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| O-03 | Keywords | Y2 | device | Z4 | electricity | S5 | renewable energy |
| | | | | | | L | Technical Services |

Commercial Heat Pump Water Heater

Features

- ◆ Heat pump water heater is highly efficient system that heats water by using heating energy, which may not be very hot but has energy abundantly available, such as ambient heat, underground heat or waste heat with the usage of heat pump technologies.
 - A new hot water system to replace the conventional boilers.
 - Only 1/3 (this may fluctuate depending on the heat source temperature and other various conditions) of the energy required to produce the same amount of water.
 - Some models can store hot water at 90°C, even from a heat source with an external air temperature of -25°C.
- ◆ Wide range of variations
 - The introduction of the commercial Eco-Cute, which uses natural refrigerant CO₂, is increasing.
 - A wide range of products are available from compact models, equivalent to home use, to larger models, used for pools and spas.
 - Hybrid hot water supply systems that combine combustion type boilers are also possible.
- ◆ Reduction of the energy consumption and CO₂ is possible and the electric power load leveling is also possible.
 - Due to the high energy efficiency the energy consumption is low. Compared to fossil fuel combustion system it is very energy conservation system which also can significantly reduce CO₂ emissions.
 - The use of hot water stored in the hot water storage tank makes it possible to suspend heat source operations in electric power peak periods during the day or hot water storage operations using discounted night time electric power to level the electric power loads and reduce running costs.



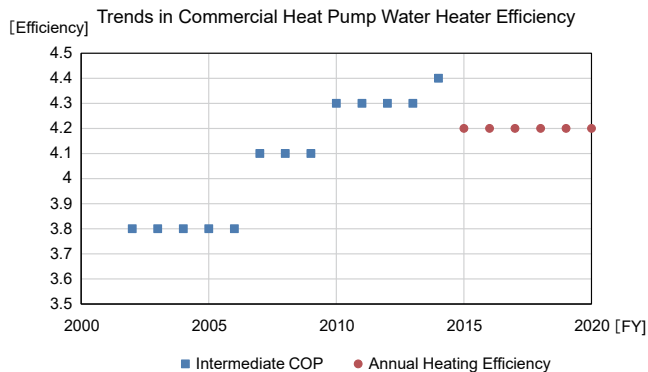
Basic Concept or Summary

- ◆ Refer to pages, such as R-03 (Heat Pump [General purpose]) and R-04 (Air/Heat Pump Water Heater with Natural-Refrigerant), regarding the operating principles of the heat pump water heater.
- ◆ Types and characteristics of refrigerants for heat pump water heater
 - (1) Natural refrigerant (CO₂)
 - Environmentally considerate refrigerants that have an Ozone Depletion Potential (ODP) of 0 and a Global Warming Potential (GWP) of 1.
 - Hot water storage tanks can be made smaller, since a maximum hot water output temperature of 90°C is possible. Furthermore, applications that require high temperature hot water, such as dish washers in kitchens, can also be provided.
 - Many models adopt a single pass temperature rise system that increases the temperature of the feed-water up to high degree in one rush. (Some models support circulated heating also)
 - (2) HFC refrigerant
 - There are two types of heating systems, one raises the temperature while circulating water with a constant temperature difference (about 5°C), whereas the other comprises a single pass temperature raising system.
 - Although technically it is possible to dispense hot water at a high temperature of 90°C, using the HFC refrigerant, but doing so significantly reduces the efficiency and for this reason the characteristics of the refrigerant are generally utilized with many models set to 70°C, the maximum temperature for highly efficient operations.
 - Since many parts are in common with other heat pump equipment, such as air conditioners, the products can be delivered with a high degree of reliability at a relatively low cost.
- ◆ Types and characteristics of hot water storage tanks
 - (1) Sealed tanks
 - These tanks are made of SUS. Hot water can be supplied using service water pressure, since it is possible to connect the tank to the service water system. Since the application of a load can potentially cause damage, hot water supplies to lower floors are restricted.
 - (2) Open tanks
 - Many of these are panel tanks built on site, using SUS or FRP. The internal pressure of a tank is atmospheric and a pump for supplying the hot water is required separately, however, it supports an instantaneous supply of large quantities of hot water or the supply of hot water to the lower floors with piping over a long distance.

Effects or Remarks

◆ Trends in Commercial Heat Pump Water Heater Efficiency

With efficiency improvements from technological developments by domestic manufacturers, an annual average heating efficiency of 4.2 has been achieved.



$$COP = \frac{\text{Available thermal energy (kW)}}{\text{Input energy (kW)}}$$

$$\text{Annual Heating Efficiency} = \frac{\text{Annual Heating Amount (Annual Standard Reserved Hot Water Thermal Dose)}}{\text{Annual Electricity Consumption Amount (Annual Power Consumption for Standard Reserved Hot Water Heating)}}$$

◆ Commercial Heat Pump Water Heater – Introduction of Case Study

- 1) Location: Ishikawa Prefecture 2) Industry: Hospital 3) Scale: No. of Beds - 199
- 4) Hot Water Equipment: Commercial EcoCute (Hot Water Tank 32 m³) 30kW x 8 units

Effect of Introduction:

As a result of renovating the above facility to fit the hot water supply system with a heat pump water heater (Commercial EcoCute) instead of a kerosene boiler, primary energy consumption has been reduced by about 31%.



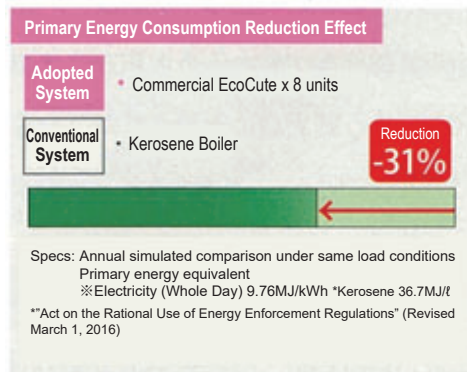
External appearance of Building



Commercial EcoCute



EcoCute Hot Water Tank



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