

Joint Research on the Small Binary Cycle Generation in the Sewage Treatment Plant

Year of Research

2012 · 2013

Establishment of energy and resource recycling

(Purpose)

Energy recovery from a sewage sludge incinerator is used for heating and drying the sludge and supplying hot water; however, no measures have been established for waste heat energy with a lower heating value (which accounts for more than half of the heat generated) to be recovered for power generation and other applications. Therefore, in this study, the benefits of the introduction of waste heat power generation in a sewage sludge incinerator are studied and verified using new technology that generates power from unused waste hot water.

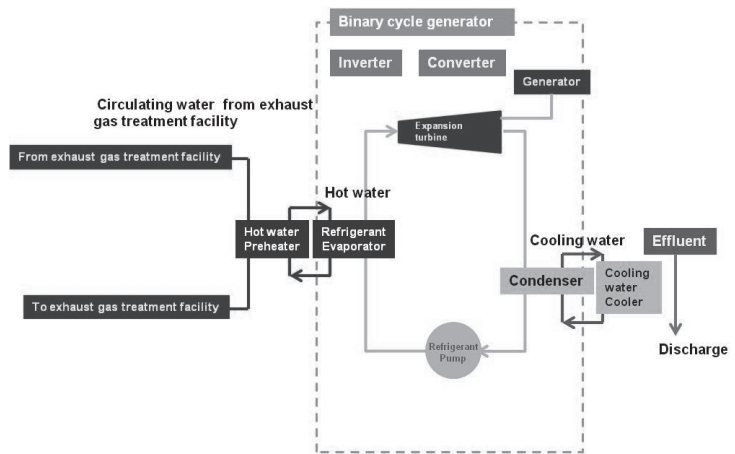


Figure 1. System flow

(Results)

(1) Outline of the technology

The system flow of the binary cycle generation studied for this research is shown in **Figure 1**. This technology allows media with a low boiling point to circulate through the refrigerant pump, refrigerant evaporator, expansion turbine, and condenser in turn. The potential heat is recovered in the refrigerant evaporator and the refrigerant is vaporized to drive the expansion turbine, which is connected to the generator for power generation. After driving the turbine, the vapor is cooled down to a liquid state before returning to the refrigerant pump.

The following are unique features of this system.

- (1) The system is capable of responding to temperature changes in heat source and coolant, providing stable and highly efficient power generation.
- (2) The system has an All-in-One structure with an evaporator and condenser mounted on the stand allowing it to be installed in a small space.
- (3) Power can be generated from the unused waste hot water at 70 to 95°C. Net power generation of 35kW can be achieved by supplying waste hot water of about 80°C at the rate of 75m³/hr.

(2) Research details

1) Technological outline

Characteristics of the technology are organized based on existing documents and data.

2) Verification and evaluation

The following verification and evaluation are performed using the verification test data and analysis results.

- (1) Evaluation of power generation performance when the system is applied to a sewage sludge incinerator.
- (2) Verification of corrosion resistance against circulating water in an exhaust gas treatment facility as well as secondary effluent.

3) Preparation of technical manual

The results of the above research are compiled and summarized in a technical manual.

(Future subject)

An experiment on the power generation of the hot water binary cycle generation (70kW unit) using circulating water from the circulating tank of an exhaust gas treatment facility will be conducted in the Kakogawa-Karyu Purification Center Incinerator No.2 after May 2013.

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Key words

Binary cycle generation, energy recovery, energy reduction, cost reduction