

Beverage manufacturer

Suntory Products Limited Takasago Factory



Utilization of heat recovery heat pump water heater in existing water circulation system for effective use of medium-temperature water

In the process of manufacturing beverages, there is what is called a water circulation system in the factory that uses low, medium, and high-temperature water. Until recently, there has been a tendency for medium-temperature water to be left over, until a heat recovery hot water heat pump was installed to take advantage of it.



Some products manufactured at the Takasago Factory

The decisive factor

Effective use of medium-temperature water

As the possible hot water output level from the heat recovery heat pump water heater which can effectively recover and use the heat from medium-temperature water, reached 90°C, it became possible to apply it to the water circulation system.

(Even though in 1999 at the time the factory was being built, the output level for hot water from the heat pump water heater was a up to 55°C. This level has now been increased to 90°C with the progress of technology.)

Advantages

Reduction of the energy consumption

Hot water made in the heat recovery heat pump water heater provides for roughly 80% of the heating and cooling load. Compared to the boiler, this saved 46% on heating and 29% on cooling, amounting to a reduction of 36%.

Reduction of the CO₂ emissions

With the installment of the heat recovery heat pump water heater, CO₂ was reduced by 54% compared with the boiler.

- Conditions for calculating primary energy consumption
- Conditions for calculating CO₂ emissions

- ◎ Power ... 0.311kg-CO₂/kWh (*2)
- ◎ Power (all day) ... 9.76MJ/kWh (*1)
- ◎ City gas ... 2.29kg-CO₂/Nm³ (*3)
- ◎ City gas ... 45.0MJ/Nm³ (*1)

*1: Act of the Rational Use of Energy

*2: Kansai Electric Power Co., Inc. FY2010 fiscal value (actual emission factors)

*3: Gas company published values

Reduction of the cost

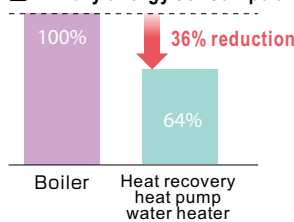
The beverage manufacturing process requires multiple simultaneous heating and cooling procedures. The heat recovery heat pump water heater has been greatly effective, as it has cut costs by 37%.

It has also led to a reduction in maintenance costs due to the extension of the maintenance cycle.

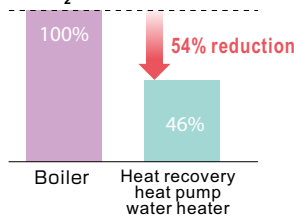
Increases productivity

Water is automatic heated, cooled, and transferred accordance with the demand for circulating water. This has helped to increase productivity.

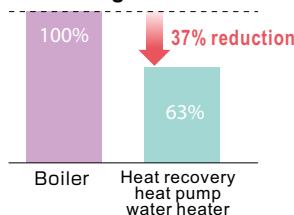
Primary energy consumption



CO₂ emissions



Running cost



Suntory Product Limited was established in January 2011 as a group member of the Suntory Beverage and Food Limited.

The company manufactures soft drinks and has factories in six locations close to major consumption areas and water sources throughout the country.

The Takasago Factory, covering an area of approximately 150 thousand square meters, manufactures drinks sold in PET bottles and cans.

As many as 200 items of products are manufactured here, including oolong tea, carbonated beverages, coffee, and alcoholic chu-hai cocktails.



Company Profile

Company name

**Suntory Products Limited
Takasago Factory**

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*Graph figures courtesy of Suntory Products Ltd.

Considered installation in order to make use of left over medium-temperature water

"We decided to introduce heat pump because we wanted to make use of the medium-temperature water generated during the manufacturing process," says Hitoshi Fujimoto, chief engineer at the Takasago Factory.



Suntory Products Limited
Takasago Factory
Chief Engineer
Mr. Hitoshi Fujimoto

In the process of manufacturing beverages, there is what is called a water circulation system in the factory that uses low, medium, and high-temperature water, supplied from respective tanks.

At the Takasago Factory, the low-temperature tank is set at 20°C, the medium-temperature tank at 40°C, and the high-temperature tank at 70°C. The low-temperature water is used to cool beverages extracted at 80 to 90°C and the high-temperature water is mainly used during pre-heating for sterilization.

Since there was a tendency for water returned from the manufacturing process to collect in the medium-temperature tank, it was often left over. Fujimoto hoped to find a way to take advantage of this.

In 1999, when the factory was just built, the maximum output temperature of a heat pump was 55°C, so one could not be installed. However, with the progress of technology, it became possible to discharge hot water



Heat recovery heat pump water heater and hot water tanks. From the left: high-, medium-, and low temperature water



Heat recovery heat pump water heater

at 90°C. Hearing of this, Fujimoto began contemplating a circulating water system using a heat recovery heat pump water heater that could efficiently create high-temperature and low-temperature water using wastewater, or medium-temperature water.

A highly efficient system built on thorough simulation

"Up until now, high-temperature water has been made with a boiler and low-temperature water with a centrifugal chiller. The beverage manufacturing process requires multiple simultaneous heating and cooling procedures. With a heat recovery hot water heat pump that could provide high-temperature and cold-temperature water simultaneously, we could expect a great effect," says Ryota Umei of the Engineering Group.

In order to use the system most effectively, two lines of products were combined in 54 types of simulations of the manufacturing process, and three modes were formulated based on the results.

Mode 1: Circulation water transfer + Circulation water transfer

Prepare low-temperature water and hot-temperature water from medium-temperature water and transfer to each tank.

Mode 2: Heat transfer + circulation water transfer

Prepare (and transfer) low-temperature water from medium-temperature water and heat high-temperature water with heat recovered (transfer heat).

Mode 3: Heat transfer + heat transfer

Transfer heat to low-temperature tank and high-temperature tank.

The most advantageous, energy cost-effective, is Mode 1. 80% of the whole performance is set to run by Mode 1. The three modes can be switched automatically, in accordance with the temperature and water volume in each tank.

Owing to these activities, in addition to the effective use of medium-temperature water, automatically switching modes allowed them to execute the improvement of controllability. Heating in accordance to the demand of circulation water, the flexibility of cooling and transferring water, and eliminating time loss due to rebooting every time the system stopped all led to increased productivity.

In addition, it was found that having three different modes lengthened the heat pump's maintenance cycle, which meant a high return on investment. This finally led to installation.

Achieved greater CO₂ reduction than estimated level

The Suntory Group's corporate philosophy is to be "In Harmony with People and Nature". As such, in 2011 the company newly established mid-term environmental goals aiming for the entire group to reduce CO₂ emissions.

At the Takasago Factory, the reduction of CO₂ emissions was estimated to be 33%. However, in actuality, there has been a significant reduction of 54%.



Takasago Factory
Engineering Group
Mr. Ryota Umei

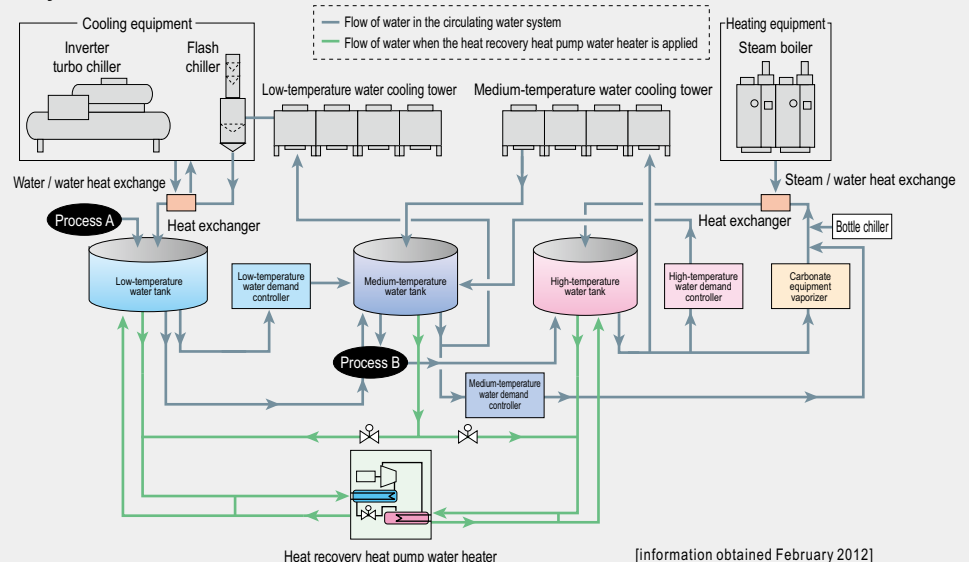
For further possibility of heat pump usage, "If hot water supply temperature reaches around 150°C, they will have more possibility to replace other process using steam." says Hitoshi Fujimoto, chief engineer.



System overview

Heat recovery heat pump water heater
Mitsubishi Heavy Industries, Ltd.
Heating capacity : 480kW
Power consumption : 148.8kW
Hot water temperature : 62.2°C in/70°C out

System flowchart



[information obtained February 2012]