

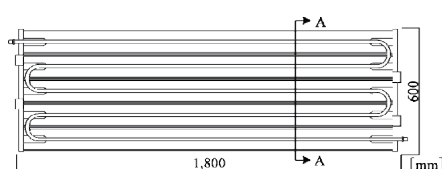
Latent Heat Sensible Heat Separation Air Conditioning System Capable of Utilizing Renewable Energy

Features

Highly efficient energy conservation performance is possible with the use of aluminum slit-type radiation panels with good load responsiveness for indoor sensible heat treatment. The cold water temperature of 16°C - 20°C and hot water temperature of 28°C - 38°C for these radiation panels are close to the indoor environment, and these can be operated without the need for heat pumps with the direct use of renewable energy such as geothermal, solar energy, etc.

The use of renewable energy, desiccant units (DC) for waste heat utilization, or sensible heat exchangers (SHEX) for outside air latent heat treatment creates a comfortable indoor humidity environment with a supply of outside air with an absolute humidity of 8g/kg or less.

This radiation panel air conditioning system creates an optimal human-friendly indoor environment by using our proprietary controller to control the indoor ring environment index PMV (predicted mean vote) without controlling the room temperature. This latent heat sensible heat separation air conditioning system also forms an essential part of ZEB (zero energy building) technologies to minimize air conditioning energy consumption.

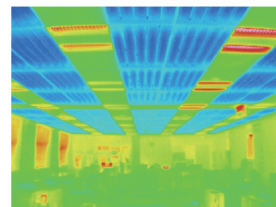


Plan View

Metal reinforced polyethylene pipe
Inner diameter 12.1mm Outer diameter 16.1mm
12mm thick aluminum

A-A Cross-section

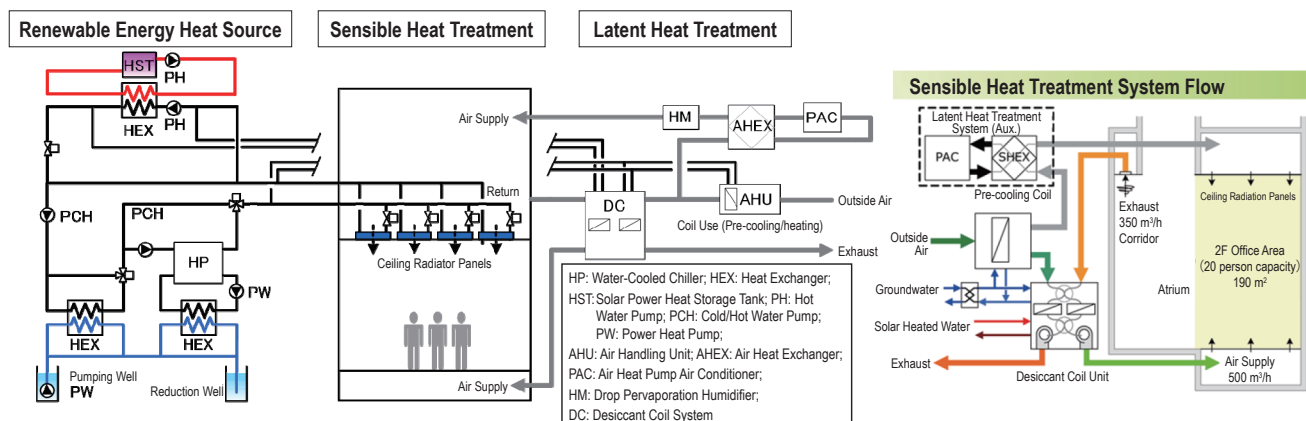
Aluminum panel → Good thermal conductivity, lightweight
Slits between panels → Natural convection effect



*The radiation panels are bent to promote an expansion of radiation area and natural convection through slits, making it possible to provide a higher cooling capacity which is about 130% of general radiation panel products and to minimize the installation area.

Basic Concept or Summary

The renewable solar energy and geothermal heat utilization system is shown below.



The DC alternately flows through 18°C cold water and 55°C hot water to two adsorption coil units, supplying dehumidified outside air of 26°C or less with an absolute humidity of 8g/Kg or less without producing indoor sensible heat load. (Pre-cooling coil cold water temperature of 18°C)

The SHEX System cools and dehumidifies and reheats using an aluminum sensible heat exchanger.

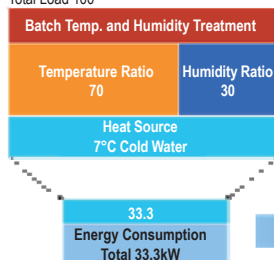
The cooling and dehumidification capacity of the heat pump equipment supplies cooled and dehumidified outside air with about 60% of normal capacity.

*This system provides a heat pump backup when renewable energy cannot be used.

Energy-saving with sensible latent heat separation air conditioning

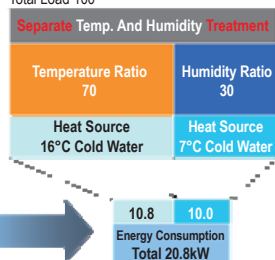
Conventional Air Conditioning

Total Load 100



Latent/Sensible Heat Separation Air Conditioning

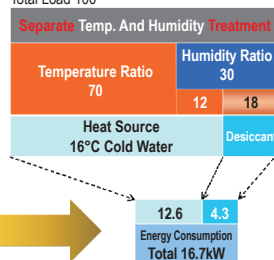
Total Load 100



38% Energy Reduction

Latent/Sensible Heat Separation Air Conditioning

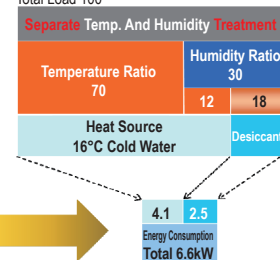
Total Load 100



50% Energy Reduction

Latent/Sensible Heat Separation Air Conditioning

Total Load 100



80% Energy Reduction

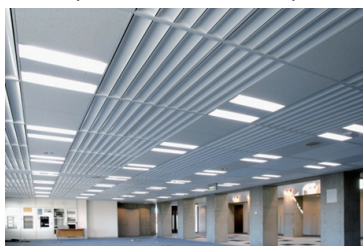
By using 16°C cold water in sensible heat treatment, 38% energy savings can be achieved with the improvement of heat source COP. The use of waste heat DCU for latent heat treatment gives an energy saving of 50%, and the further use of geothermal heat applied directly to the 16°C cold water can produce an energy saving of 80%.

In addition, the use of radiant panel air conditioning is more energy efficient in terms of heat transfer than conventional convection air conditioning. (Specific Heat – Water:Air 4.19:1 KJ/(kg/K))

Installation in Practice or Schedule

Domestic

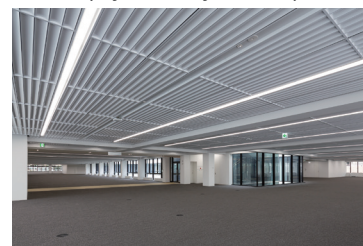
(Tsukuba Mirai TC)



(Sapporo Branch)



(Kyoto City Office)



- Sanken Setsubi Tsukuba Mirai Technology Center ZEB (Design and Construction: Sanken Setsubi Kogyo) ZEB Achieved Mar. 2014
Awards: 2nd Society of Heating, Air-Conditioning and Sanitary Engineers of Japan Awards Renewal Award
Advanced Technology Introduction Award from the 2014 Environment Minister's Award for Global Warming Prevention Activities
Carbon Neutral Award, 3rd Japanese Association of Building Mechanical and Electrical Engineers Awards
Sustainable Architecture Jury Encouragement Award, 6th Institute for Building Environment and Energy Conservation Awards
- Sanken Setsubi Sapporo Branch Office ZEB (Design and Construction: Sanken Setsubi Kogyo) Completed Nov 2018
Awards: Outstanding Performance Award at the 2018 METI Hokkaido Bureau of Economy, Trade and Industry Northern Energy Conservation/New Energy Awards
2018 Illumination Promotion Award (Hokkaido Area), Illuminating Engineering Institute of Japan
9th Carbon Neutral Award (Hokkaido Branch) of the Japanese Association of Building Mechanical and Electrical Engineers
Special Award from Judging Committee of the FY2021 Energy Conservation Grand Prize Award, Energy Conservation Center, Japan
- Kyoto City Office (Design: Nikken Sekkei Ltd.; Construction: Sanken/Meiwa JV) Completed May 2019
Sensible latent heat separation radiant air conditioning area of about 4,000㎡ (No slit type radiation panels)
Awards: Prize of the Chairman of ECCJ of the FY2022 Energy Conservation Grand Prize Award, Energy Conservation, Japan
61st SHASE Award for Distinguished Technologies (Architectural Equipment Category), Society of Heating, Air-Conditioning and Sanitary Engineers of Japan
11th Carbon Neutral Award (Kinki Branch) of the Japanese Association of Building Mechanical and Electrical Engineers
CIBSE Building Performance Awards 2024 (Project of the year - International)

Overseas Completion of renovation work at Zero Energy Plus Building of BCA Academy in Singapore in Sep. 2020

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