

Food manufacturer

# CALBEE, Inc. Shin-Utsunomiya Factory



Heat recovery heat pump

## Introduction of heat recovery heat pump to the wastewater treatment facility proved energy saving and CO<sub>2</sub> reduction

At this plant, wastewater is heated at the anaerobic wastewater treatment facility, in order to stabilize the processing capability. In place of the steam boiler that had been used for this heating, the installment of the heat recovery heat pump greatly contributed to the reduction and heat loss of primary energy usage, demonstrating a high energy and CO<sub>2</sub> effect.



Some of the key products shipped from the Shin-Utsunomiya Factory

### The decisive factor

#### Stability of the temperature and amount of wastewater

Installation of heat recovery heat pump was determined based on the assessment that this heat recovery heat pump could be used in wastewater treatment facilities, because the temperature of steam-heated wastewater after treatment (treated water) is stable as a heat source and a certain amount of heat can be obtained continuously,

### Advantages

#### Reduction of the energy consumption

The installation of a heat recovery heat pump reduced primary energy consumption by 43%.

#### Reduction of the CO<sub>2</sub> emissions

With the reduction of energy use, CO<sub>2</sub> emissions were down by 48%.

- Conditions for calculating primary energy consumption
  - ◎ Power (daytime) ... 9.97MJ/kWh (\*1)
  - ◎ Power (night) ... 9.28MJ/kWh (\*1)
  - ◎ City gas ... 45MJ/Nm<sup>3</sup> (\*1)

- Conditions for calculating CO<sub>2</sub> emissions
  - ◎ Power ... 0.375kg-CO<sub>2</sub>/kWh (\*2)
  - ◎ City gas ... 2.29kg-CO<sub>2</sub>/Nm<sup>3</sup> (\*3)

\*1: Act of the Rational Use of Energy  
\*2: TEPCO FY2011 fiscal value  
\*3: Gas company published values

#### Reduction of the heat loss

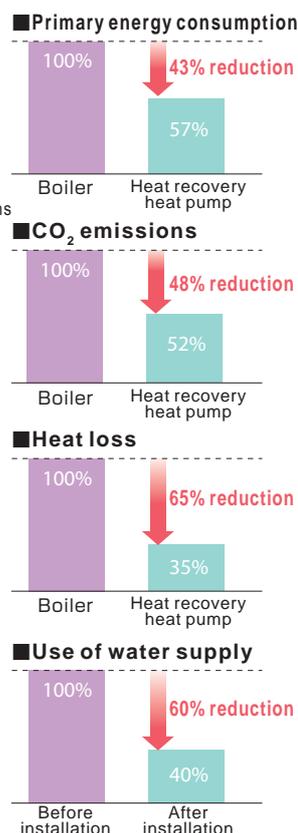
As it was no longer necessary for steam to be drawn from the boiler in the factory 250 meters away in order to supplement the heating capacity, it was possible to reduce heat loss by 65%.

#### Reduces use of water supply

The amount of water supply used in the boiler was reduced by 60%.

#### Decreases discharged water temperature

The heat recovery heat pump reduces the temperature of discharged water, which reduces the environmental burden.



\*Graph figures courtesy of CALBEE, Inc.

Known for products that include "Potato Chips", "Kappa Ebisen", "Sapporo Potato", and "Jagariko", among others, CALBEE, Inc. is a snack manufacturer that continues to expand its line of tasty snacks that boast freshness, made from ingredients to enhance natural flavor and nutrition.

Of its 15 factories, the Shin-Utsunomiya factory that covers the East Japan region ships nearly 20 billion yen worth of goods, with a production share 18% of all factories. It is one of CALBEE Group's central production bases. (FY2011 results)



### Company Profile

Company name  
**CALBEE, Inc.**  
**Shin-Utsunomiya Factory**  
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## Dependence on the boiler, heat loss No use for exhaust heat

“When the plan was officially decided to be put into action, and with a backdrop of great achievements in previous environmental investments, I thought, in this growing momentum meant, I should take the opportunity to try something new,” reflects Factory manager Sakai.

CALBEE, Inc.  
East Japan Business Headquarters  
Shin-Utsunomiya Factory manager  
Mr. Hiroshi Sakai



East Japan Business Headquarters  
Shin-Utsunomiya Factory Maintenance Division  
Equipment Maintenance Team  
Energy Supervisor  
Mr. Wataru Abe

Since the factory was newly established in 1995, anaerobic wastewater treatment equipment has been used. With this method, it was necessary to raise the temperature of drainage water to over 35°C in order to stabilize processing capacity. For this reason, three boiler systems – the city gas fuel type that was installed in the wastewater treatment facility, the biogas type where methane gas generated by the wastewater treatment is turned into fuel, and the city gas fuel type placed within the factory facility – were used to create steam to directly heat wastewater.

The issues were heightened dependence on the boiler, heat loss from steam pipes, and the existence of wasted heat that could not be used.

Heat loss was especially significant in the steam



Outer view of wastewater treatment facilities. The water tank is buried underground.

The pipe connected to the back of the heat pump.



pipes drawing from boilers placed within the factory to maintain heating capacity. Yearly heat loss was said to be up to 4,833GJ per year.

Energy Supervisor Abe of the Equipment Maintenance Team says, “The length of the pipe reaching from the boiler room to the wastewater treatment facility was 250 meters. Heat was lost on the way.”



The infrastructure line connecting the first connection building with each facility. With the distance, heat loss was inevitable.

Because wastewater (treated water) that had reached 35°C was drained without ever being used for other purposes, there was the concern that it’s higher temperature than normal one would impact the environment.

Amidst these circumstances, there was an inspection of the factory based on the Energy Conservation Law in 2009 providing an opportunity for the entire scheme to fully be reviewed. After serious deliberation, it was decided that a new system based on a heat recovery heat pump would be installed.

## Re-using energy that had been wasted

In the new system, the heat recovery heat pump makes warm water at 50°C, by using the heat from high-temperature treated water that is transferred out of the treatment tank and into the discharge tank as its heat source.

The wastewater drawn up from the high-concentration adjustment tank is heated with the warm water made in the heat pump and sent to the pH adjustment tank. Meanwhile, because the heat of the treated water that is drawn from the

discharge tank is recovered by the heat pump during the process of making warm water, the temperature declines.

Due to this system, our dependence on the boiler reduced significantly and eliminated the need to send steam from the boiler room in the factory facility. Moreover, because the wastewater temperature at the time of discharge could be lowered, this led to the reduction in environmental impact.

“When I saw the effects of energy-saving, realized that the energy we had been throwing away was being returned as our own. I could truly feel the worth,” says Factory manager Sakai who expects to recover the capital investment for the new system in approximately 3.2 years, due to greatly controlled running costs from the energy-saving effect.

## Energy-saving and improved productivity are two sides of the same coin

Shin-Utsunomiya Factory’s experience and performance has been reported to CALBEE’s other factories and introduction of the heat recovery heat pump in other factories is now being considered for the entire Group.

Energy Supervisor Abe says that even after the new system is installed, existing inspections and improvements will lead to the next step, he says, “The most important thing to consider when broadening and deepening hardware use is the accumulation of experience. Continued improvements will further raise capability.”

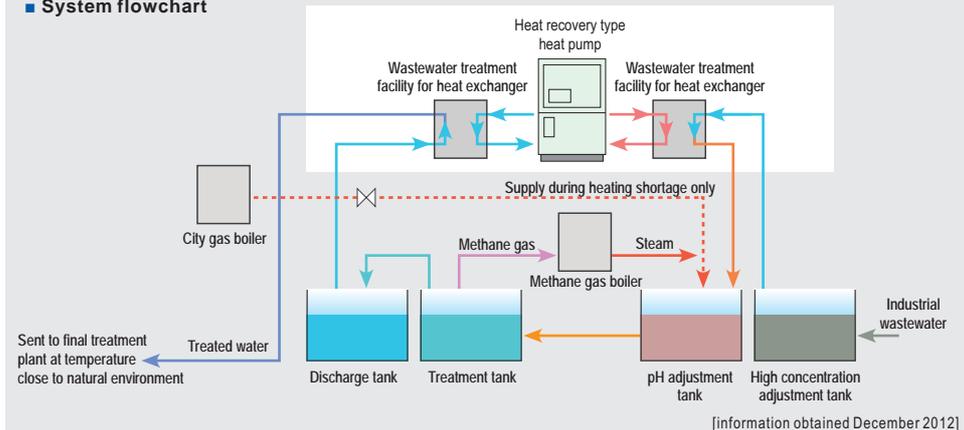
Factory manager Sakai says that he wishes to convey the message to employees, that energy-saving and improved productivity are two sides of the same coin. “The approach to improving efficiency and eliminating heat loss also lead to energy-saving and improved productivity. Not only a capital investment, but also a small suggestion could lead to a significant approach. I will talk to the employees about this as I carry on with improvement activities.”

Remarks: The position of Mr. Sakai and Mr. Abe, and the product made by CALBEE, Inc. are those at the time of the interview.

### ■ System overview

Heat recovery type heat pump Kobe Steel, Ltd.  
Heating capacity : 461.3kW Power consumption : 111.9kW Hot water temperature : 40°C in / 50°C out

### ■ System flowchart



[information obtained December 2012]