sufficient incinerator have been introduced.

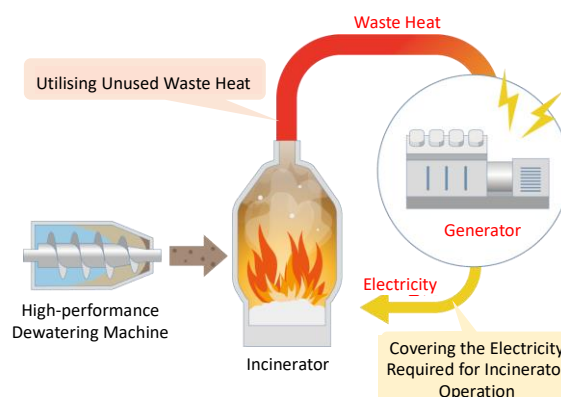


Figure 1: Energy Self-Sufficient Incinerator

(4) Achievements

Since 2004, the Bureau has been systematically promoting measures against global warming based on the Earth Plan, and in the fiscal year 2021, it reduced greenhouse gas emissions by 27% compared to the fiscal year 2000.

Special Features and Innovations

In recent years, as the climate crisis has become

more severe, there has been acceleration in movements towards decarbonisation both domestically and internationally. In Tokyo, action by 2030 is critical to achieving zero emissions by 2050. Efforts have accelerated to achieve the 'Carbon Half' policy, to cut Tokyo's carbon emissions to half of 2000 levels by 2030.

Based on these new national and municipal initiatives, the new 'Earth Plan 2023' was formulated in March 2023 to prevent global warming. This plan integrates measures against global warming and energy issues based on the characteristics of sewerage projects, aiming to further accelerate and strengthen efforts toward decarbonisation. The plan sets a goal of reducing greenhouse gas emissions by 50% or more compared to the fiscal year 2000 by the fiscal year 2030. It also outlines a vision for innovative initiatives toward achieving zero emissions by 2050. In the future, efforts will be intensified not only to accelerate existing initiatives but also to strengthen efforts such as the introduction of newly developed facilities and the further utilisation of renewable energy.