Energy recovery utilizing the waste heat of gas turbines to improve power generation efficiency

Waste Disposal and Super Waste-To-Energy System

Features

- A power generation of 10,070 kW/h attained by an independent steam turbine will increase to 12,400 kW/h as a result of reheating with the waste heat of a gas turbine.
- The power generation efficiency of a steam turbine will be improved to be approximately 20% higher than the power generation efficiency (10% to 15%) of a conventional system of waste power generation.
- Japan's first power generation plant integrated with waste incineration facilities.

Super Power Generation System in East Second Factory of Sakai Clean Center

Overview (Technical principles, actions, etc.)

Super Waste-To-Energy System

Sakai City's super waste-to-energy system is Japan's first power generation plant integrated with waste incineration facilities.

A conventional system of waste power generation burns waste, generates steam, and turns a turbine with the steam to generate power, the power generation efficiency of which is approximately 10% to 15%. In order to improve the efficiency, the difference in thermal energy between the inlet and outlet of the steam turbine should be enlarged. The combustion gas of the system, however, is highly corrosive, and there is a problem in the durability of the boiler that uses high-temperature gas emissions and generates steam. When the Sakai Clean Center was constructed, no boilers could withstand high-temperature corrosion. Therefore, the steam temperature of the conventional system of waste power generation on the premises was set to a maximum of 300℃ for the reduction of high-temperature corrosion.

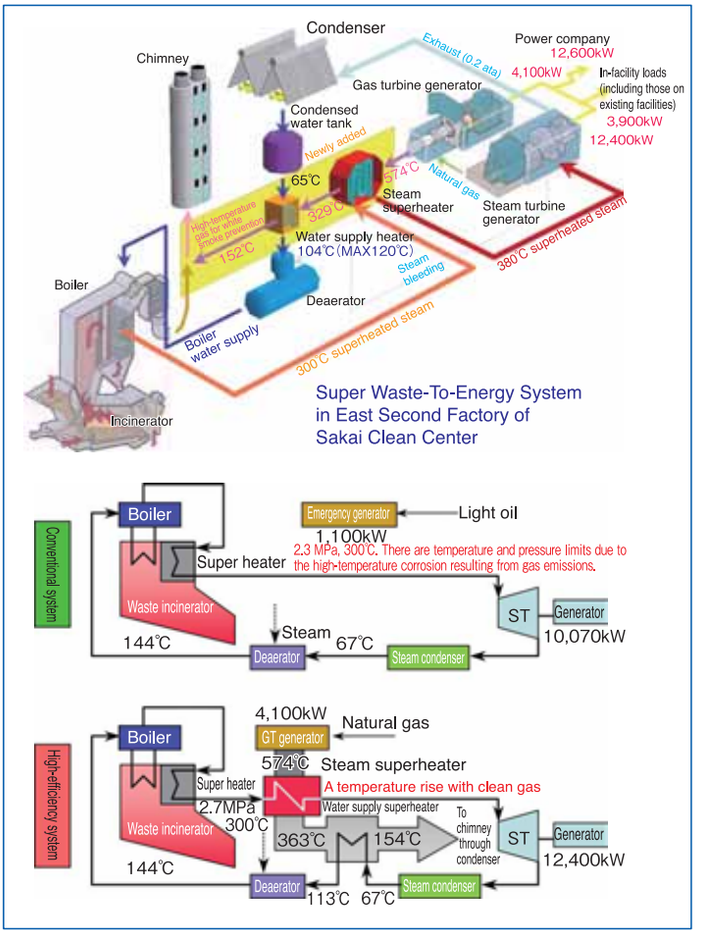
In order to solve this problem, The Sakai Clean Center adopted an additional burning method for steam reheating with a clean heat source acquired outside the facilities, which made it possible to increase the temperature and pressure of the steam. The super waste-to-energy system uses a gas turbine generator fueled by natural gas as well, and the steam is heated by high-temperature gas emissions generated from the generator, which made it possible to send the steam at 380℃ to the turbine. This made is possible to increase the power generation efficiency by approximately 20%.

Introductory Track Record

- **Sakai City's super waste-to-energy system is Japan's first power generation plant integrated with waste incineration facilities.**
- **Sakai City succeeded in increasing the power generation efficiency of the system to 20%, which is approximately 5% higher than the power generation efficiency of a conventional system.**

Effects

◎**In order to improve the power generation efficiency of a conventional system, it is necessary to increase temperature and pressure steam on the turbine inlet side as much as possible and decrease the pressure of the steam lower on the outlet side, which is, however, difficult due to a problem in high-temperature corrosion caused by incineration waste gas. The super waste-to-energy system solved this problem and increased the power generation efficiency by discharging the steam once and reheating the steam with the waste heat of the gas turbine.**



Super Waste-To-Energy System

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