What is the Top Tens? – One of the 10 IPEEC task groups

IPEEC

International Partnership for Energy Efficiency Cooperation

- **Purpose: Features a framework of cooperation on energy efficiency cooperation by non-IEA member influential energy consumer countries such as China and India etc.**
- **Member Countries: G8, China, South Korea, Mexico, India, Australia, South Africa, Brazil, EU (Indonesian membership pending)**
- **Activities: Organization to promote improvements in energy efficiency in the following 10 fields, with the Top Tens one of the task groups. Since 2015, IPEEC has made reports to the G20 on the progress of cooperation based on work plans.**

<IPEEC Initiatives>

NDTG	Networked Devices TG (task group - same applies below)
SEAD	Super-Efficient Equipment and Appliance
EMWG	Energy Management Working Group
EMAK	Energy Management Action Network for Industrial Efficiency
TTG	Transport TG
BEET	Building Energy Efficiency TG
HELE	High Efficiency Low Emissions TG
EEFTG	Energy Efficiency & Finance TG
Top Tens	Top Ten Energy Efficiency Best Practices and Best Available technology
IPEEI	Improving Policies Through Energy efficiency Indicators

<G20 EE Action Plan>

Existing work streams	Buildings
	Industry
	Generation
New work streams	Finance
	Networked devices
	Transport

Top Tens

Top Ten Energy Efficiency Best Practices and Best Available Technologies Task Group

Member Countries: China, Australia, United States, South Korea, France, Canada, Japan
Observer: Brazil
Countries with a hope to join: ASEAN, other IPEEC member countries

Aim

Develop a list of energy conservation Best Practice (BP) and Best Available Technologies (BAT) on energy conservation for the purpose of spreading China-led activities

Japanese Stance

- Utilize an international network of people involved in energy conservation built by Japan
- Utilize the results of other activities within IPEEC

⇒Actively participate in the process of developing selection criteria and screening methods etc. and secure influence.

Final Goal

Expansion of the sales of Japanese equipment and technologies

***International Top Tens lists have been created twice in the past. First in 2016, second in 2019**

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Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

						S3/5	smart home/renewable energy
T-1	Keywords	Y3/4	equipment or facility/system or software	Z4	electricity	L	Technical Services

Nikken Sekkei Ltd

Energy conservation activities at a next-generation green hospital

Features

It is a project advanced by a large general hospital to create a next-generation green hospital.
In order to build a next-generation green hospital utilizing abundant natural environment, hospital director himself took the initiative to build an ideal hospital that can reduce energy consumption and CO_2 emissions, with the cooperation of the building designers and facility designers.

<Introduced energy saving and low CO_2 emission equipment from the construction phase>
- Constructed a distributed local heat source system with localized steam equipment
- Used abundant well water for the heat pump system etc.
- Applied radiant air conditioning and introduced minimal ventilation control and vaporizing humidification control
- Energy management and digital signage visualization with BEMS automatic reporting functions

<Energy saving and low CO_2 emission activities at the operation phase>
- Eco Patrol with the Eco Committee as the central member
- Designers verified performance and briefings were held on energy saving operation

<Energy saving effectiveness>
After opening, the average primary energy basic unit was 2,240MJ/m^2 per year, a reduction of about 45% compared to the basic units for a typical large hospital.

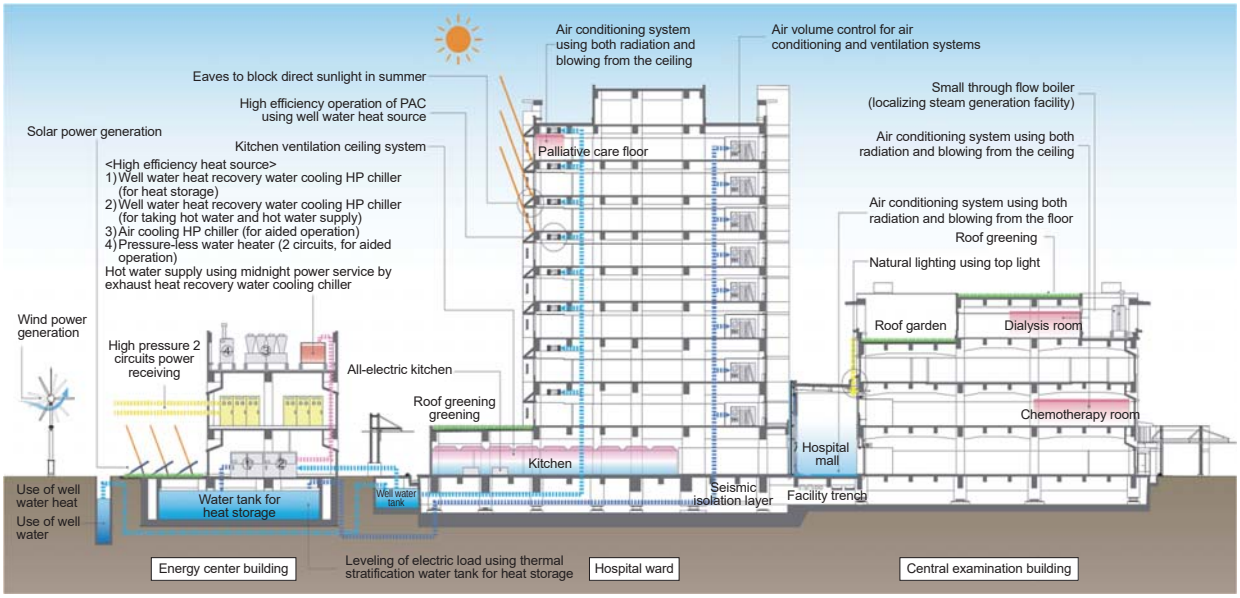
Basic Concept or Summary

Introduced as many energy saving and low CO_2 emission technologies as possible that are applicable to hospitals, under the concept of “next-generation green hospital”.

<Introduction of energy saving and low CO_2 emission equipment from the construction phase>
- The use of steam was limited to medical use, and built a high efficiency heat source system for air conditioning and hot water supply.
- Heat pump system utilizing abundant supply of well water: adopted a well water heat recovery system for air conditioning and hot water supply to improve efficiency.
- Use of wind and solar power generation for enlightenment: installed wind and solar power generation system for display for the people coming to the hospital as a symbol of a green hospital.
- Body-friendly radiation cooling and heating system: radiation-type cooling and heating system achieving both energy conservation and comfort, to provide a comfortable environment for the inpatients.
- Minimizing ventilation when outer temperature hits peak or during nighttime: control outer air volume to reduce energy consumption for heat source and ventilation.
- Total energy conservation for the kitchen: kitchen ventilation ceiling system (displacement air conditioning) + electric kitchen (low heat radiation) + control of ventilation volume
- Automatic reporting function BEMS system: energy data can be output automatically in an excel format report.

<Energy saving and low CO_2 emission activities at the operation phase>
- Briefing on eco-friendly hospital operation by the designer: held a briefing to explain the intention of the design and the operation methods to the hospital staff members.
- Performance verification by the designer: simulation of heat source operation using LCEM, and measurement of the interior environment and energy conservation.
- Eco patrol: Major members of the Eco Committee conducted eco patrols.
- Periodic reporting of energy usage by the Eco Committee: report energy consumption by division or level of the hospital.

Effects or Remarks



Effects or Remarks

- Energy conservation performance
  - Energy intensity: 2,240 MJ/m^2 year (average of FY2012 and 2013)
    →About 45% reduction compared with average intensity of large hospitals
  - Amount of energy conservation: Crude oil equivalent 2,315 kL/year (average of FY2012 and 2013)
  - CO_2 reduction: 3,930 t-CO_2/year (average of FY 2012 and 2013)
  - Ratio of energy consumption:
    Electricity (daytime): 60.6%, electricity (nighttime): 33.9%, gas: 5.4%, oil: 0.1%
    →Contract electricity: 2,500 kW (48 W/m^2), significantly contribute to the leveling of electric load.
- Return on Investment
  Initial cost of all facilities for energy conservation: Approx. 1.4 billion yen
  Yearly running cost: Reduced by approx. 200 million yen
  Simple investment recovery period: Approx. 7 years
- Major Awards
  - IFHE (International Federation of Hospital Engineering) Building Award 1stPrize
  - IHF (International Hospital Federation) Dr Kwang Tae Kim Grand Award
  - Japanese Association of Building Mechanical and Electrical Engineers Carbon Neutral Award
  - The Energy Conservation Center, Japan (ECCJ), Energy Conservation Grand Prize for excellent energy conservation equipment, Minister Prize of Economic, Trade and Industry
  - Society of Heating, Air-Conditioning and Sanitary Engineers of Japan Technology Promotion Award
  - Association of Building Engineering and Equipment Environmental Equipment Design Award BE Award
  - Japan Institute of Healthcare Architecture Healthcare Architecture Award
  - Japan Toilet Association Good Toilet Selection
- Incidental Effects (Human resource development, social recognition and energy saving and disaster prevention)
  - Fostered medical staff members friendly to the environment and also to the patients. Human resources development through the environment.
  - Fostered sustainable mind of the staff members by introducing a system ceiling, scratch-proof floor materials, wax-free floor materials, curved mirrors, visible piping, and eaves to prevent bird droppings from coming in, to extend the life of the hospital.
  - Balanced energy-saving and disaster prevention initiatives. Maintained the functions as a disaster base hospital for full back-up in case of a disaster.

Installation in Practice or Schedule

Domestic Ashikaga Red Cross Hospital (completed in April, 2011) in Ashikaga, Tochigi




- Transmission of information of a green hospital: hospital director, head of the administration section and designers gave lectures and made many contributions to newspapers and magazine.
- PR activities by accepting inspection tours: efforts of a next-generation green hospital were introduced to more than 300 medical and welfare institutions.
- Visualization using digital signage: using display monitors set at the entrance, transmit eco information to the staff members and the patients.
- As a next-generation green hospital aiming to become a ZEB, the hospital was recognized not only in Japan but also in Asia and in the world.

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Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-2	Keywords	Y4	system or software	Z2	oil	D	Construction

Misawa Homes Co., Ltd. / CS Logistics Co., Ltd.

Energy Conservation through "Building Material Delivery" in Building Materials Procurement Logistics

Features

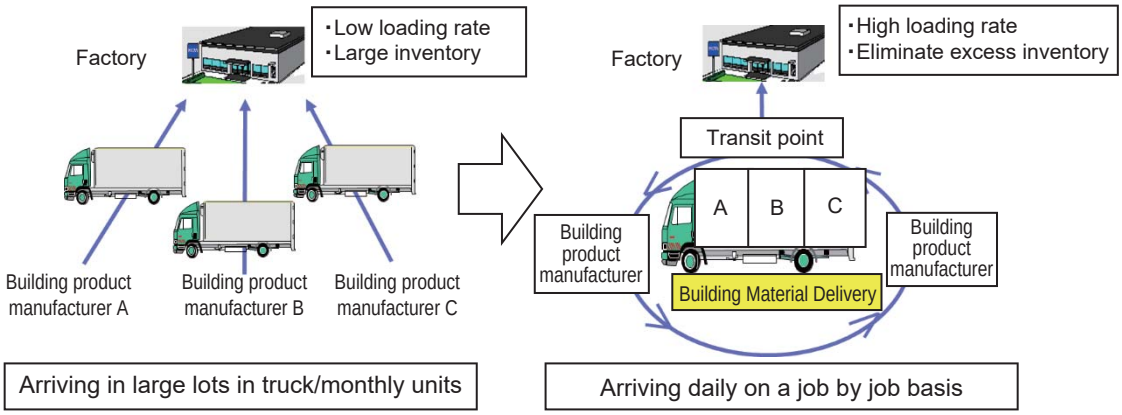
The components that make up houses vary greatly in weight and shape, making efficient transportation by each builder very difficult and a problem to solve.
As a result of developing ideas about joint transport and delivery, consideration was given to whether transport and production inefficiency could be minimized by picking up necessary components for suppliers, and this led to the establishment of a logistics network for consistent palletization as a system for carrying irregular and indeterminate loads. The current logistics system has been developed with the expansion to the companies in the housing and other industries of the handling of low-volume, wide-variety items such as long items (up to 6m) and cabinet components with low loading efficiency.

Basic Concept or Summary

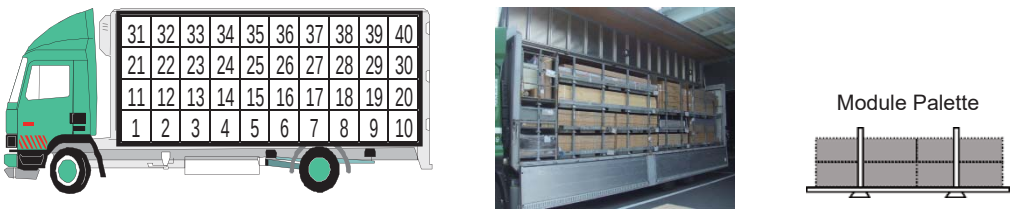
(1) Low-volume, wide-variety logistics system
A logistics system which delivers to factories and construction sites nationwide for the procurement of components and materials needed on a job by job basis as part of wide-variety customer orders.

(2) Integrated palletization logistics network
- Palette modularization for efficient loading onto vehicles
- Online system sharing loading information with suppliers
- Efficiently located distribution centers (transit point)

(3) Development of a logistics system
① From dedicated operations for each supplier to mixed operation (3PL)



② Improved loading efficiency with palette modularization
Developed module palettes for the efficient transportation of housing components of various shapes in wide-variety, low volumes



③ Efficient vehicle dispatch by grasping and sharing supplier loads online
Provides the required number of vehicles by sharing the number of blocks (number of module palettes) of daily load from suppliers online

Effects or Remarks

(1) Effect of Introduction (Internal Comparison)

① Energy consumption for procurement logistics for 250 suppliers participating in building material delivery

	Initial	After Introduction	Current	Impact
Energy Consumption	23.1GJ/Bldg.	19.7GJ/ Bldg.	16.7GJ/ Bldg	28% reduction

*The coefficient for the calculation of energy consumption was based on the Energy Conservation Center "Energy Conservation Act Compliance – Guide to the Promotion of Energy Conservation by Shippers (Third Edition)".

② Reduction of building material inventory in our factory
Achieved zero excess inventory of ordered components at our factory and relay stations

(2) Awards
Received the Minister's Award at the Energy Conservation Center's 2015 Energy Conservation Awards (supported by METI)

(3) Opening to Others (Expansion to the handling of general building materials)
This was originally a closed logistics system within our group, but a construction material delivery service was developed through a logistics subsidiary (CS Logistics) by opening this to competitors and suppliers requiring the delivery of long-size items.

(4) Future Issues

① Expansion of Nagamono.com (long-size item delivery)
Routes for the delivery of small quantities of long items (up to 6m) have been difficult but incorporating this into the logistics system improves the productivity of the transport of long items and contributes to the reduction of Japan's CO_2 emissions.

Installation in Practice or Schedule

Domestic Please see the following websites for details and examples of the building material delivery service.

[Energy Saving Award Press Release]
https://www.misawa.co.jp/corporate/news_release/2016/0121/index.html
[Nagamono.com (long item delivery)]
https://www.nagamono.com/

Contact: **Misawa Homes Co., Ltd. / CS Logistics Co., Ltd.**
Please see the following websites for company information and contact information
https://www.misawa.co.jp/en/info/
https://www.nagamono.com/

Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-3	Keywords	Y3	equipment or facility	Z4	electricity	E29	electrical machinery

Sharp Corporation Kameyama Plant

Energy-Saving Measures Introduced to Outdoor-air-Processing Units

Features

In order to maintain the environmental conditions for the manufacture of products in LCD/semiconductor factories (constant temperature and humidity, maintaining cleanliness, operating conditions for manufacturing equipment, etc.), many outside-air processors are installed and using a great deal of energy. Against this backdrop, four measures introduced to outside-air processors will be introduced here.
Measures to introduce outside-air processing units:

(1) Inverter installation and efficient operation (Figure 1)
(2) Heat recovery from factory waste heat (Figure 1)
(3) Heat recovery from water film and dehumidified drain water (Figure 1)
(4) Energy reduction through improved pressure loss (Figure 2)

Basic Concept or Summary

(1) Inverter installation and efficient operation

Reduced electricity consumption by installing an inverter to the outside air processor and fully opening the discharge damper which was throttling air volume.

(2) Heat recovery from factory waste heat

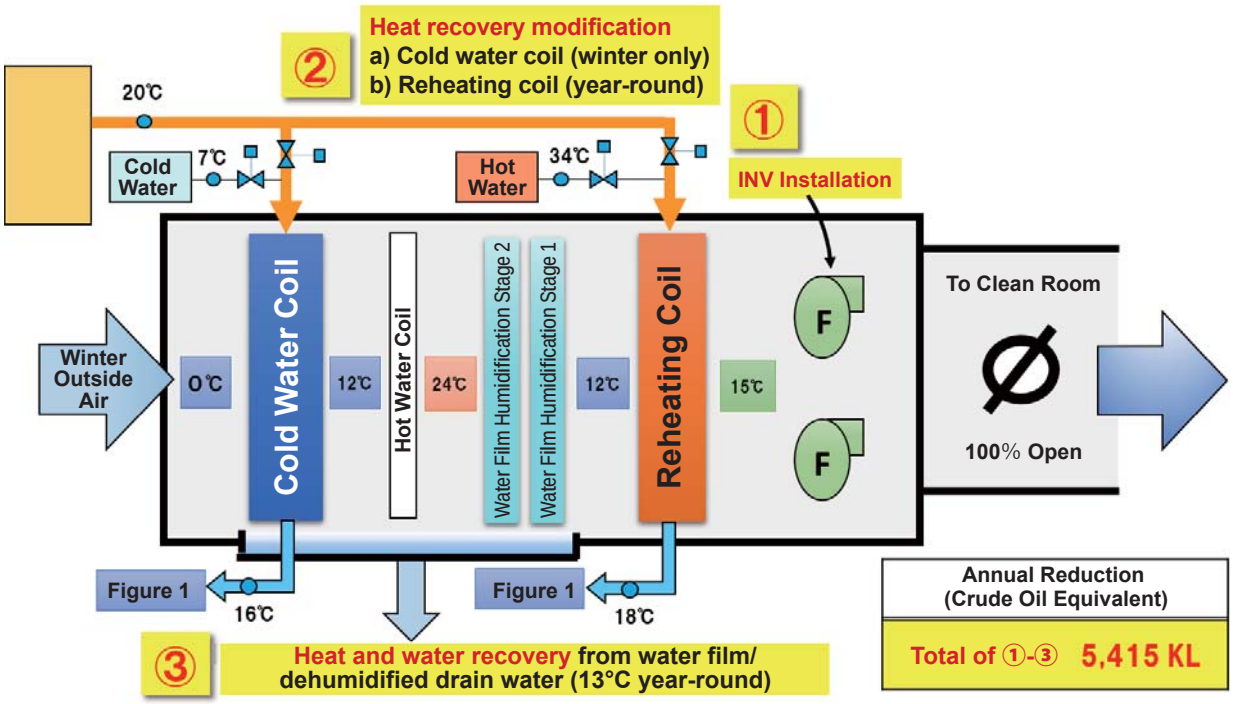
a) Heat recovery from cold water coils (effective only in winter)
Cold water (20°C) drawing heat from the factory was supplied to the cold water coil which wasn't used in the winter, reducing the load on the latter stage hot water coil and cold water (refrigerator) loads.

b) Heat recovery from reheating coil (effective year-round)
Cold water (20°C) drawing heat from the factory was supplied to the reheating coil, reducing both the hot and cold water loads.

(3) Heat and water recovery from water film and dehumidified drain water

Cold water load was reduced by taking the water film and dehumidified drain water discharged at about 13°C year-round and applying an odor removal spray and reusing as auxiliary water for the cooling tower.

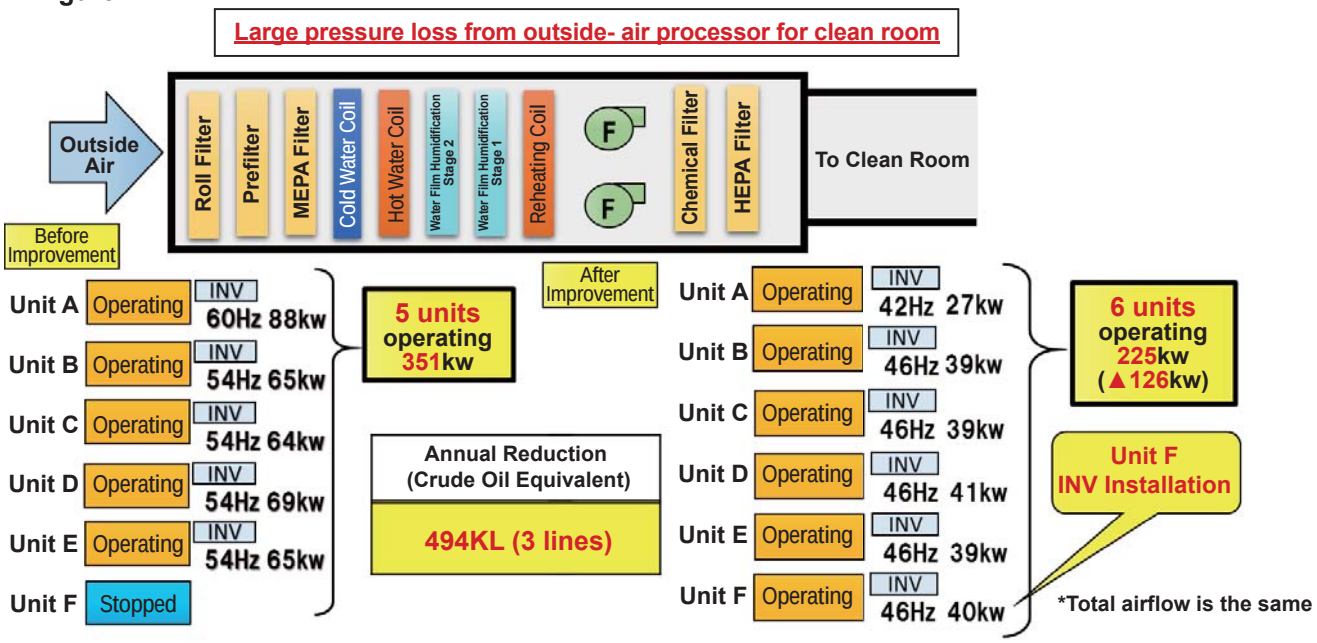
Figure 1



(4) Energy reduction through improved pressure loss

Outside air processors for clean rooms have a lot of filters and coils, resulting in greater pressure loss than for regular air conditioners. Here, as shown in Figure 2, inverting one of the suspended outside-air processors to INV for additional operation, the pressure loss is improved by reducing the air flow per unit, reducing the overall power for the outside air processors.

Figure 2



Effects or Remarks

- As a measure to effectively utilize waste heat from the factory (heat recovery), hot and cold water loads were reduced.
- Inverter installation and the addition of operating units have led to a significant reduction in transport power.
- Received “Minister Prize of Economic, Trade and Industry” at the 2014 Energy Conservation Awards
- Received the “Chairman Prize of ECCJ” at the 2018 Energy Conservation Awards

Installation in Practice or Schedule

Domestic The number of outdoor-air processing units installed
Sharp Kameyama Plant No. 1, 10 units
Sharp Kameyama Plant No. 2, 23 units

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Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-4	Keywords	Y2	device	Z4	electricity	E29	electrical machinery

Mitsubishi Electric Corporation

Energy-saving technology and airflow control of room air conditioners loaded with propeller fans

Features

- Changed the blower from a cross flow fan to a propeller fan, reducing the electric power consumption during ventilation by 31%
- Changed the shape of the heat exchanger from Λ-shape to a W-shape, increasing the heat exchanger capacity by 15% in the same cross-section area
- Achieved the highest energy saving rating of "★★★★★" for large capacity models (4.0kW to 9.0kW)
- Dual temperature air conditioning realized by independently driving two propeller fans, resulting in a 7% reduction in power consumption while maintaining comfort
- Equipped with premium dehumidification function which suppresses the decline of room temperature while maintaining a weak wind system, reducing power consumption

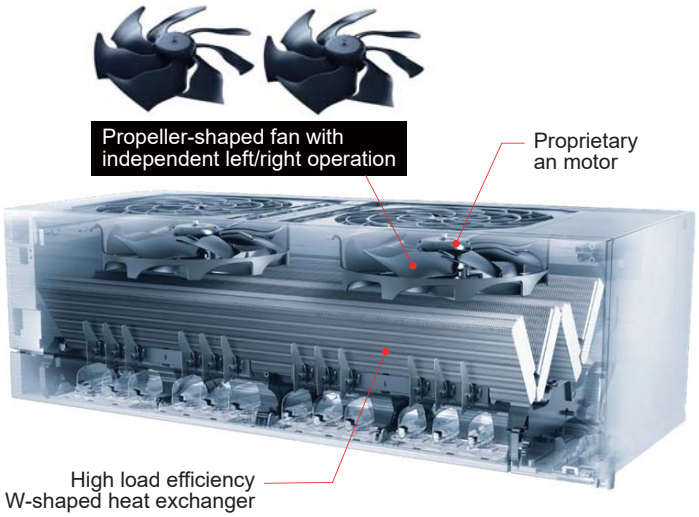


Figure 1 Air blowing mechanism of the indoor propeller unit

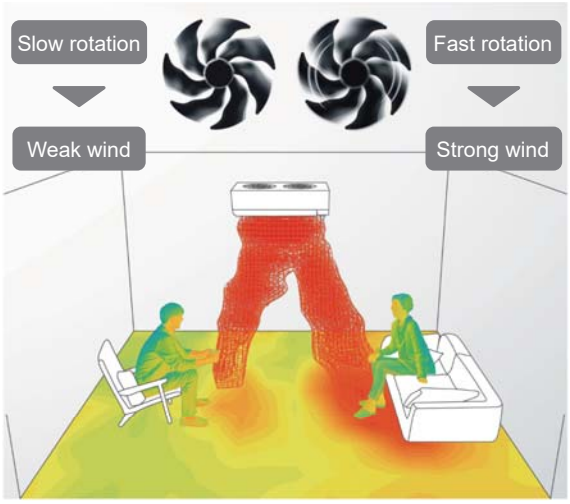
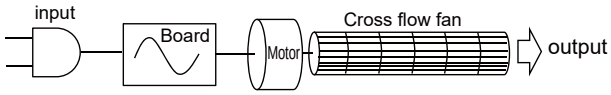


Figure 2 Left/Right Split-type Air Conditioning

Basic Concept or Summary

- Analyzed the efficiency of the electronic circuits, motor and blower involved in air blowing and developed a new blower taking notice of the blower of the greatest loss
- Dramatically improved air flow rate with the change of blower from a conventional cross flow fan to a propeller fan
- Made the propeller fan thinner and changed the shape of the heat exchanger from Λ-shape to W-shape, expanding the mounting capacity
- Realize two temperature spaces in one room by independently controlling the rotation speeds of two propeller fans
- Developed a new dehumidification method which suppresses the decline of room temperature by reducing the rotation speed of the fan on one side to a minimum, while also reducing power consumption



Input power × Board efficiency × Motor efficiency × Fan efficiency = Total efficiency

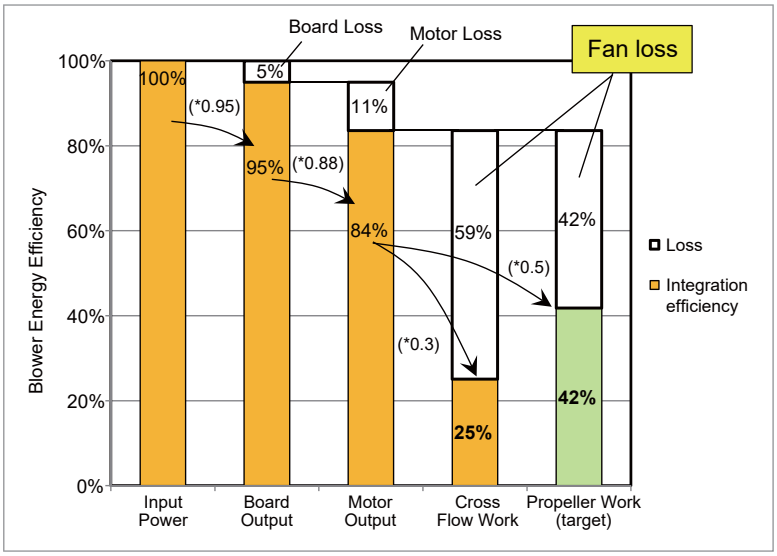


Figure 3 Blowing efficiency analysis

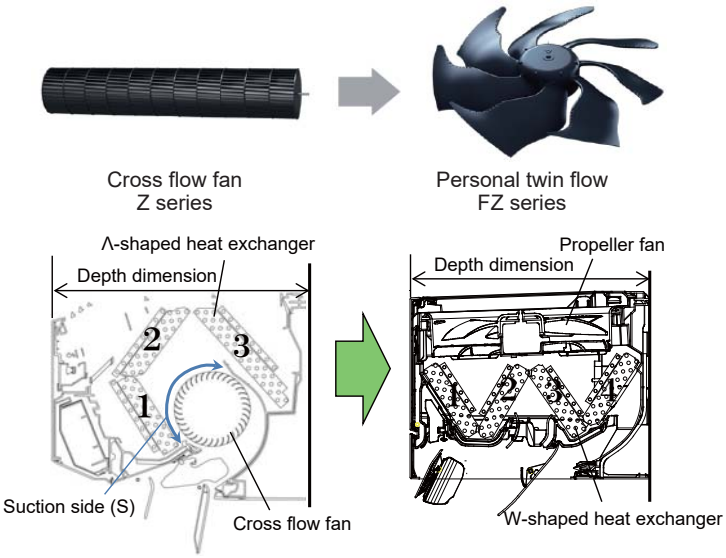


Figure 4 Layout change of blower and heat exchanger

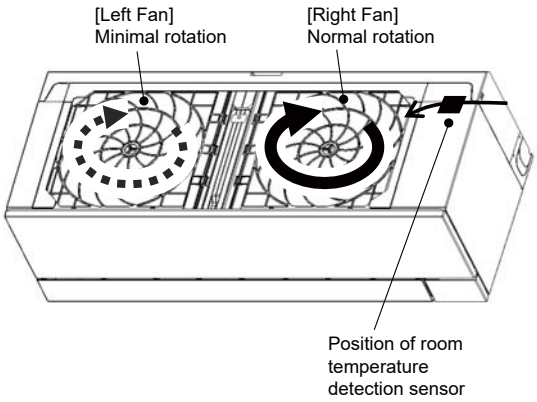


Figure 5 New dehumidifying operation

Effects or Remarks

- Obtained the number one energy saving rating for large capacity models (4.0kW ― 9.0kW) compared with other companies (As of August 30, 2019)
- Achieved the highest energy saving rating of "★★★★★" for large capacity models (4.0kW ― 9.0kW) (As of August 30, 2019)
- Achieved an energy saving of about 43% in comparison with the model 10 years ago (improved APF from 4.6 to 6.6 in the 7.1kW class)

	Model	Release Year	APF Standards	4.0kW		5.6kW		6.3kW		7.1kW		8.0kW		9.0kW	
Our Company	FZ Series	2019	JIS 9612(2013)	**7.9**	958	**7.2**	1471	**7.0**	1702	**6.6**	2035	**6.3**	2402	**5.6**	3040
			Energy Conservation Label	★★★★★		★★★★★		★★★★★		★★★★★		★★★★★		★★★★★	
	Model 10 years ago (ZW Series)	2009	JIS 9612(2013)	5.8	1304	―	―	5.0	2383	4.6	2920	―		―	
	Other Company Top	2019	JIS 9612(2013)	7.7	983	6.9	1535	6.8	1752	6.4	2098	6.1	2481	5.4	3152

Installation in Practice or Schedule

Domestic Nov 2015 – Released the Kirigamine FZ series room air conditioner (2016 model) – about 10,000 units/year
Nov 2016 – Released the Kirigamine FZ series room air conditioner (2017 model) – about 10,000 units/year
Nov 2017 – Released the Kirigamine FZ series room air conditioner (2018 model) – about 10,000 units/year
Nov 2018 – Released the Kirigamine FZ series room air conditioner (2019 model) – about 10,000 units/year

Figure 6 Appearance of indoor unit

Overseas To China – released the FZ series household air conditioners in March 2018, for about 2,000 units/year

Contact: **Mitsubishi Electric Corporation**, Shizuoka Works
Room Air Conditioner Department, Engineering Section A
Tel: 0120-139-365 Customer Service Center (Open 24h/365 days (available only in Japan))
URL: https://www.mitsubishielectric.co.jp/home/kirigamine/

Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-5	Keywords	Y2	device	Z4	electricity	E29	electrical machinery

Toshiba Carrier Corporation

High-Efficiency Energy-Saving Residential CO_2 (Natural Refrigerant) Heat Pump Water Heaters

Features

- A high-performance residential heat pump water heaters that uses a natural refrigerant CO_2 and enables energy-saving, power-saving, and peak power suppression.
- Realized energy-saving and a reduction of CO_2 emissions amount by improving the efficiency of the heating stage where the water is heated to make hot water (heat pump unit) and reducing the radiation loss during the temperature-maintaining and usage stage including the hot water storage and supply (tank unit).
- Power-saving and peak power suppression are possible by connecting to a HEMS (Home Energy Management System) with a built-in communication protocol ECHONET Lite standard and executing information visualization on the light touch remote control.

Light touch remote control (Kitchen & Bath room)

Heat pump unit　Tank unit

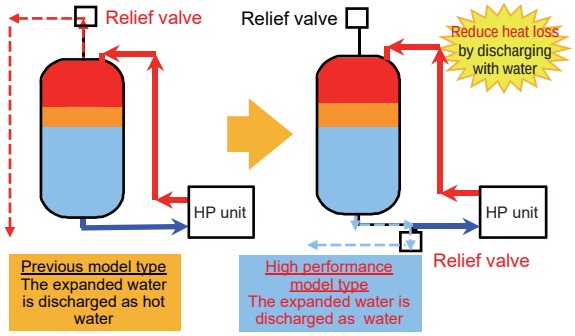
Basic Concept or Summary

- Improvement of the energy-saving efficiency of the tank unit (radiation loss reduction during the temperature-maintaining and usage stage)

(1) Improvement of the tank can body thermal insulation performance using warm cap thermal insulation
The warm cap thermal insulation is an insulation system that realizes high thermal insulation performance. It is a new thick foam heat insulating material in which the upper part of the tank where it gets the hottest is surrounded by a heat insulator shaped into a cap form so that the temperature doesn't go down and the unit size is kept as is, but the thickness of the heat insulator doubled. With this, thermal insulation performance was improved from previous models.

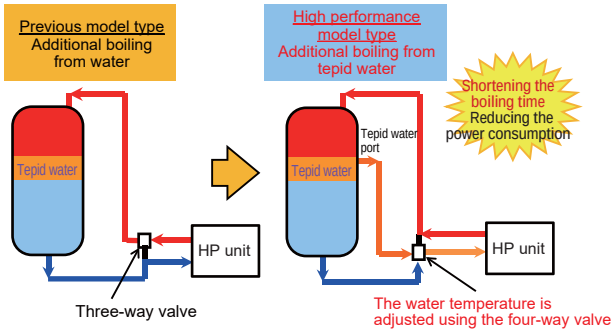
(1) Structure of heat-insulated tank

(2) Reduction of heat loss with the keep control system
For the expanded hot water that occurs during the boiling, with previous tank models, hot water with the highest temperature was discharged from the upper relief valve. However, by equipping a new relief valve with a different setting pressure in the lower part of the tank to discharge lower temperature water, hot water that was boiled can be stored without waste and heat loss from the can body can be suppressed.



(2) Control system maintaining heat

(3) Reuse of heat with the reuse control system
When hot water is supplied and boiling repeated, tepid water that is lower in temperature to the hot water supply occurs in the middle part of the tank. When tepid water increases, the amount of hot water that can be stored decreases, and sometimes the boiling efficiency lowers. The reuse control system makes efficient use of the tepid water by mixing with water and boiling rather than boiling from water, hence shortening the boiling time and reducing the power consumption when conducting boiling.

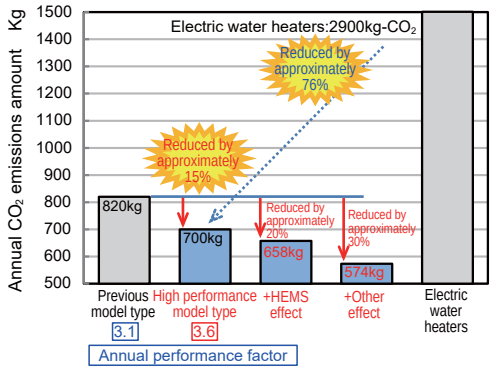


(3) Control system for reusing tepid water

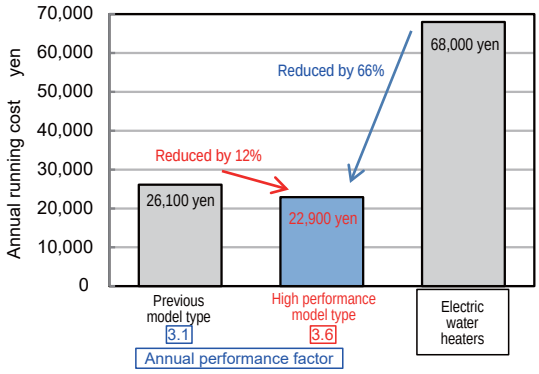
- Energy-saving performance improvement of the heat pump unit (efficiency improvement during the heating stage where the water is heated to make hot water)
  Due to the improvement of the main parts, the heating efficiency has improved from the previous models. The compressor motor efficiency was improved by increasing the coil winding and motor electromagnetic steel sheet lamination thickness. The efficiency of the inverter was improved by electric current suppression and optimum motor tuning. The heat transfer performance of the water heat exchanger was improved by the thinning of the refrigerant piping and increasing their numbers in addition to changing the water pipes to a large diameter. The evaporative performance of the air heat exchanger was improved by the increase in heat exchange volume with the adopting of a new heat transferring pipe groove shape and duplication.
- Energy-saving acceleration with HEMS connection
  In addition to the strengthening of the visualization of energy when connecting to HEMS, a function that enables the selection control of the water storage operating method, which makes efficient use of photovoltaic power generation in response to weather forecasts, has been added. Due to this, in addition to a further improvement in energy-saving due to power-saving and peak power suppression, by equipping a save additional boiling operation mode that reduces 25% of power consumption during daytime additional boiling, daytime peak power can also be suppressed. More so, by making the information visual with the light touch remote control that would lead to energy-saving, it promotes energy-saving and water-saving by the user. Moreover, since the latest model will support VPP (virtual power plant), and additional function that can efficiently use the photovoltaic power generation's surplus power was added.

Effects or Remarks

- Achieved an annual performance factor of 3.6 stipulated in the Residential Heat Pump Water Heaters JIS C 9220 and with regard to the standard value of 3.3 (energy-saving top runner target year FY 2017) for the full auto model type (classification 17), the achievement quotient was 109% (116% compared with previous models).
- The reduction effect of CO_2 emissions amount if converted from an annual performance factor can be reduced 15% compared with previous models (an approximate 76% reduction equivalent is possible against the heater type electric water heaters).Moreover, an approximate 5% CO_2 reduction effect can be provided with an HEMS connection, and when other such items that encourage energy conservation behavior by the user is added, there can be an approximate 10% CO_2 reduction effect that will not appear in the annual performance factor, resulting in the provision of a total approximate 30% CO_2 reduction effect from previous models.
- An approximate 3,200yen reduction in annual utility charges, an approximate 12% equivalent against previous models will be possible if converted from an annual performance factor. More so, compared with a heater type electric water heaters, the difference will be more than 40,000yen annually, which is a big benefit.



CO_2 reduction effect



Running cost comparison

<Conditions for trial calculation>

- Trial calculation based on the annual performance factor of JIS C 9220 (hot water supply load 40°C/456L per day, bath heat retention 4.12MJ per day).
- 0.525kg-CO_2/kWh used for the CO_2 emissions amount conversion.
- Nighttime charge of 12.16yen/kwh and daytime charge of 25.92yen/kwh of the Tokyo Electric Power Company service area was used for the electricity charges (including basic charge).

- History of Awards
  - January 2015: Received the FY 2014 Grand Prize for Energy Conservation, Energy Conservation Center Chairman's Award
  - June 2015: Received the FY 2015 Demand-side Management Commendation, Heat Pump & Thermal Storage Technology Center of Japan Promotion Award

Installation in Practice or Schedule

Domestic Began sales of the high-performance model of the residential natural refrigerant CO2 heat pump water heaters in year 2014

Overseas Began sales of the residential natural refrigerant CO_2 heat pump water heaters at our Chinese subsidiary in year 2019

Contact: **Toshiba Carrier Corporation**, Domestic Products Planning Dept
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T-6	Keywords	Y1	material or part	Z4	electricity	E21	ceramic, products

NICHIAS Corporation

High-Strength and Low Thermal Conductivity Heat Insulating Materials

Features

- A fuel cell thermal insulation material/high-temperature furnace insulation material with the main application of providing insulation for industrial furnaces (backup material).
- Superior thermal insulation performance over conventional insulation and excellent energy saving performance can be achieved by greatly reducing the amount of heat dissipation.
- In addition to its excellent thermal insulation properties, “ROSLIM™ Board GH” is able to be handled and machined easily without special tools or equipment.

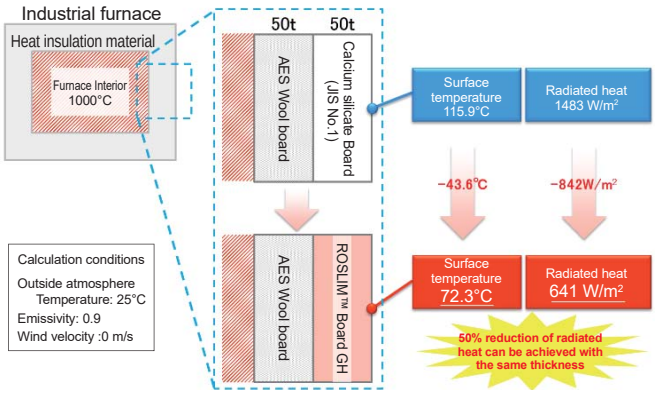

Figure 1 Advantage of the “ROSLIM™ Board GH”
(Examples of the calculation of insulation)

Basic Concept or Summary

○Summary

“ROSLIM™ Board GH” is a siliceous porous insulation material with high-strength and low thermal conductivity and a nanopore structure that includes a heat resistant reinforcing fiber and a radiation scattering material. The product has the following features:

1. Better heat insulation performance than stagnant air
2. Excellent machinability performance, outperforming conventional low thermal conductivity materials
3. Excellent workability, even without using special tools

Table 1 shows the physical properties of “ROSLIM™ Board GH”, and Figure 2 shows a comparison of the thermal conductivity of various heat insulation materials.

Table 1 Physical properties of “ROSLIM™ Board GH”

Density [kg/m³]	250	
Thermal conductivity [W/(m·K)]	at 400°C	0.030
	at 600°C	0.036
	at 800°C	0.044
Compressive strength [MPa] (10% Compressive force)	1.02	
Heat Shrinkage [%]	at 800°C×24hr	0.6
	at 1000°C×24hr	2.5
Maximum temperature rating [°C]	1000	

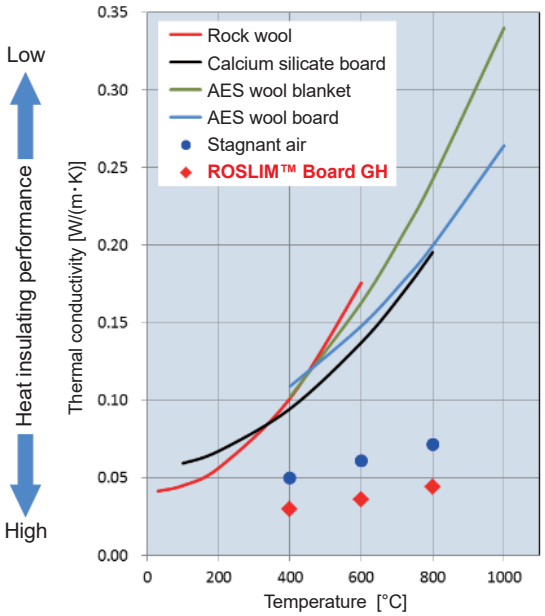

Figure 2 Comparison of Thermal conductivities of heat insulation materials

○Principles of Low Thermal Conductivity

“ROSLIM™ Board GH” has excellent thermal conductivity properties, at about ½ of that of stagnant air and less than 1/3 of that of general insulation. As shown in Figure 3, this is achieved by way of a structure (Figure 3) that has a smaller pore diameter than that of the mean free path of stagnant air, suppressing heat transfer of gas. Additionally, the radiated heat is scattered and attenuated by the effect of the radiation scattering material in the high temperature range, creating a superior thermal insulation property and a thermal conductivity ½ of that of stagnant air at 600°C.

○Principles of High Strength

“ROSLIM™ Board GH” exhibits a significant improvement in bonding force by applying special treatment to bound particles at the particle boundaries (Figure 4). As a result, it exhibits a compressive strength of about twice that of conventional products.

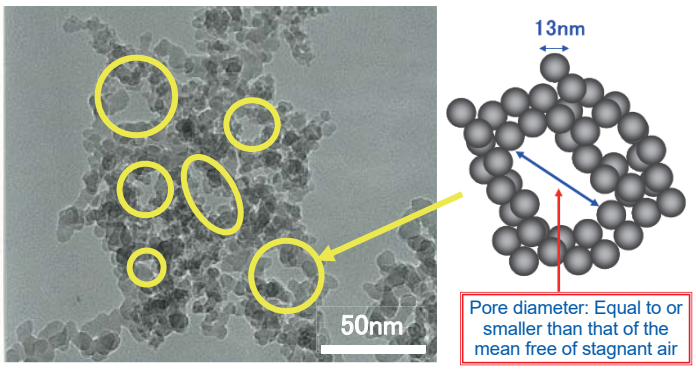

Figure 3 Inner structure of "ROSLIM™ Board GH" (TEM image)
Mean free path of stagnant air: 68nm (room temp.), 196nm (600°C)

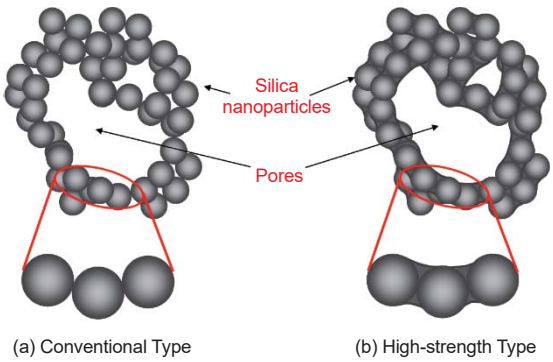

Figure 4 Schematic showing improved strength by interparticle bonding

Effects or Remarks

◆ Figure 5 shows a comparison in energy saving effects between the use of general insulation only and use in combination with "ROSLIM™ Board GH" in an electric furnace at 1000°C.

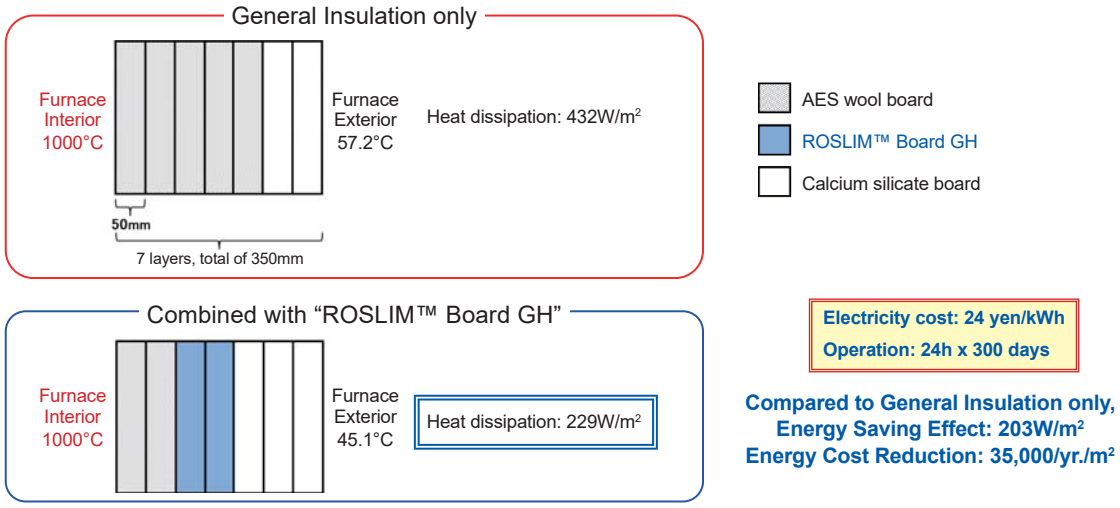

Figure 5 Energy-saving effect when combined with "ROSLIM™ Board GH"

◆ Awarded the Chairman's Prize in the Products and Business Models Category at the 2015 "Energy Conservation Awards", sponsored by the Energy Conservation Center.

◆ Participated in the New Energy and Industrial Technology Development Organization (NEDO) of the National Research and Development Agency project and promoted development.

1. Strategic development of energy usage optimization technologies
   Advanced R&D into more effective of use of basic energy technologies
   Development of a high-performance, insulation material with ultra-low heat conductivity by controlling the nanocomposite structure
   R&D Period: October 1, 2003 to March 20, 2005
2. Strategic development of energy usage optimization technologies
   Practical development of energy usage optimization technologies
   Practical development of ultra-low thermal conductivity insulation with nanopores/composite structure
   R&D Period: June 22, 2005 to March 20, 2007

Installation in Practice or Schedule

Domestic
- Fuel cell insulation
- Continuous roller hearth kiln furnace (backup material)
- Thermal insulation for cylindrical high temperature isolator (backup material)

Overseas
- Fuel cell insulation
- Continuous roller hearth kiln furnace (backup material)

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T-7	Keywords	Y2	device	Z4	electricity	E29	electrical machinery

YASKAWA Electric Corporation

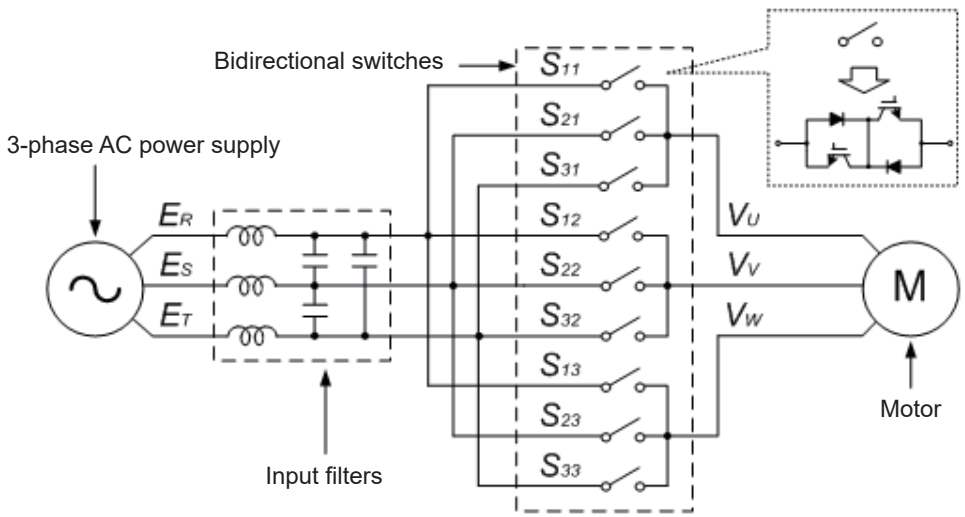
Matrix Converter

Features

- High power factor/power line harmonic suppression
  With high power factor control and power line harmonic suppression, power supply capacity is miniaturized, and harmonic suppression guidelines are cleared!
- Realized high efficiency
  Reduced energy loss compared to conventional power regeneration systems because there is no regenerative converter and peripheral devices!
- Compact
  The single advanced matrix converter realizes an inverter function to control motor speed, power regeneration function, power factor improvement function and power line harmonic suppression function!
  All-in-one unit saves wiring and space!
- Series
  Matrix Converter U1000
  Three-phase 200V class 5.5～55kW
  Three-phase 400V class 2.2～400kW
  Note: kW figures show a rough estimate.

Basic Concept or Summary

- Variable speed motor drives using inverters are becoming popular for energy conservation in the industrial field. However, there is a need to suppress power line harmonics based on the basic principles of the inverter and to process the regenerated energy created by the load side revolutions. In order to solve these problems, devices such as a regenerative power converter, an AC reactor, a harmonic filtering reactor, a condenser and others are coupled to the inverter. On the other hand, these devices require a large space for installation because of the increased number of components. This product enables both the suppression of the harmonics and the utilization of the regenerated energy in a single unit, does not require additional space for the installation and drastically reduces cost. This product reduces workload drastically, improves the energy conservation rate in operation by 2%, and reduces the capacity of generator by 50% and the capacity of power supply unit by 20%. Thus, the product deserves to be called as the next-generation motor drive that solves the problems of the conventional general-purpose inverters and contributes to the customer's energy conservation by its efficiencies which are higher than the inverters.
- Principle
  The matrix converter U1000 comprises a circuit configuration shown in the right-hand figure, and supplies sine-wave voltage and current to a motor by direct PWM control of 3-phase AC voltage with 9 bidirectional switches located on a matrix between a power supply and the motor.

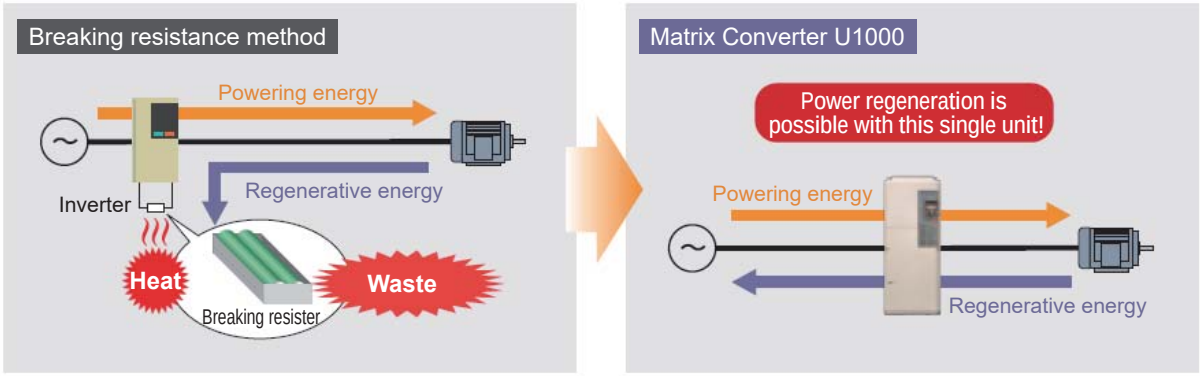


Effects or Remarks

◆ Effect of improvement

Utilizing regenerated energy, one of the features of the product, is very effective for large scale cranes and elevators.

In the case of single inverter, the regenerated energy during unloading is wasted as a heat from a braking resistor. The product allows recycling of the wasted regenerated energy at the power supply and utilization of the energy as an additional energy source. In the case of the 10-ton crane, 110,000 yen is saved annually as converted to the electric power charge.

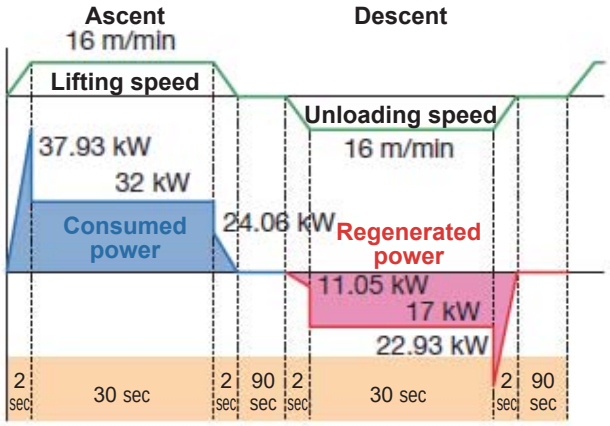


[Examples of Regenerative Energy Savings]

■**Operating Cycle**

10t crane
16m/min
Electricity Unit Price
20 yen/kWh

Don't throw away regenera-tive energy as heat, reuse it as energy!!



◎ **Annual power consumption**

Breaking resistance method: 10,150kWh

Regenerative Energy Saving: 4,700kWh

Reduction effect 5,450 kWh

◎ **Annual electric power charge**

Breaking resistance method: 203,000 yen

Regenerative Energy Saving: 94,000 yen

Reduction effect 109,000 yen

Installation in Practice or Schedule

◆ Date of Introduction – April 2014

◆ Results of Introduction (Domestic and Overseas)
- Cranes in seaports
- Cranes in steel works
- Cranes in waste disposal sites

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Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-8	Keywords	Y4	system or software	Z4	electricity	E25	general-purpose machinery

Mitsubishi Heavy Industries Thermal Systems Co., Ltd.

Optimum Control of High Efficiency Variable Speed Drive (VSD) Centrifugal Chillers using a Heat Source Integrated Control System

Features

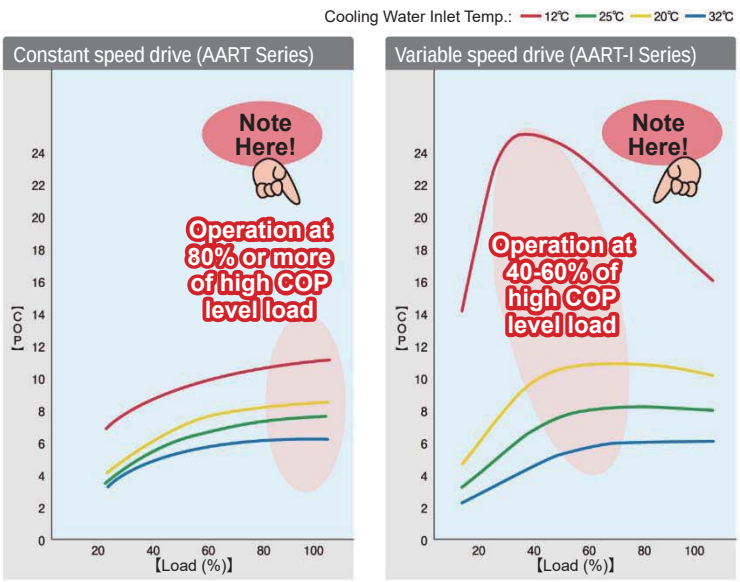
- Central control and optimization of the heat source system including the control of auxiliary equipment to demonstrate the energy-saving performance of the VSD centrifugal chiller.
- In addition to using the high efficiency VSD centrifugal chiller as a heat source, by integrating the air conditioning system including auxiliary equipment such as pumps and cooling towers, energy-savings can be further improved with optimized control.
- The centrifugal chiller incorporates high COP unit control and independent control for each auxiliary machine, and a simple control algorithm for overall optimization.
- While heat source system control involved a single conventional on-site sliding-type program, making this a standard control program for mass-production leads to further quality improvements and reductions in the introduction costs for each case.

Basic Concept or Summary

As a Heat source control system, the product has the following three features.

POINT 1. Extraction of the best performance from the centrifugal chillers

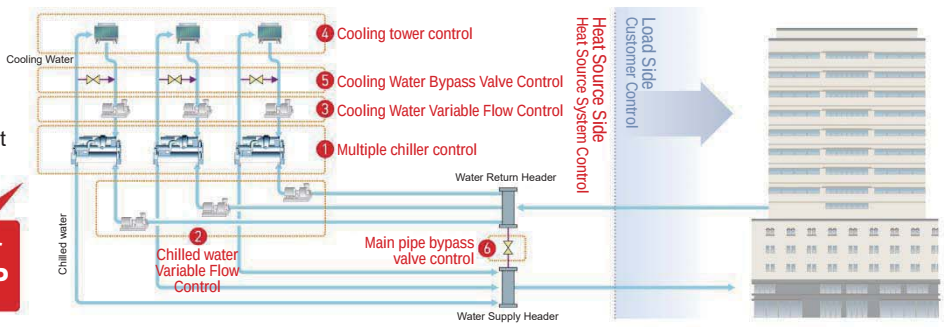
- Chiller data (optimal load range for max. COP etc.) is acquired by communication signal for optimal control.
- By communicating with the chiller, complex pre-setting work such as characteristics curve climbing etc. can be eliminated, and this also contributes to the elimination of plant sensors such as thermometers and flow meters.



POINT 2. Incorporation of various energy conservation control functions

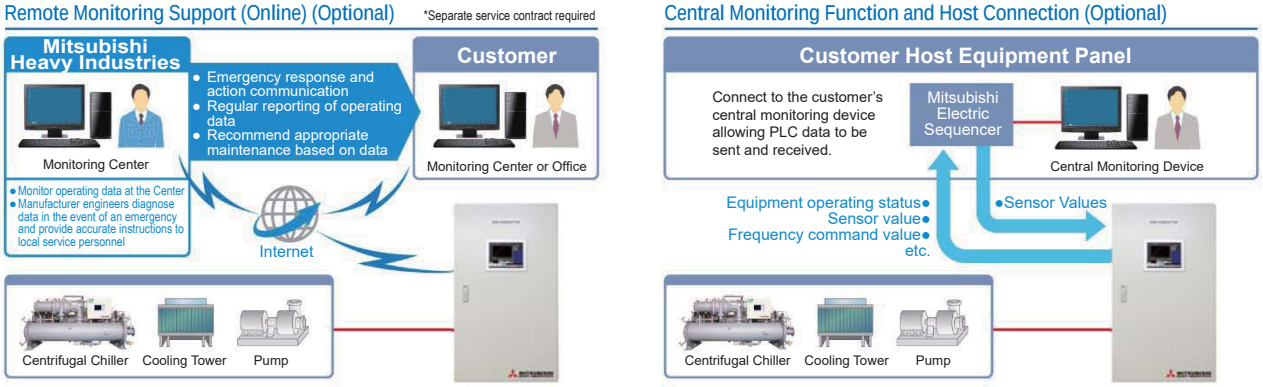
- Incorporate the 6 main heat source system controls as standard so that customers can freely combine them.
- Realize high quality and low cost with standard embedded software.

Simultaneous control of ① - ⑥ for Increased System COP



POINT 3. Incorporation of External Communication Function

● Incorporating External Communication Function (WEB, PLC) which can be easily monitored remotely

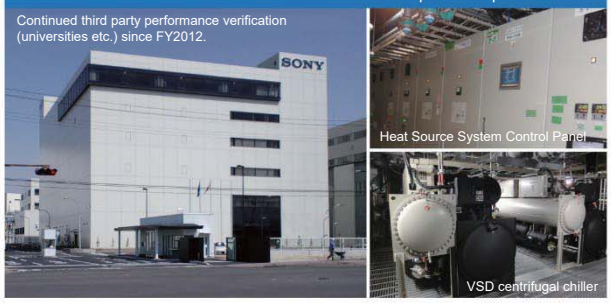


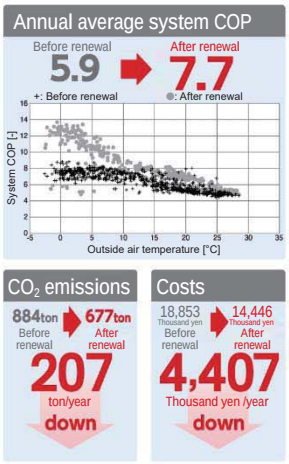
Effects or Remarks

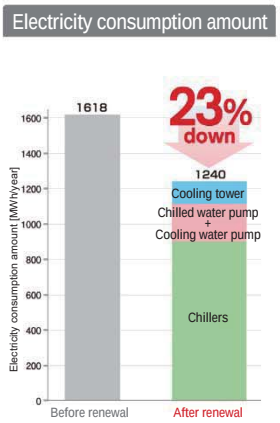
● **Sony Corporation Sendai Technology Center**

Mar 11, 2011 – Introduced energy-saving equipment for restoration and renewal work after the Great East Japan earthquake

Continued third party performance verification (universities etc.) since FY2012.







(1) Awards
- FY2013 Energy Conservation Grand Prize for excellent energy conservation equipment (Minister Prize of Economic, Trade and Industry (Electricity-saving Award))
  Sponsored by: The Energy Conservation Center, Japan

(2) Documents, etc.
- FY2013 Energy Conservation Grand Prize for excellent energy conservation equipment Award-winning Entry Abstracts [Products and Business Models Category], The Energy Conservation Center, Japan, p20-21
- Mitsubishi Heavy Industries Technical Review Vol. 51 No. 2 (2014), p4-9

(3) Patents
- Patents relating to control of multiple chillers: 4 patents, patents relating to controlling the auxiliary equipment: 8 patents, patents relating to attached functions: 4 patents, display screen design registrations: 2 registrations

Installation in Practice or Schedule

Domestic A total of 49 units have been delivered in Japan since 2011.
The following are examples of customers.
- Sony Corporation Sendai Technology Center
- Megmilk Snow Brand Co., Ltd. Ebina Factory

Overseas A total of 7 units have been delivered overseas since 2015 (2 in Thailand, 2 in Turkey, 1 in UAE, 1 in Singapore, and 1 in Malaysia).

Contact: **Mitsubishi Heavy Industries Thermal Systems Co., Ltd.** Sales Department
2-3, Marunouchi 3-chome, Chiyoda-ku, Tokyo, 100-8332
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T-9	Keywords	Y3	equipment or facility	Z3/4	system or software	E14	pulp, paper

Rengo Co., Ltd.

Promotion of energy conservation by circle activities at a paperboard manufacturing plant

Features

Various initiatives have been implemented, including company-wide efforts to reduce global warming impact, a large capital investment to introduce a high nip shoe press with the aim of breaking the common understanding of the industry, the introduction of advanced technologies and the energy-saving activities of the newly launched small-group energy conservation circle etc., to achieve a cumulative reduction in energy consumption of 8,663kl/year up to August 2014, a reduction of about 8% (compared to 2011) of the entire factory energy consumption.

Basic Concept or Summary

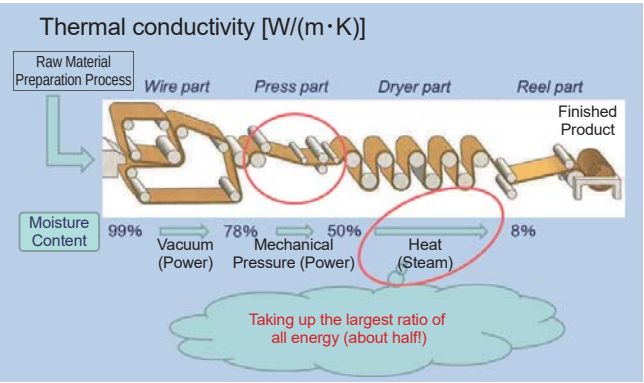
Rengo has adopted the motto of “Less is more”, aiming to produce packages that are high quality with high added value which effectively utilize resources and place a reduced burden on the environment.

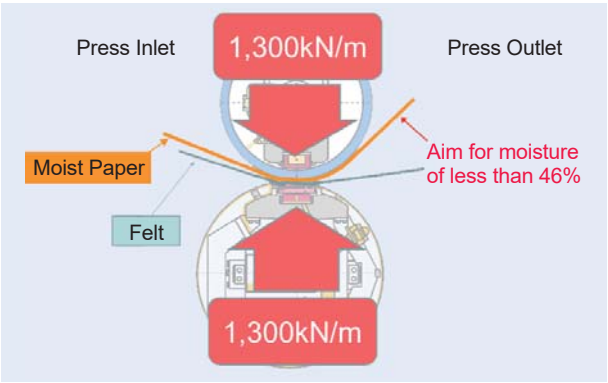
As part of this, we have introduced equipment to reduce their environmental load such as with the conversion of the Yashio factory from heavy oil to city gas for boiler fuel and the establishment of cogeneration facilities, etc., but in April 2009 significant CO_2 reduction targets were implemented in Saitama prefecture where the plant is located with the enforcement of the Global Warming Countermeasure Promotion Ordinance. Although the reduction target was difficult for the Yashio factory, which had already worked to reduce its environmental impact, the following was addressed to comply with these new regulations.

(1) Rengo is the leader in the industry in the efforts to reduce the weight of corrugated boards and paperboards.
(2) After investigating and considering the usage outside Japan and technical information, Rengo has introduced the high nip load shoe press of the highest linear pressure in Japan. Energy consumption was reduced through the subsequent drying process

Paper becomes a product through the process of taking 1% pulp and 99% moisture and forming it into layers, dehydrating, drying and creating the product, but in order to reduce steam consumption which takes up the largest weight in the drying process for the total energy use in papermaking a technical study was advanced, collecting information from both Japan and overseas, with a focus on promoting dehydration by mechanical pressure. As a result, after confirming the energy-saving and productivity improvement from the introduction of the high nip shoe press, modifications were made first to the No. 7 paper machine press part from a pressure of 1,000kN/m to the highest Japanese standard pressure of 1,200kN/m, lowering the moisture content from 48% to 46.5%.

This broke the common understanding in the Japanese paper industry that 46% was the limit for dehydration by mechanical pressure, and following this, a high nip shoe press was introduced as the No. 1 paper machine press part with a higher linear pressure of 1,300kN/m (currently operating at 1,500kN/m, 1.4 times the conventional maximum linear pressure in Japan) with the aim of breaking the press outlet moisture figure of 46%.





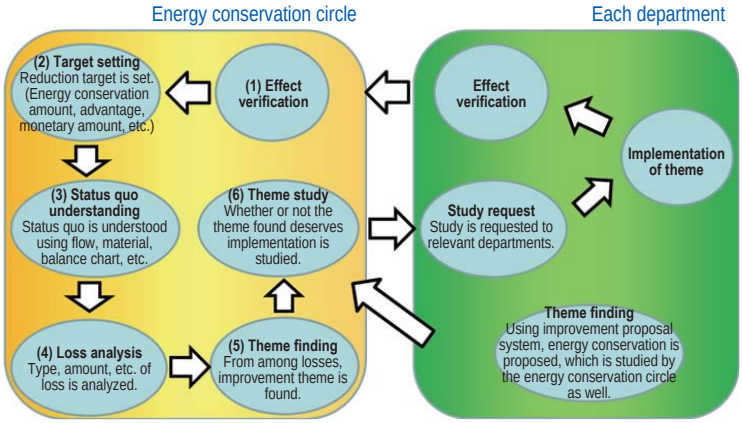
(3) Horizontal deployment to other similar facilities after a review of the advanced technologies of energy-saving equipment and trial basis introduction actively

(4) Grass-roots activities to find and implement energy-saving measures by a newly established energy conservation circle (Team Low Emission Yashio) with the participation of all members in the mill.

Based on the newly established energy conservation circle (Team Low Emission Yashio), implemented mill-wide information sharing from management to rank-and-file employees, through ISO activities, Environmental Committee and the efforts at workplace, implemented and continued a PDCA cycle of energy conservation activities.

Young people were appointed from each department to replace veteran members adopting a structure in which the execution ability of members was free from fixed stereotypes.

- Consultants are invited so that the members can learn the basics of the activity.
→ Establishment of PDCA cycle



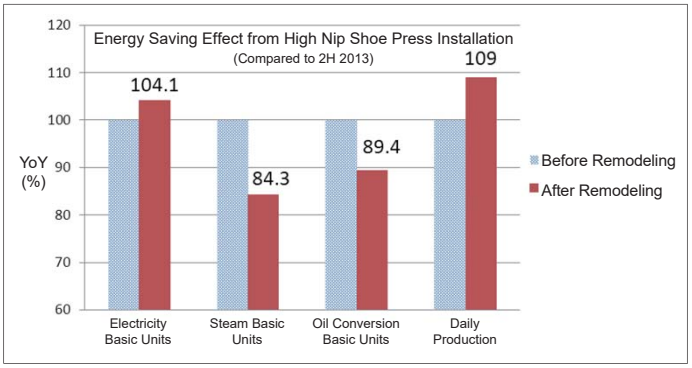
Effects or Remarks

(Crude oil equivalent)

(1) Weight reduction of corrugated boards and paperboards: A reduction of 89 kl/year

(2) Reduction of energy consumption of paperboard machines in the drying process: A reduction of 1,435 kl/year
*Application of the energy use rationalization project support subsidy

(3) Introduction and horizontal deployment of 14 energy-saving machines ▲3,239kl/year
*Partial application of the energy use rationalization project support subsidy



(4) Grass-roots activities of a small-group energy conservation circle with the cooperation of each business department: A reduction of 3,900 kl/year
Sum total of the reduction above: 8,663 kl/year (Cumulative up to August 2014)
Awards: Minister of Economy, Trade and Industry Award at the 2014 Energy Conservation Awards

(5) While the introduction of the high nip shoe press resulted in worse electricity consumption, steam basic units improved for a total improvement of 10.6% of crude oil equivalent. By reducing the steam used in the drying process, which had proven to be a bottleneck, productivity was increased by 9% (compared to the 2nd half of 2013). The moisture contents at the press outlet fell to 45.5%.
The high nip shoe press is currently operating at 1,500kN/m. The press outlet moisture contents are is around 45.0%. There have also been other initiatives, but further improvements in the steam basic units have resulted in an improvement of about 20% over 2012 for the productivity of the No. 1 paper machine.

(6) The efforts of the small-group energy conservation circle continue to this day, with a total of 117 projects having been implemented from its start in 2011 till 2019. The cumulative reduction in crude oil equivalent accounts for about 7% of the total factory energy (compared to 2011), achieving an energy-saving effect from cumulative small energy-savings comparable to a large-scale capital investment.

Installation in Practice or Schedule

Domestic Established new energy conservation circles in two other paper mills, having achieved great results.
Updated a shoe press at the No.5 paper machine in the mill to a similar high nip load shoe press. Achieved about an 8% improvement in specific steam consumption.
Remodeled other paper mills to increase existing shoe press linear pressure. Achieved energy-saving and productivity improvements.

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URL: https://www.rengo.co.jp/english/
E-mail: eco@rengo.co.jp

Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-10	Keywords	Y4	system or software	Z3/4	natural gas/electricity	D	Construction

Taisei Corporation

Promotion of ZEB (Zero Energy Building) by Energy-Saving and Achieving Comfort

Features

- In May 2014, Japan's first urban ZEB "Taisei Construction ZEB Demonstration Building" was completed, and following this, zero net annual energy (net ZEB) has been achieved for 5 consecutive years.
- Main technologies introduced

(1) Lighting system

A low luminance task & ambient lighting system combining equipment to use natural light and high efficiency LED lightings to achieve sufficient brightness with low luminance: energy consumption for lighting reduced by about 86%

(2) Air conditioning system

Task and ambient air conditioning combining air conditioning by radiation from the building structure utilizing exhaust heat from fuel cells and personal floor air outlet control: energy consumption for air conditioning reduced by about 76%

(3) Solar power system

High efficiency single crystal silicon solar power panels and other equipment for energy creation were installed on the roof and outer walls for energy creation.

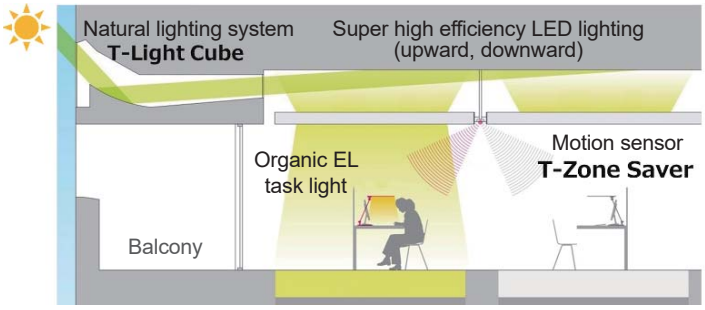
Major use	Office
Location	Totsuka-ku, Yokohama City
Total floor space	1,277m^2
Levels	3 levels above ground
Completed	May 2014

Basic Concept or Summary

Introduced Technologies

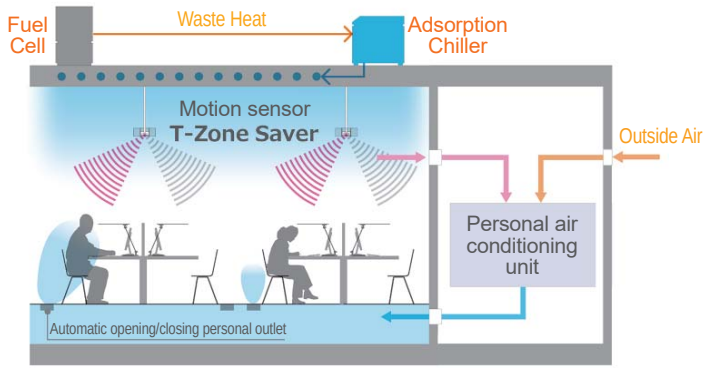
(1) Comfortable light environment making the most use of natural light

- Planned to maximize the use of natural light to reduce lighting energy as much as possible.
- Our proprietary natural lighting system T-Light Cube attached to the outside wall delivers natural light to the innermost recess of the office when the sun is shining.
- Highly efficient LEDs are used for all indoor lighting, and organic EL task lights are adopted for soft lighting.
- Also, by controlling the flashing and dimming of lighting with the real time detection of the presence of people using our proprietary human sensor T-Zone Saver, about 86% of lighting energy has been saved in comparison with that of regular buildings.



(2) Highly efficient, comfortable thermal environment utilizing exhaust heat

- In addition to architectural planning to reduce the load of air conditioning itself so as to reduce air conditioning energy, the use of a highly efficient air conditioning system has achieved about 76% of energy saving.
- The radiant cooling and heating system using the exhaust heat from highly efficient power generation fuel cells is adopted.
- Personal outlets were installed in the floor to allow the personal selection of air flows in consideration of comfort. Further energy saving is possible from the adjustment of air volume with human detection sensors similar to the case of lighting by detecting if someone is there.



Effects or Remarks

- LEED Certification
  Was the first building in Japan, in 2014, to receive the highest rating “Platinum” certification under the new building category LEED-NCv3 for the US Green Building Performance Certification System (LEED).
- BELS Certification
  Received the highest rating of “☆☆☆☆☆” from BELS (Building-Housing Energy-efficiency Labeling System)
  This was the first case of receiving the highest rating of “☆☆☆☆☆” from BELS.
  ZEB certification was also obtained along with the start of ZEB certification by BELS.
- WELL Certification
  Received the highest rating of “Platinum” from the US building health and well-being evaluation system (WELL Building Standard TM).
  Of the three evaluation categories set for building use under the WELL certification standards, the rating of “Platinum” is extremely difficult to obtain for new/existing buildings, and this was the first case of this rating being awarded in the world.
- Major Awards
  - 2014 – Environment Minister’s Award for Global Warming Prevention Activity (Introduction of Advanced Technical Measures)
  - 2016 – Energy Conservation Awards (Energy Conservation Examples Section)
  - 2016 – 4th Carbon Neutral Awards
  - 2017 – Technology Award at the 55th Society of Heating, Air-Conditioning and Sanitary Engineers of Japan

Installation in Practice or Schedule

Domestic Major ZEB Achievements

JS Hakata Watanabe Bldg.
ZEB Ready
Fukuoka / Office / 2018

Taisei Sapporo Bldg.
[Refurbishment]
ZEB Ready
Hokkaido / Office / 2016

Aichi Prefecture Environmental Research Center, Aichi Prefecture Eisei Research Institute
Nearly ZEB
Aichi / Research Lab / Sched. 2019

Kinki Sangyo Credit Union New HQ
ZEB Ready
Osaka / Office / 2019

Furubira-cho new government office
ZEB Ready
Hokkaido / Govt. Bldg.
Exchange Center / Sched. 2022

Next Generation R&D Bldg.
[Renovation]
Nearly ZEB
Kanagawa / Research Lab / 2018

Contact: **Taisei Corporation**
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Tel: +81-3-3348-1111
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Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-11	Keywords	Y4	system or software	Z2	oil	E31	transportation equipment

Mitsubishi Fuso Truck and Bus Corporation

Reducing CO_2 Emissions in the Supply Chain

Features

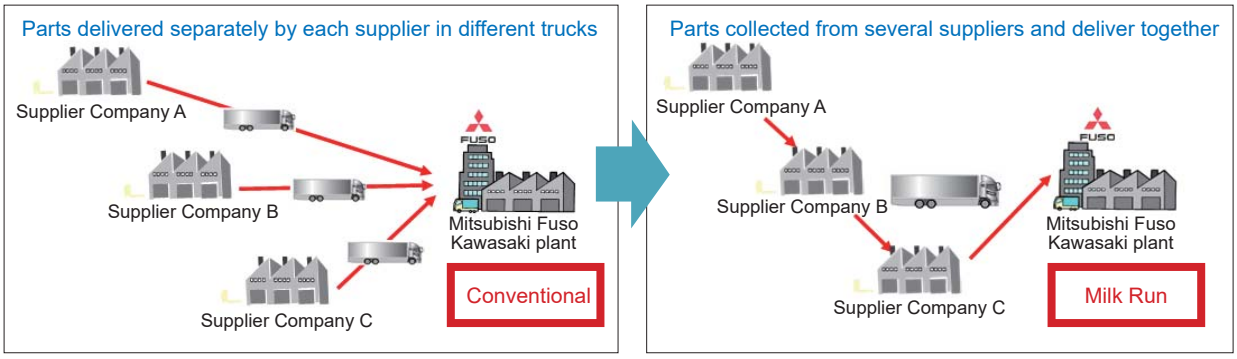
CO_2 emission reduction activities are being carried out by the company as measures against global warming, and one of these activities is aimed at the optimization of logistics to create an efficient, waste-free supply chin for “the procurement of parts from suppliers, to the manufacture of trucks and buses and their delivery to customers”.

<Major energy conservation activities>
(1) Milk run
(2) Modal shift to railroad transportation
(3) Improved direct delivery rate due to transportation route reduction
(4) Eco-friendly driving training

Basic Concept or Summary

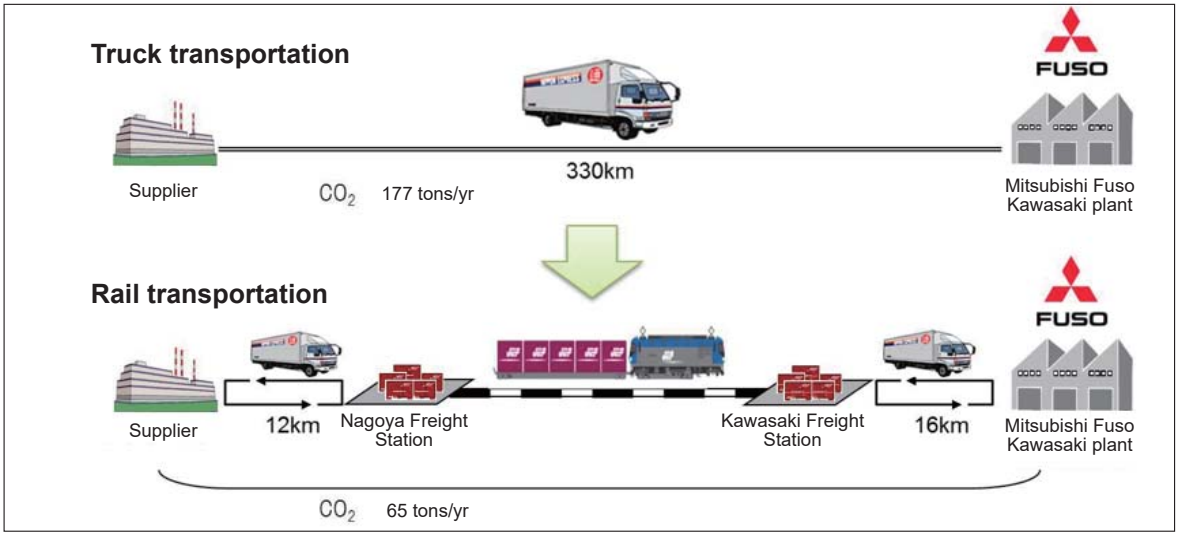
(1) Improved vehicle loading efficiency due to milk run

Conventionally, the various parts suppliers scattered throughout the country would deliver parts to the company’s production bases, but delivery to these bases has been improved by having suppliers that are neighboring or relatively close to each other transport their parts using the same trucks. This method is used by milk producers to procure milk raw materials, and is known as a milk run, comparing it to the collection of milk from multiple farms. Also, where a single supplier used multiple vehicles to deliver parts to this company, improvements to container loading methods and loading efficiency have led to a significant reduction in the number of transport trucks and CO_2 emissions.

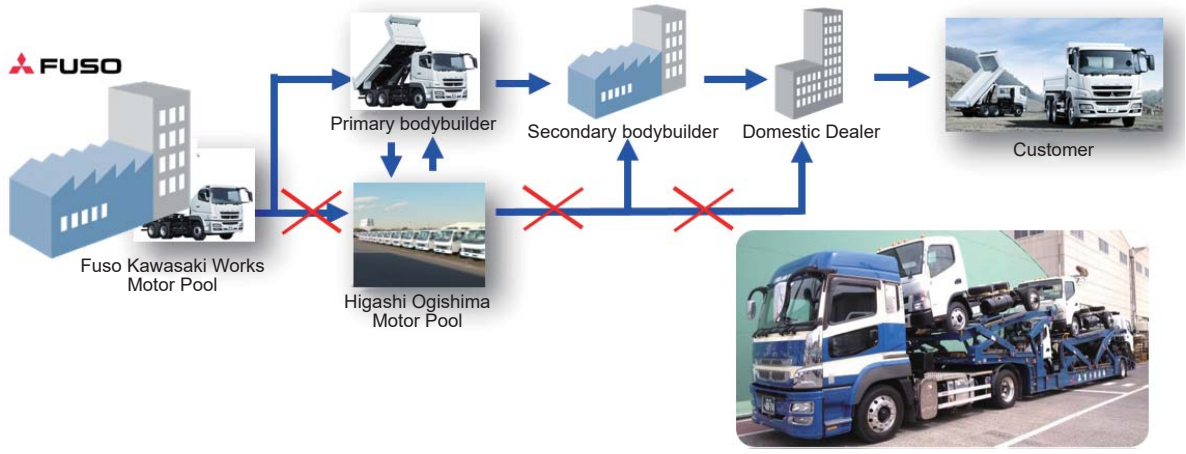


(2) Reduced CO_2 due to modal shift to railroad transportation

This modal shift is a change from conventional long-distance truck transportation to more environmentally friendly railroad or ship transportation to save energy and reduce CO_2 emissions, and this company had previously adopted ship transportation for some assembled vehicles in the past. By switching some truck transportation sectors for production parts to railroad transportation with the cooperation of trucking companies a further reduction of CO_2 emissions has been realized. A total of 130 tons of CO_2 have been reduced through milk runs and the modal shift to railroad transportation.



(3) Improved direct delivery rate due to transportation route reduction
Conventionally, trucks that were completed at the factory were temporarily placed in the factory parking lot, after which they were moved to a relay parking lot (motor pool) near Kawasaki Port or Yokohama Port, where they were kept until the date of delivery to the customer. By self-delivering directly to sales offices or customers without going through this relay parking lot, the delivery distance can be shortened, reducing the amount of fuel used and reducing CO_2 emissions.
At the same time, the utilization of carrier vehicles for assembled vehicle transportation improves the direct delivery rate by reducing transportation routes, reducing CO_2 emissions by 243 tons.



Effects or Remarks

Along with the improvement of the direct delivery rate due to the modal shift to milk runs and railroad transportation, the utilization of carrier vehicles for assembled vehicles and the elimination of stops on route during transportation, as well as the electrification of forklifts in factories has resulted in a 14.5% reduction in 2012 over as 2010.
Energy-saving driving training have also been held for drivers at affiliated companies and partners, sharing specific examples of initiatives aimed at CO_2 reduction, which is believed to have contributed to an improved awareness of energy-saving driving by drivers.

Installation in Practice or Schedule

Domestic Continuing activities mainly in the Logistics Department of the Mitsubishi Fuso Kawasaki plant

Overseas None

Contact: **Mitsubishi Fuso Truck and Bus Corporation**
Corporate External Affairs & Environmental Management Department
Tel: Customer Service Center (available only in Japan) 0120-324-230
URL: https://www.mitsubishi-fuso.com/content/fuso/en/index.html

Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

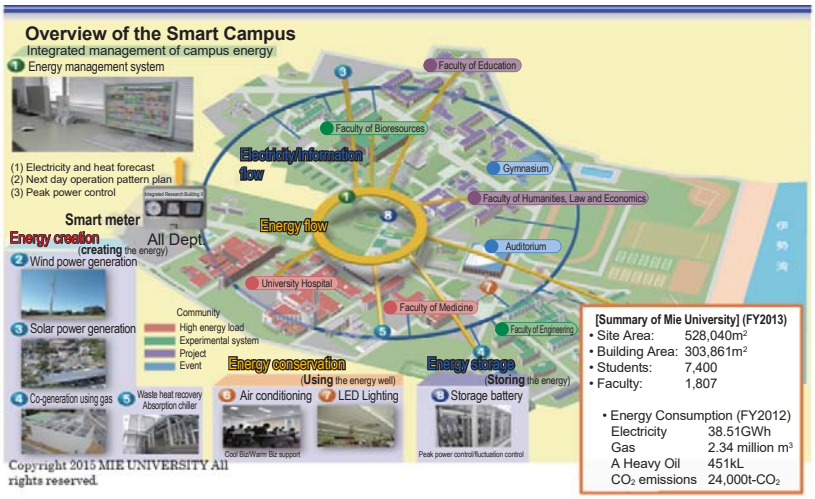
						S8	urban system
T-12	Keywords	Y4	system or software	Z3/4	natural gas/electricity	O	Education, Learning Support

Mie University

University-wide efforts to build a smart campus

Features

1. Energy saving project (Smart Campus) at the University campus to introduce innovative energy saving equipment Introduced organically combined energy equipment to “create, store and save energy” to optimize energy management (EMS), reduce energy and CO_2 emissions and control peak power.
2. Power saving efforts of all students and faculty members in the university Voluntary activities in which students and faculty participate for the environment, energy conservation and to suppress electricity demand.
   - **MIEU Point**
     A new mechanism for the reporting of environmental and energy saving activities implemented and the immediate “visualization” of results by participants. Activities providing incentives to improvement behavior
   - **Demand Response (power saving activities)**
   - **Green curtain**



3. Actual rate of reduction energy and CO_2 emissions

Figures compared with 2010

Item		Unit	2013	2014
Entire	Energy (crude oil equivalent)	kℓ/year (%)	**▲ 1,855 (▲ 20.4%)**	▲ 2,630 (▲ 25.4%)
	CO_2	t-CO_2/year (%)	**▲ 4,401 (▲ 27.3%)**	▲ 5,613 (▲ 31.5%)
Hospital	Energy (crude oil equivalent)	kℓ/ year (%)	**▲ 1,711 (▲ 44.3%)**	▲ 2,477 (▲ 52.7%)
	CO_2	t-CO_2/ year (%)	**▲ 4,138 (▲ 54.1%)**	▲ 5,337 (▲ 59.4%)

Basic Concept or Summary

1. Colaboration with stakeholders and local cooperation
Study groups and research with Mie prefecture, national and local governments, and companies.

2. Introduction of innovative technologies for the next-generation energy society

<Energy Creation>
- Introduced technology assuming the mass deployment of renewable energy Local energy (wind, solar) used throughout the campus (local production, local consumption)

<Energy Storage>
- Suppress fluctuations in power with hybrid power storage and maximize controls at peak power

<Energy Saving>
- With DC solar power generation which doesn’t require currency conversion (low loss), high efficiency LED lighting is also possible
- High efficiency cogeneration utilizing all electricity and waste heat without loss (cooling steam collection from exhaust heat)
- Energy saving air conditioning suited to a hot and humid climate

<Campus EMS>
- Unmanned operation of energy supply/demand equipment based on energy demand and supply forecasts
- Demand control with supply/demand equipment


(1) High efficiency cogeneration


(2) Wind power generation facility

3.University-wide energy saving and power saving activities
- MIEU Point energy and power saving activities (an energy saving activity which refers to MIE: Mie prefecture, and U: University and “you”)
- Demand responsive with the participation of all students and faculty
- Student-led green curtain
  Created a “green curtain” of plants to reduce the load of indoor air conditioning and to reduce and absorb CO_2 emissions
- Visualization of energy demand by sector and power saving execution

4. Publicity of Demonstration Content and Promotion to Other Universities
Teaching elementary and junior high school students (see and feel experience) - 46 times
Smart community exhibitions and introduction/presentation at academic societies - 32 times
Smart campus planning and support for other universities in Japan and overseas

Effects or Remarks

1. Energy saving effect1.Energy saving effect

(1) Solar power generation equipment
177kW of solar power generation equipment for the entire campus was installed, with a focus on the solar power generation facility next to the main gate (60kW), reducing energy and CO_2 emissions.
Energy ▲56kℓ/yr, CO_2 emissions ▲81t-CO_2/yr (Power reduction ▲217,000kWh/yr)

(2) Wind power generation equipment
Good wind conditions throughout the year (sea breeze in the summer, mountain breeze in the winter)
Wind power generation equipment (300kW) was installed to utilize local conditions, reducing energy and CO_2 emissions.
Energy ▲68kℓ/yr, CO_2 emissions ▲99t-CO_2/yr (Power reduction ▲265,000kWh/yr)


Study tour of the wind power generation facility (300kW)

(3) Gas engine cogeneration equipment
Introduced a 510USRT (1,793kW) cold and heat source facility to produce cold water using exhaust heat and a gas engine cogeneration facility (2,000kW) for energy and CO_2 emission reduction.
Energy ▲1,183kℓ/yr, CO_2 emissions ▲1,725t-CO_2/yr (Power reduction ▲ 10,556,000kWh/yr,
A Heavy oil reduction ▲987kℓ/yr, city gas usage + 2,224,000Sm^3/yr)

(4) Introduction of desiccant air conditioning equipment
Updated mainly heat sources with long annual operating hours. By making the humidity and temperature controlled independently by the new equipment, the electric desiccant air conditioner allows both power saving and comfort.
Energy ▲82kℓ/yr, CO_2 emissions ▲173t-CO_2/yr (city gas reduction ▲100,000Sm^3/yr, Power + 123,000kWh/yr)
"Compared with conventional air conditioner (gas heat pump)"

(5) Fuel conversion for hospital heat supply equipment
Converted the fuel supplying the heat equipment at the hospital from oil to city gas.
Energy ▲466kℓ/yr, CO_2 emissions ▲2,322t-CO_2/yr (A Heavy oil ▲1,803kℓ/yr, city gas + 1,097,000Sm^3/yr, Power + 411,000kWh/yr)

(6) Efforts of all students and faculty to save power
- Visualization of energy saving activities and MIEU points **▲2,770kWh/yr (▲1.03t- CO_2/yr)**
- Demand response (Power saving activities to control peak power) **▲430kW (▲4.5% of demand)**
- Green curtain (planting bitter gourd in front of the Environmental Science Museum)
  Solar radiation shielding effect ▲65~90%, under-leaf temperature ▲1.5~2.5°C

2. Awards

(1) Minister of Economy, Minister Prize of Economic, Trade and Industry for 2014 in the Energy Saving, Energy Saving Case Study Category
(2) Minister of Education, Culture, Sports, Science and Technology Award at the 22nd Global Environment Awards 2012
(3) Minister of the Environment Award at the 2015 Green Procurement Awards

3. Subsidies

Granted a subsidy for next-generation energy technology demonstration projects in 2013 (METI)

Installation in Practice or Schedule

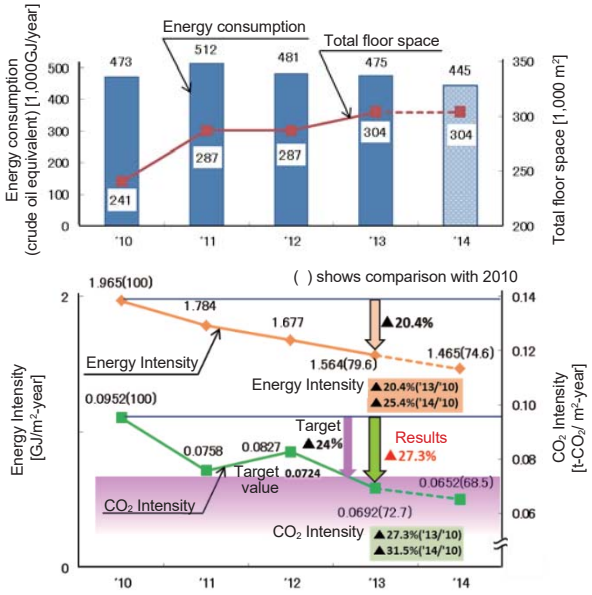
Energy Saving Achievements

The figure on the right shows the trends for energy consumption and per area energy/CO_2 basic units for 210 to 2014. In 2013, energy basic units were ▲20.4% and CO_2 basic units were ▲27.3% compared to 2010.

For hospitals, that need constant energy both night and day, Cogeneration allows the effective utilization of electricity and heat exhaust without shortage. Also, power from solar and wind power generation is used throughout the campus without the FIT (Feed-in Tariff, fixed price purchase system). The 2013 energy basic units by floor area for the hospital were ▲44.3% (CO_2 basic units were ▲54.1%).

Control of Peak Power

Peak power (9,530kW) was reduced by 4,770kW (50.1% of peak value)
through cogeneration, storage and improved facility operation.



Trends of university-wide energy and CO_2 emissions and basic units

Contact: **Mie University**, Global Environment Center for Education and Research
Tel: +81-59-231-9823
URL: http://www.mie-u.ac.jp/en/index.html E-mail: contact@gecer.mie-u.ac.jp

Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

T-13	Keywords	Y4	system or software	Z4	electricity	E29	electrical machinery

OMRON Corporation

“Visualization (energy audit)” and “Optimization” of factories using Environmental Andon System (EQS-AD10)

Features

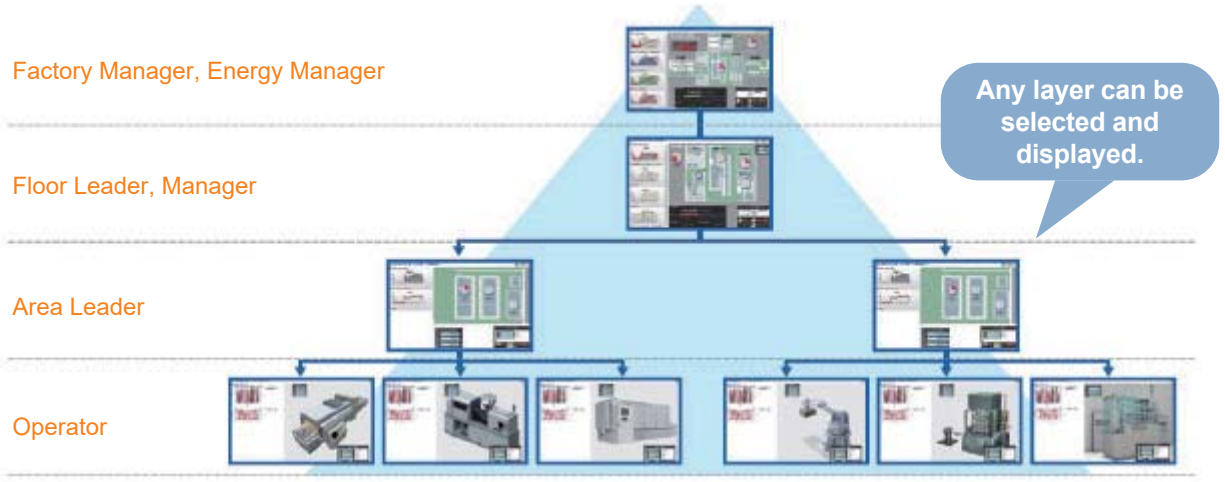
- The “Environmental Andon”, born out of our own factory, was developed for communication about energy conservation and environmental concerns.
- You can select from layers to easily check the production and environmental status that you are interested in, if you are in the Factory Management Department to Equipment Operators
- This monitoring system makes it possible not only to easily “visualize” data acquired from various sensors installed in equipment, but can also centrally “diagnose” by comparing, analyzing and monitoring.
- It is very easy to create a screen. Paste an image of the floor map and customize by simply putting icons in place.
- Compatible with three languages, Japanese, English and Chinese.

* “Andon” refers to a visual management tool to provide the right information to the right people in a timely manner.
The general Andon is the graphical display of power data and environmental data.
An Environmental Andon is a tool which measures the electricity and environment of each piece of equipment on the production site in real time, allowing anyone to see whatever they want to see at any time, making it possible to share information and learn things from the screen and data.

Basic Concept or Summary

(1) Alert function being displayed as icons, you can easily see where there are alarms and what the problem is

(2) With “layer selection”, people can freely check what they need to check, and can engage in participation-based communication



Effects or Remarks

- Starting activities in 2010, factory power consumption has been reduced by more than 20% over 2010 levels as of 2018. (Basic units ▲47%) (2,741,000 kWh →2,178,000 kWh)
- The total amount of energy savings for FY2010-2018 was 25.32 million yen.
- At the production site, energy saving measures are considered difficult due to concerns over the impact on productivity and quality, but this system allows energy saving measures to be put into practice on the production site without concern, as the “Environmental Andon” can be used at the production site level to “diagnose”, displaying measurement data when there are negative impacts on productivity and quality.
- Working towards the goal of “optimization” to improve the balance between “energy saving, environmentally-friendly, quality, productivity and safety”, problems at production sites can be solved through close communication with the worksite.
- Patent Registration: Patent No. 4377353 (By “layer selection”, people can freely check what they need to check, and can engage in participation-based communication)
- Awards receiving history includes the “Minister Prize of Economic, Trade and Industry” at the 2012 Energy Conservation Awards, the “Keidanren Chairman’s Award” at the 23rd Global Environment Awards and being listed in the “Industrial Sector” of the 2nd IPEEC Energy Conservation Top Ten International List

Installation in Practice or Schedule

Domestic

Internal: OMRON Yasu and Aso factories

Other Companies: Adopted by more than 200 companies, contributing to energy conservation activities at production sites (Released June 2013)

In addition to customers that have purchased the system, we also contribute to the environment in society by conducting more than 100 cases per year of factory tours and outside lectures to share internal expertise with customers conducting energy saving activities.

Overseas

Internal: OMRON Shanghai, Malaysia factories

Other Companies: several

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