

Development of “SOLAMO”, the Gas-Fired Hot Water System Utilizing Solar Heat



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1. Introduction

In recent years, the gas industry has focused on integrating gas and renewable energy to help create a low-carbon society. With this background, Tokyo Gas and Osaka Gas developed “SOLAMO”, a gas-fired hot water system utilizing solar power. With this system, customers can cover part of their domestic thermal demand for hot water and heating by solar heat. “SOLAMO” was named in line with our belief that gas can make better use of solar power¹⁾.

Tokyo Gas released the SOLAMO system for detached houses in January 2010 (manufactured by Chofu Seisakusho Co., Ltd.), and the SOLAMO system for installation on the balconies of newly-built condominiums in February 2010 (joint development by Tokyo Gas, Yazaki Corporation, Sankyo Tateyama Aluminium, Inc., Rinnai Corporation and Gastor Co., Ltd.), while Osaka Gas launched the SOLAMO system for detached houses in May 2010 (manufactured by Takagi Industrial., Co., Ltd.). Tokyo Gas and Osaka Gas worked together on the development where possible so as to standardize the specifications.

Every SOLAMO system has a latent heat recovery type highly efficient gas water heating system called “ECO-JOES”, and comes with a mode that allows hot water to be heated by solar power alone. This greatly reduces the gas consumption and CO₂ emissions compared with existing water heaters. When sufficient heat is not available due to a change of weather, the gas water heater can take over and supply hot water at any time. Moreover, the remote control panel features a solar heat monitor for checking the use of solar heat and a display that indicates the solar

heat collection status in real time, thus helping users to feel they are really using solar energy.

The SOLAMO system consists of a heat collection unit to collect solar heat, a hot water tank unit which stores solar heat, which is then used for supplying hot water and heating, and also a remote control panel which acts as an interface between the system and the user. This report outlines the major specifications and characteristics.

2. Major Specifications and Characteristics of Each System

2.1 SOLAMO system for detached houses manufactured by Chofu Seisakusho

The major specifications of the system manufactured by Chofu Seisakusho are shown in Table 1. This system is designed to be used in detached houses. A 200-liter hot water storage tank and 42kW class ECO-JOES gas water heating system as a supplementary heat source are installed in the hot water storage unit. The remote control panel is equipped with EneLook and solar heat monitoring function. This unit was developed based on the 2009 “Good Design Award”-winning “ECOWILL” remote control unit released in 2009. On the solar heat monitor, users can check the utilization rate of solar heat (%), which shows the proportion of hot water that is supplied by solar heat for the total demand, and also the reduction of gas consumption (m³, yen), and the reduction of CO₂ (kg) thanks to the SOLAMO system. In addition, sophisticated mechanisms such as “Eco-Yu” mode which supplies hot water heated by only solar power, and the change of the backlight of the remote control panel during solar heat collection give

customers a sense of achievement that they are collecting or using solar energy at that very moment. There is also a version of the SOLAMO system that comes with a designated calorimeter in the hot water storage unit for compliance with the Green Heat Certification System, which is designed to encourage the use of equipment utilizing solar power in houses (a subsidy system of the Tokyo Metropolitan Government). Figure 1 shows the appearance of the SOLAMO system manufactured by Chofu Seisakusho.

Table 1 Major specifications of the SOLAMO system manufactured by Chofu Seisakusho

Hot water storage unit	Hot water storage tank: 200 L (installed on the hot water supply loop) Supplementary heat source unit: 42kW class ECO-JOES unit Dimensions: H 1900 × W 440 × D 750 (mm)
Heat collection unit	Flat type, approx. 4 m ² (2 m ² × 2 sheets)
Remote control panel	EneLook remote control panel with a solar heat monitoring function



Figure 1 Appearance of SOLAMO System
Manufactured by Chofu Seisakusho

2.2 SOLAMO system for installation on the balconies of newly-built condominiums

The major specifications of the SOLAMO system for condominiums are shown in Table 2. This system was commercialized focusing on the following points:

Heat collector

Heat collectors are built into the handrails of balconies so that they are in harmony with the appearance of buildings. One of the key points is to make the frames of handrails as low profile as possible. By dividing the solar battery into two parts, and placing these at both ends of a heat collector, we succeeded in making the frame look slim and simple. A blindfold board is also incorporated so that open pipes will not impair the appearance of condominiums. Meanwhile, to facilitate maintenance, parts can be replaced from inside the balcony. Figure 2 shows the appearance of the handrail built-in type heat collector.

Table 2 Major specifications of the SOLAMO system for installation on the balconies of newly-built condominiums

Hot water storage unit	Hot water storage tank: 100 L (installed on the hot water supply loop) Supplementary heat source unit: 42kW class ECO-JOES unit is separately installed. Dimensions: H 1900 × W 480 × D 400 (mm) (in case of a hot water tank alone)
Heat collection unit	Handrail built-in type, flat type (vertical installation) approx. 3 m ² (1 m ² × 3 sheet) Solar battery attached to make a solar heat collecting pump drive.
Remote control panel	Remote control touch panel equipped with solar heat monitor



Figure 2 Handrail built-in type heat collector installed in the laboratory facility

Remote control panel

An exclusive remote control unit was developed based on the touch panel type EneLook remote control unit for heat source device of the Gas Central Heating system (GCH), with the function of a solar heat monitor. On the initial display, not only the heat collection status and the amount of hot water storage, but also the cumulative reduction of CO₂ are indicated so that customers can visualize their contribution to environmental preservation. A user-friendly display was developed based on a usability evaluation. In addition, by turning off the switch, the customers can change the mode to use hot water heated only by solar power. Figure 3 shows the appearance of the remote control panel installed in a kitchen.



Figure 3 Picture of the appearance of the remote control panel installed in the kitchen

Hot water storage unit

During the test operation of the heat collection loop, a method suitable for the small-output solar battery powered pump was developed. This method allows automatic checking of the completion of injecting heat transfer liquid. The fixing method was also improved by carrying out an earthquake resistance test because an earthquake resistance of 1 Gal is required when the unit is installed in condominiums.

2.3 SOLAMO system for detached houses manufactured by Takagi Industrial

Table 3 shows the major specifications of the SOLAMO system manufactured by Takagi Industrial. In their system, unlike the previous two systems, solar heat is absorbed as hot water which is stored in the hot water storage tank. By

adopting a high-temperature water distribution method, the hot water in the tank can be used not only for heating equipment, but also for hot water supply and bath heating getting through liquid-to-liquid heat exchangers (refer to Figure 4). This system makes it possible to utilize latent heat efficiently because when the system provides hot water heated by both solar heat and gas, the feed water can obtain latent heat before being exchanged with hot water for heating. In addition, this system offers another advantage that neither depressurization valves nor mixing units are required since no hot water storage tank is installed on the feed water loop.

Table 3 Major specifications of the SOLAMO system manufactured by Takagi Industrial

Hot water storage unit	Hot water storage tank: Open type 180 L (installed on the heating loop) Supplementary heat source unit: 42kW class ECO-JOES unit Dimensions: H 1910 x W 480 x D 780 (mm)
Heat collection unit	Flat type approx. 4 m ² (2 m ² x 2 sheets)
Remote controller	EneLook remote controller equipped with solar heat monitor function

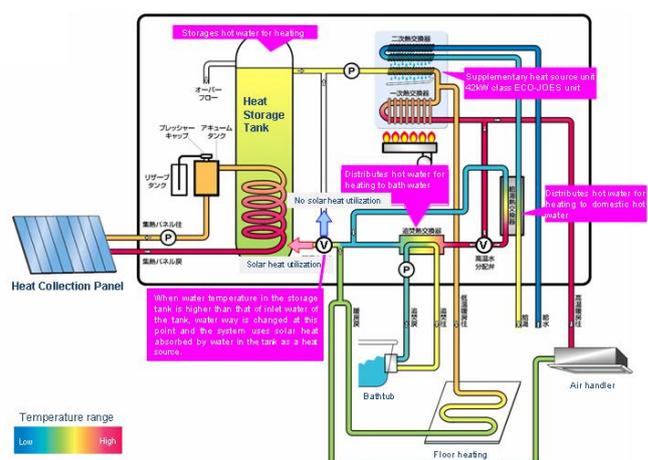


Figure 4 Components of the loop of SOLAMO system manufactured by Takagi Industrial

3. Conclusion

“SOLAMO” was developed to integrate renewable energy and gas-fired hot water supply

systems using solar power. Tokyo Gas and Osaka Gas collaborated on the development so as to standardize the specifications. The SOLAMO system for detached houses (manufactured by Chofu Seisakusho and Takagi Industrial) and the SOLAMO system for installation on the balconies of newly-built condominiums have now been released, and the product range will continue to be improved and expanded.

Reference:

- 1) Tokyo Gas Co., Ltd. Press Release issued on February 5, 2010.